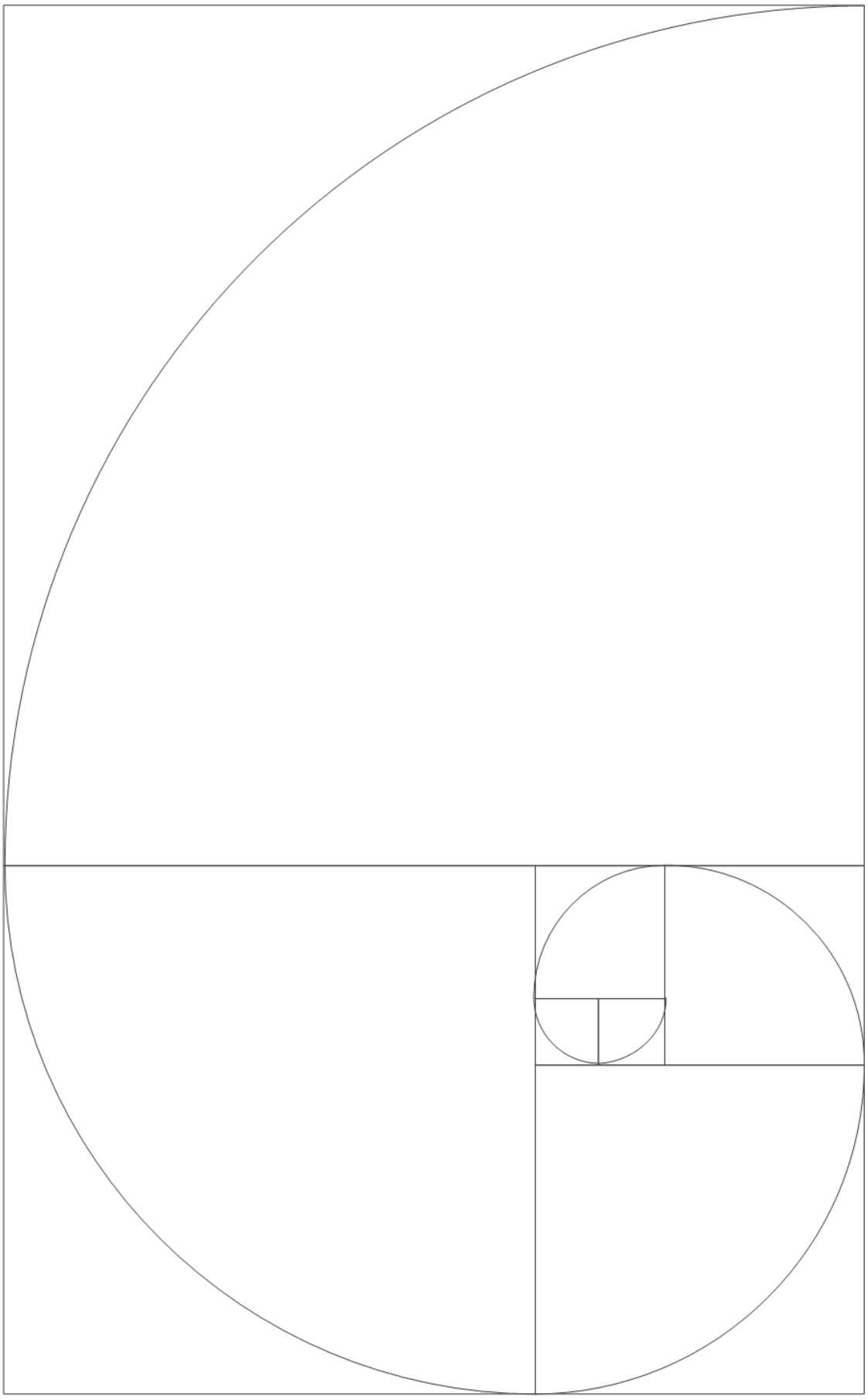

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SELECTION OF INFORMATIVE COLOR FEATURES COMPLEXES FROM DIGITAL IMAGES OF HEALTHY AND DISEASED VINE LEAVES

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***Abstract**: The purpose of the paper is to present selection of informative colour features complexes from digital images of healthy and diseased vine leaves. Tthe basic descriptive statistics related to 17 colour features from six color models (RGB, HSV, Lab, YCbCr, XYZ, xyY) extracted from digital images of healthy and diseased vine leaves are presented in the paper. Comparative analysis of methods for informative feature selection is done. Complexes of informative color features for classification of healthy and diseased vine leaves are proposed.*
***Key words:** statistical approach, digital images, vine leave, colour features.*

1. INTRODUCTION

The purpose of the paper is to extract and determinate colour features from six colour models (RGB, HSV, Lab, YCbCr, XYZ, xyY) of healthy and diseased vine leaves extracted from their digital images, to assess informative colour features for classification of healthy and diseased vine leaves and to compare methods for informative feature selection.

2. MATERIAL AND METHODS

2.1. General information about the research objects

The research objects are healthy and diseased vine leaves. Figure 1 presented Digital colour images of healthy vine leaves. The main disease of vine leaves are Scab and Powdery mildew which are presented on Figure 2, Digital colour images of diseased vine leaves.

2.2. Operation algorithm for division of healthy from diseased vine leaves through colour images

2.2.1. Training and test data set

Classification of the vine leaves requires using of two data sets - training and test. The first one (training set) is formed from the images of typical vine leaves for class healthy and class diseased. Images of both classes are shown on Figures 3 and 4.

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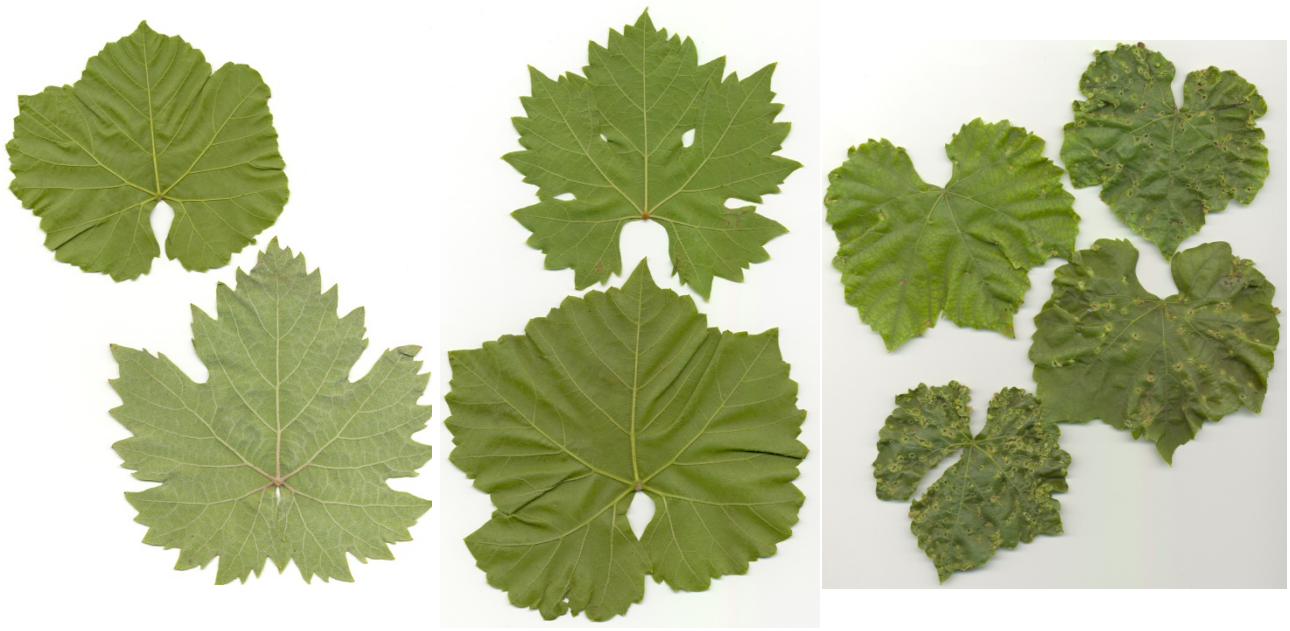

Figure 1.
Digital colour images of healthy vine leaves

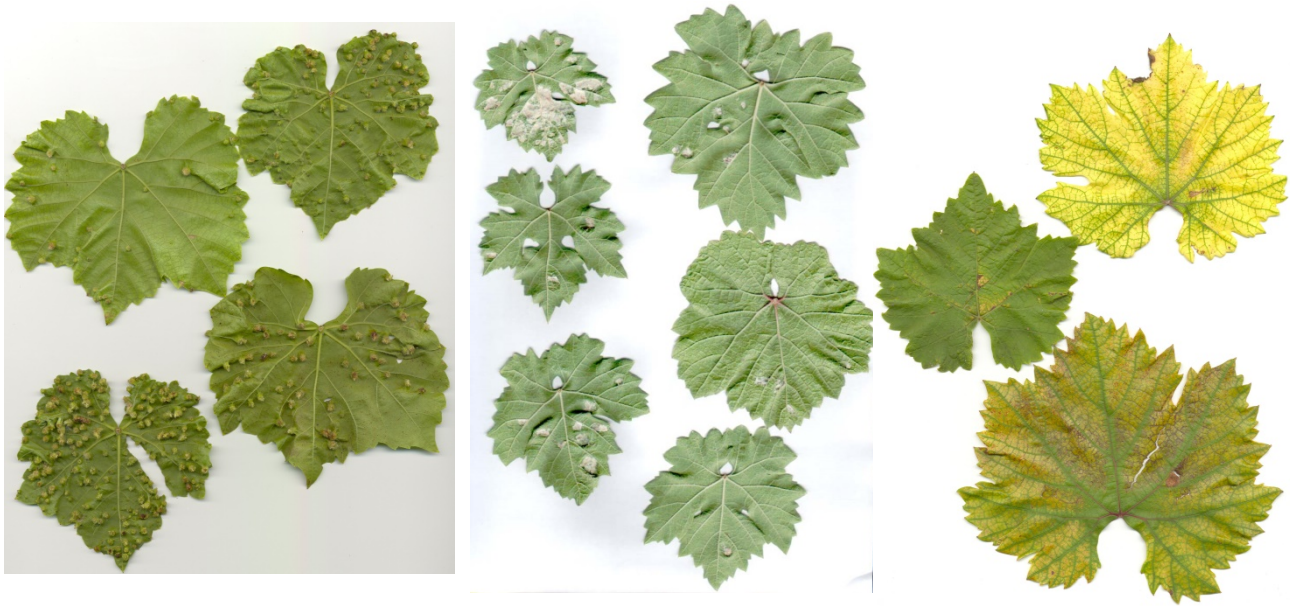

Figure 2.
Digital colour images of diseased vine leaves

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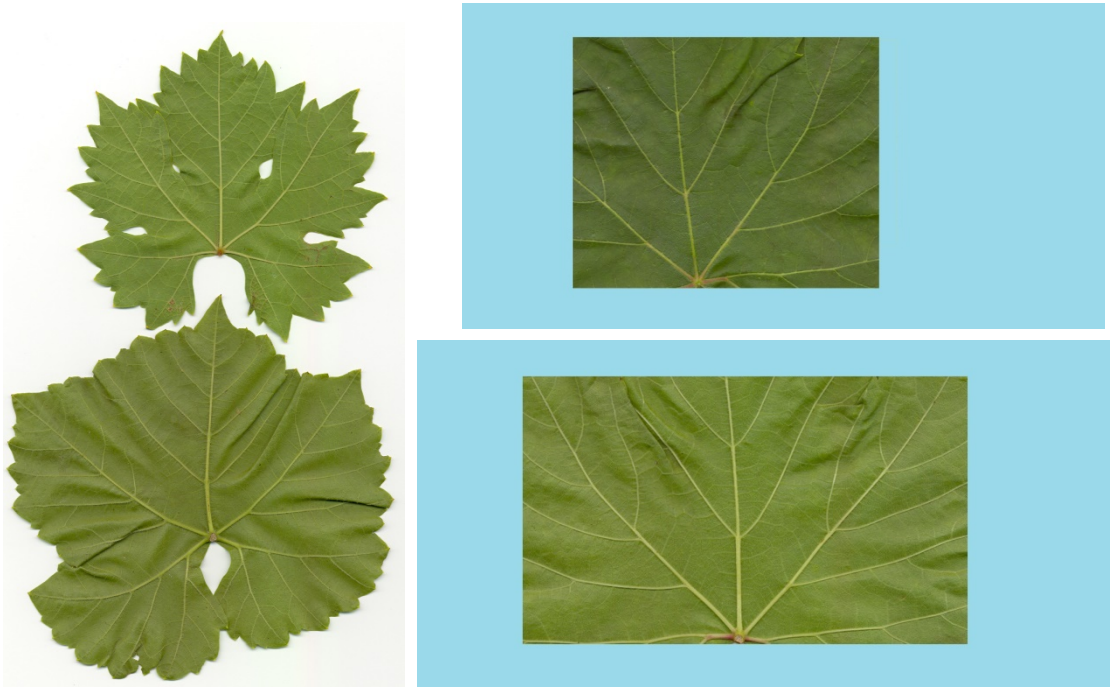

Figure 3. Class healthy vine leaves - typical images

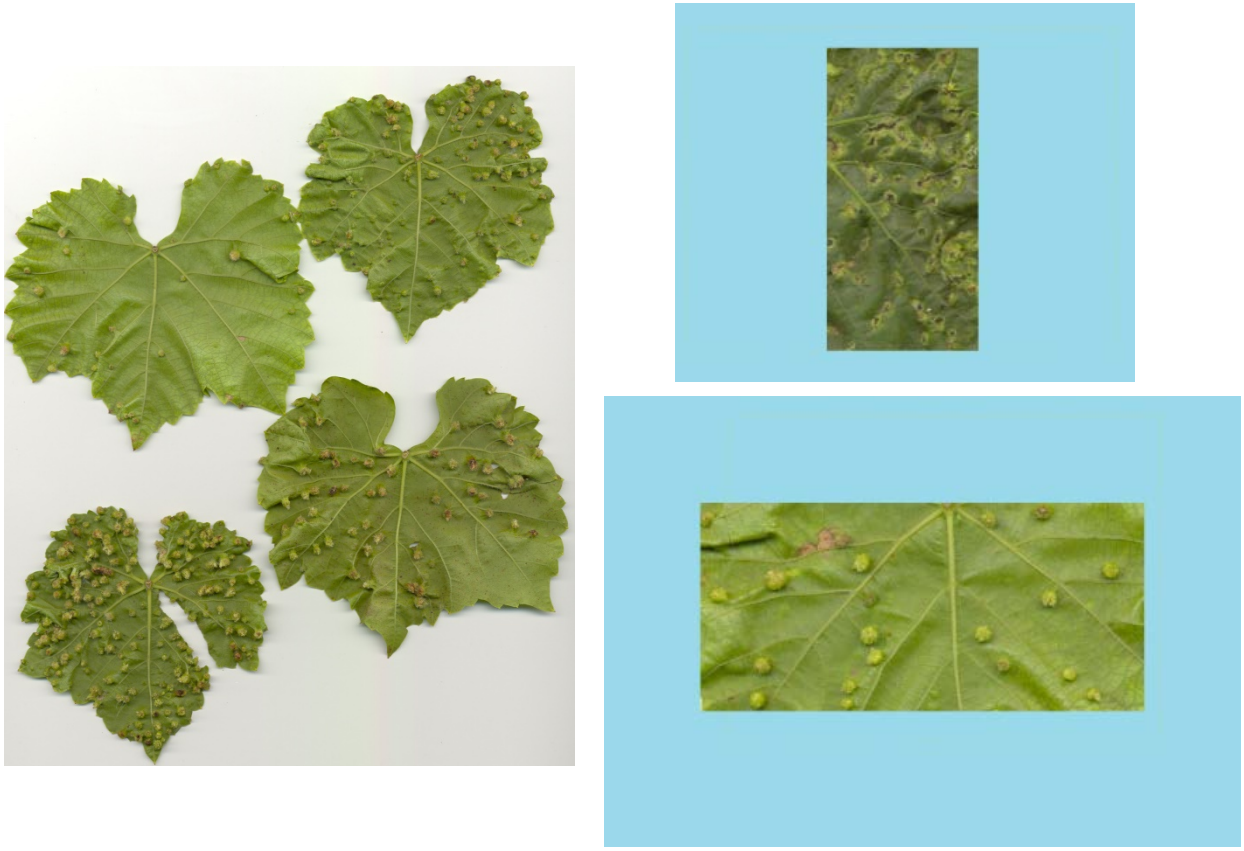

Figure 4. Class diseased vine leaves - typical images

2.2.2. Colour features extract

The next step is to achieve the pixels which below only to the object. The RGB colour image is converted into HSV colour model. The H colour component is used for removing the background of the image and to save only the pixels from the vine leaf. The pixels belonging to the leaves are converted to RGB, HSV, Lab, XYZ, YCbCr, xyY colour models. For the purpose of recognizing a colour indication of each pixel of the image of the leaves are extracted in 17 colour attributes corresponding to the 17 components (R, G, B, L, a, b, X, Y, Z, H, S , V, Y, Cb, Cr, x, y) of colour patterns mentioned above. Calculation of the mean values of the colour components of all pixels in the image of each leaf is:

$$\overline{R}_m = \frac{1}{n}\sum_{i=1}^{n} R_i \,, \tag{1}$$

Where R is the value of the R component of the RGB colour model;
m - the number of leaf;
i - number of image pixel of the current leaf;
n - number of pixels of the image of the current leaf.

2.2.3. Selection of the colour features

In the paper are presented two types of assessments of the colour features - individual and combination of features. Two methods are used for individual assessment of the informative of colour features: FDR (Fisher's Discriminant Ratio) and Statistical Chi-square/ CS.
FDR (Fisher's Discriminant Ratio) criterion is appropriate for dimensional classification on individual features between two equal classes of objects. This criterion is independent of the type of the allocation classes. On the features, which averages two classes of objects differ greatly among themselves and dispersions classes are small in value, the value of FDR criteria (2) will be great, and the sign will be highly informative.

$$FDR = \frac{(\mu_1 - \mu_2)^2}{\sigma_1^2 + \sigma_2^2} \tag{2}$$

Where μ_1 is the average value of a feature of the first class;

μ_2 is the average value of the feature for the second class;

σ_1^2 - the standard deviation of the feature values in first class;

σ_2^2 - the standard deviation of the feature values in the second class.

Criterion chi-square (Chi-square / CS) - CS measure known statistics for each subset of input features in terms of classes. Great value corresponds to the high correlation between the feature and the class. Value of the feature F is calculated by the following relationship:

$$\chi^2(F) = \sum_{i=1}^{m}\sum_{j=1}^{k}\frac{(A_{ij} - E_{ij})^2}{E_{ij}} \,, \quad E_{ij} = \frac{R_i.C_i}{|S|} \,, \tag{3}$$

Where m is the number of subclass formed by feature value F;

k - number of classes;

A_{ij} - value of the feature in the i-th subset of the j-th class;

E_{ij} - expected of feature A_{ij} belonging to the i-th subclass;

C_j - number of features in the j-th class;

R_i - number of observations in the i-th subclass.

Three methods were used for assessment of the informative combination of colour features: Scalar Feature Ranking, Best Feature Combination – (BFC) and Discriminant Analysis.

2.3. Experimental Researches

The obtained images of healthy and diseased vine leaves are distributed into two sets. The training set includes 20 images of healthy and 20 images of diseased vine leaves of each kind or totally 40 images. The test set includes 30 images of healthy and 30 images of diseased vine leaves of each kind or totally 60 images.
The mean values of the colour components of all pixels in the image are shown in Table 1 for class healthy and Table 2 for class diseased.
Statistical values (mean and mean squared deviation) of the colour components for class healthy and class diseased are shown in Table 3.

Table 1. Mean values of the colour features for healthy vine leaves

RGB			HSV			Lab			XYZ			Ycbcr			xy	
R	G	B	H	S	V	L	a	b	X	Y	Z	Y	cb	cr	x	y
75.04	137.73	49.39	103.61	0.65	137.73	73.23	-29.74	31.14	34.57	46.08	25.78	12.52	-3.43	-2.32	34.57	46.08
100.38	121.45	63.13	82.05	0.48	121.45	72.50	-17.80	24.42	37.63	44.16	30.22	10.79	-2.09	-0.08	37.63	44.16
98.19	117.20	53.74	78.38	0.55	117.21	71.74	-17.14	26.23	36.03	42.53	26.48	10.31	-2.37	0.07	36.03	42.53
78.65	92.35	41.18	76.16	0.57	92.36	65.13	-13.58	26.12	28.48	33.57	20.21	18.89	-5.03	-0.11	28.48	33.57
90.17	109.17	19.44	72.60	0.84	109.20	67.63	-18.29	44.08	31.10	38.60	12.87	19.97	-8.78	0.05	31.10	38.60
152.88	164.52	102.19	71.17	0.38	164.88	81.35	-10.10	21.55	55.00	61.76	47.21	49.72	-9.13	0.25	55.00	61.76
88.37	101.62	51.52	76.00	0.50	101.62	73.40	-11.45	23.13	32.13	37.29	24.80	17.01	-3.81	0.02	32.13	37.29
85.46	98.18	49.61	75.83	0.51	98.18	68.27	-11.78	23.44	31.03	36.03	23.81	31.70	-7.63	-0.37	31.03	36.03
85.46	98.18	49.61	75.83	0.51	98.18	68.27	-11.78	23.44	31.03	36.03	23.81	31.70	-7.63	-0.37	31.03	36.03
88.42	103.81	48.67	77.00	0.54	104.04	67.71	-13.06	24.65	32.23	37.82	23.86	42.93	-11.31	-1.01	32.23	37.82
120.71	138.57	54.90	72.83	0.61	138.76	74.35	-14.53	30.71	42.78	50.45	28.20	46.70	-14.48	-0.32	42.78	50.45
90.53	107.20	48.76	77.34	0.55	107.26	69.36	-13.66	26.28	33.05	38.95	24.09	30.15	-8.02	-0.65	33.05	38.95
117.84	134.66	53.66	72.52	0.61	134.75	72.55	-14.08	29.39	41.68	49.07	27.51	30.63	-9.29	0.03	41.68	49.07
91.26	108.46	47.43	77.18	0.57	108.46	70.40	-14.07	27.63	33.25	39.33	23.69	19.47	-5.19	-0.25	33.25	39.33
117.80	134.67	53.76	72.59	0.61	134.74	72.61	-14.27	29.54	41.68	49.08	27.54	32.19	-9.77	0.00	41.68	49.08
96.73	120.74	44.56	79.30	0.64	120.76	70.85	-15.95	30.35	35.60	43.12	23.22	28.14	-8.86	-1.08	35.60	43.12
96.25	119.54	45.58	79.29	0.63	119.63	70.63	-15.90	30.03	35.44	42.78	23.56	30.19	-9.30	-1.16	35.44	42.78
117.65	134.69	55.32	72.97	0.60	134.77	74.44	-14.45	30.48	41.77	49.11	28.12	51.37	-15.54	-0.39	41.77	49.11
86.17	98.84	48.70	75.18	0.53	98.84	70.71	-13.08	26.82	31.15	36.24	23.43	22.07	-5.35	-0.06	31.15	36.24
112.91	124.32	50.19	69.30	0.61	124.34	72.29	-12.95	29.26	39.21	45.68	25.63	36.55	-11.19	0.61	39.21	45.68

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Table 2. Mean values of the colour features for diseased vine leaves

RGB			HSV			Lab			XYZ			Ycbcr			xy	
R	G	B	H	S	V	L	a	b	X	Y	Z	Y	cb	cr	x	y
167.17	166.53	52.98	60.66	0.71	172.56	82.67	-12.51	44.67	54.13	62.14	28.73	42.37	-15.74	3.23	54.13	62.14
170.45	170.16	66.63	60.55	0.62	175.75	83.99	-11.46	38.81	56.23	63.86	34.53	36.99	-11.85	2.54	56.23	63.86
169.43	166.85	35.23	59.30	0.82	173.03	82.99	-12.70	46.06	53.12	61.85	21.20	18.39	-7.93	2.02	53.12	61.85
173.73	171.74	66.27	59.09	0.63	176.60	83.43	-11.22	38.14	56.97	64.57	34.49	23.70	-7.50	1.95	56.97	64.57
124.28	128.84	59.12	62.84	0.56	134.18	77.20	-10.41	31.77	42.37	48.17	29.24	27.90	-7.64	1.31	42.37	48.17
142.37	148.79	78.87	65.41	0.48	150.29	79.30	-10.35	29.43	49.48	55.83	37.73	25.72	-5.90	0.97	49.48	55.83
160.78	150.52	45.70	53.38	0.74	164.22	79.81	-10.29	38.75	50.32	56.91	24.76	23.05	-8.73	2.81	50.32	56.91
166.19	161.12	66.89	56.50	0.61	169.78	81.12	-9.91	37.26	54.32	60.99	34.13	23.47	-7.06	2.11	54.32	60.99
111.67	120.91	52.18	69.16	0.58	123.79	77.06	-11.04	34.87	38.70	44.69	26.24	17.51	-4.81	0.66	38.70	44.69
130.00	137.71	59.18	66.27	0.59	141.89	77.34	-11.40	34.21	44.53	51.13	29.82	13.51	-3.63	0.78	44.53	51.13
115.11	125.89	54.42	70.46	0.58	129.35	76.36	-11.61	33.69	40.10	46.43	27.31	14.02	-3.73	0.56	40.10	46.43
129.31	133.51	57.64	63.29	0.59	138.08	76.65	-11.06	34.52	43.74	49.87	29.02	21.80	-6.20	1.23	43.74	49.87
121.10	116.36	38.46	54.78	0.71	130.51	75.32	-11.08	36.46	38.67	43.84	20.75	12.88	-4.33	1.56	38.67	43.84
119.96	114.17	39.62	53.32	0.70	128.72	74.81	-10.72	36.45	38.31	43.19	21.30	15.00	-4.95	1.78	38.31	43.19
216.62	208.04	66.41	57.09	0.71	219.20	82.72	-12.03	42.23	69.03	78.35	36.45	31.67	-11.58	3.14	69.03	78.35
213.21	202.84	80.17	55.90	0.63	215.09	83.13	-11.31	39.96	68.77	77.01	41.48	22.99	-7.21	2.35	68.77	77.01
145.45	141.96	56.12	58.76	0.64	150.65	78.02	-10.72	37.26	47.44	53.55	28.75	24.38	-7.70	2.14	47.44	53.55
151.05	153.52	62.34	61.76	0.61	157.06	78.78	-11.54	35.85	50.42	57.44	31.94	24.98	-7.59	1.61	50.42	57.44
119.33	118.46	59.80	58.68	0.53	124.36	75.50	-9.90	31.46	40.19	44.89	28.94	19.28	-4.68	1.42	40.19	44.89
137.19	146.83	80.98	68.47	0.46	147.44	77.62	-10.51	28.31	48.50	54.90	38.37	26.55	-5.71	0.61	48.50	54.90

Table 3. Statistical values of the colour features for class healthy and diseased vine leaves

Statistical values of the colour features				
Feature	Class healthy		Class diseased	
	Mean value	Mean squared deviation	Mean value	Mean squared deviation
R	99,544	18,62	140,5322	30,80194
G	118,295	18,41	144,0644	25,76386
B	51,567	14,54	60,0730	11,47094
H	76,856	7,03	63,8581	7,09419
S	0,575	0,09	0,5959	0,09406
V	118,358	18,46	149,2148	27,57967
L	71,371	3,42	77,7837	3,82355
a	-14,883	4,09	-11,2744	0,98850
b	4247,977	12989,14	33,5285	6,66878
X	6356,384	15433,61	47,1944	8,84062
Y	42,884	6,79	53,8259	9,86667
Z	5859,898	14374,94	30,3870	5,13942
Ycbcr	7239,165	14245,41	22,3237	8,07573
cb	-7,910	3,68	-6,5637	3,07236
cr	-0,357	0,64	1,3652	0,96465
xm	6356,384	15433,61	47,1944	8,84062
ym	42,884	6,79	53,8259	9,86667

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Table 4.
Methods for feature extraction of informative colour features combination of the vine leaves

	Methods for feature extraction		
Classes	Discriminant Analysis	SFR	BFC
Healthy - Diseased	G,B,H,S,V,a,Z,Ycbcr, cb,cr,ym	ym,b,cb,S,B,xm,Z	ym, b, B

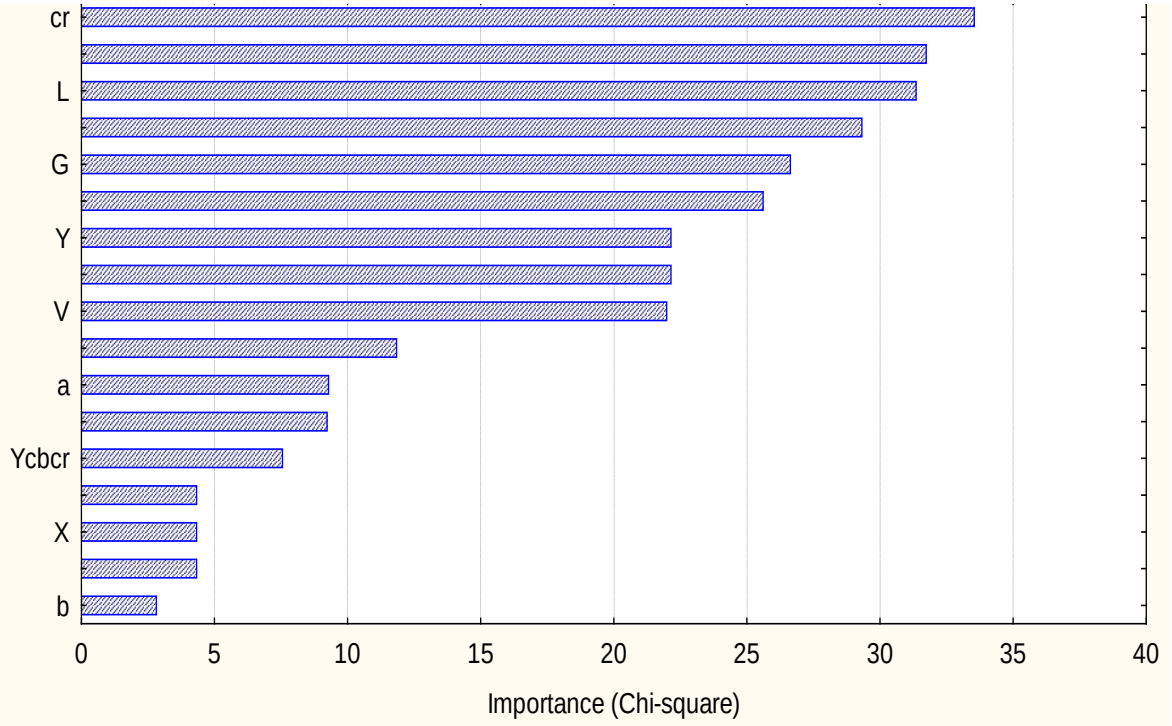

Figure 5. Informative features arrangement using the method of chi-square statistic

3. CONCLUSION

Database of digital images of vine leaves healthy and diseased is obtained. The basic descriptive statistics related to 17 colour features from six colour models (RGB, HSV, Lab, YCbCr, XYZ, xyY) extracted from digital images of healthy and diseased vine leaves are calculate.
Comparative analysis of methods for informative feature selection is done.
Complexes of informative colour features for classification of healthy and diseased vine leaves are proposed.

4. REFERENCES

[1] Facchin S., J. Trierwieler, V. Conz. Soft sensor design: A new approach for variable selection. 2nd Mercosur Congress on Chemical Engineering.

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CLASSIFICATION OF HEALTHY AND DISEASED VINE LEAVES USING COLOR FEATURES

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***Abstract**: An algorithm for classification of healthy and diseased vine leaves images using color features is presented in the paper. Classification accuracy is assessed when different complexes of informative features and classification methods are used. Three methods are used for classification: support vector machines (SVM), k-nearest neighbors (k-NN) algorithm and decision tree. The classification accuracy is in the range between 79.86% and 97.14% according to the selected complex of color features.*
***Key words:** Vine leaves, k-nearest neighbors, SVM, Decision Tree, Color features, Classification.*

1. INTRODUCTION

The effectiveness of precision recognition depends not only on fast collection of field data, as early as possible, but also on analysis and interpretation of the collected data and the development of classification techniques. Various statistical and artificial intelligence methods have been used for analysis of agricultural data.
The purpose of the paper is to compare classification accuracy of healthy and diseased wine leaves when different complexes of informative features and classification methods are used.

2. MATERIAL AND METHODS

2.1. Sample preparation

Classification of the vine leaves requires using of two data sets - training and test. The training set is formed from the images of typical vine leaves for class healthy and class diseased. Obtained RGB colour components of each vine leaf are collected in matrixes. STATISTICA software was used for image data processing.

2.2. Data Processing

On the basis of preliminary review of standard methods classification (Alpaydin, 2010; Tsang, 2007), the trends outlined by a variety of other contemporary scholars systems for real-time (Burges; Damyanov, 2010) and last but not least set requirements to solve the specific task in the thesis using the following classification algorithms process the support vectors, a method of complex they most nearest neighbour, Bayesian classifier and decision tree.

These algorithms are selected, since each operates on a different basically method for differently generates the model for predicting the target variable (class). Therefore, the implementation of these algorithms on the same data may lead to the preparation of mixed results - in some cases certain algorithms give better results in others - other algorithms do better in terms of predicting class (this actually seen from the results obtained in the present study). Therefore comparison between the operation of several different methods allowing it to be selected optimal solution for the subsequent application on the new data.
The data were analyzed using three commonly used in precision agriculture classifiers - kNN, SVM and decision tree.
The k-Nearest Neighbours algorithm (or k-NN for short) is a non-parametric method used for classification and regression. In both cases, the input consists of the k closest training examples in the feature space. The output depends on whether k-NN is used for classification or regression. In k-NN classification, the output is a class membership. An object is classified by a majority vote of its neighbours, with the object being assigned to the class most common among its k nearest neighbours (k is a positive integer, typically small). If k = 1, then the object is simply assigned to the class of that single nearest neighbours. In k-NN regression, the output is the property value for the object. This value is the average of the values of its k nearest neighbours. k-NN is a type of instance-based learning, or lazy learning, where the function is only approximated locally and all computation is deferred until classification. The k-NN algorithm is among the simplest of all machine learning algorithms. Both for classification and regression, it can be useful to assign weight to the contributions of the neighbours, so that the nearer neighbours contribute more to the average than the more distant ones.
The measure of similarity, which is the second parameter setting k-NN classifier and depends on the characteristics of the input data in this case is chosen to be the Euclidean distance as (1); V-fold cross validation (V=10) was applied as well.

$$d(X,Y) = \sqrt{\sum_{i=1}^{n}(X_i - Y_i)^2} \tag{1}$$

The choice of this classification stems from the need for fast and simple from a mathematical standpoint classification. kNN classifier is one of the most frequently used non-parametric classifiers, it works on the principle classification by association to a group of images from a class called nearest neighbours (Figure 1).

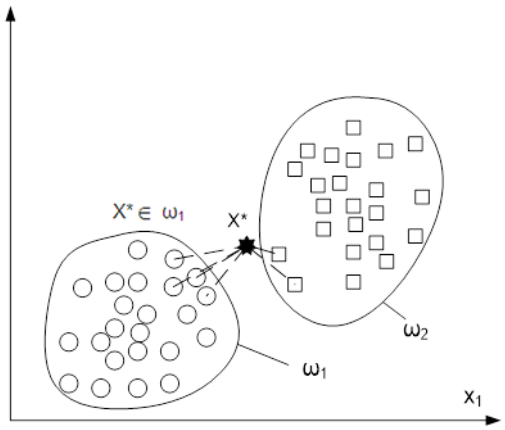

Figure 1. Geometric interpretation of kNN classifier for two classes

In the phase of training data sample trainees are regarded as typical samples and on the basis of these aggregations of multiple standards form descriptions of classes. In every phase of classification unknown input image refers to the class to which they belong, at least S of the nearest neighbours of providing a sample of images. S is a threshold of credibility and is usually selected within a range $k/2 < S \leq k$.

If k separates the image of the sample, the number of images belonging to the same class is equal to S or greater than, it is assumed that the object belongs to this class. If this condition is met for two or more classes, the unknown image refers to the class with the largest number of nearest neighbors. "k" is an integer, which normally has a small value. The choice depends on the characteristics of the data, the larger value of k reduces the impact of noise on the results of the classification, but makes the boundaries between classes less clear. The number of nearest neighbours to which calculates the Euclidean distance is specified experimentally.

The RBF kernel is one of the most popular kernel functions of SVM classifiers. SVM makes use of the so-called kernel. The most commonly used kernels are linear kernels, polynomial kernels, and radial basis functions. Each kernel represents a given space and, depending on the data distribution in the problem, linear separation cannot be guaranteed. First, the average test data set classification accuracy obtained from a single SVM without any involvement of the designing procedure proposed was estimated. The implementation of the method was made for radial basis function (RBF) with a width σ and is formulated as

$$K(x, y) = \exp(-\|x - y\|^2 / (2\sigma^2)) \quad (2)$$

The optimal values of the regularization constant *C* and the kernel width have been selected experimentally. To select the values, a “qualified guess” was made from several experiments, first. Then, several loops were run to refine the values by keeping one parameter fixed and adjusting the other one, interchangeably. We studied the effectiveness of the feature selection procedure applied to single SVMs.

The method of support vectors - SVM (Support Vector Machines) is a basic, modern method widely used in a number of studies on the classification of objects in an asymmetrical structure of the available data and an inability classes be divided directly by linear functions.

It is a method of classification by nonlinear transformation of the original data in another area with a higher dimensionality, wherein the objects are linearly separable (Figure 2).

In SVM method the pillars that represent breakpoints for a class data in the space of signs is built optimal hyper plan. It satisfies the condition, the distance between the borders of the two classes is maximum (Figure 2.a).

The function Φ determine the image of the entrance area K (x, y) in a new high dimensional feature space:

$$K(x,y) = (\Phi(x), \Phi(y)) \quad (3)$$

As for training and classification is used only scalar product of pairs of vectors Φ (x), Φ (y). With nuclear (kernel) function can indirectly define the work in this space, such as the use of different kernel functions constructed various classifiers, some of which are the same as traditional architectures - linear classifier, polynomial, RBF classifier, neural network MLP (Nashata, 2011).

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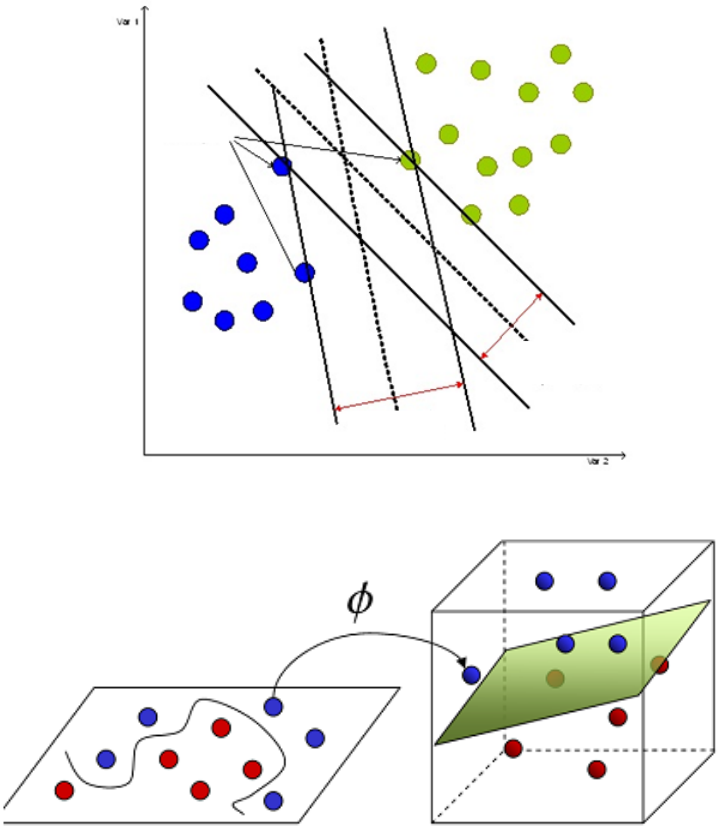

a) b)

Figure 2. Optimal hiperplan at SVM method.
a) with linearly separable areas; b) non-linear separable areas

Characteristic of this method is not required to calculate or even to know the transformation function Φ, since it never used explicitly. This in turn permits, without requiring significant computing resources to work indirectly in multidimensional feature space, which gives better opportunities to improve severability between classes in a limited capacity.
In the case of linearly inseparable classes can use the strategy "soft Margin", where necessary compromise between the size of the marginalized and the number of incorrectly classified training data. RBF function is most preferred in nonlinear separable areas given its good properties ($0 < K < 1$).
The classification accuracy of samples is evaluated by the method of support vectors using software package of StatSoft STATISTICA 8. The realization of method is made for radial basis function (RBF) with width σ.

$$K(x, y) = \exp(-\|x - y\|^2 / (2\sigma^2)) \quad (4)$$

The training of a SVM classifier with nuclear function type Radial basic function - Radial Basis Function (RBF) there are two parameters setup: capacity and gamma.

The significance of the parameter Capacity - C, which is common to all types of SVM, account during the phase of training the classifier and is expressed in prioritizing one of the two factors - minimizing the number of wrongly classified sites by providing sample or factors complexity synthesized hyper surface (simplicity of the decision surface).
By the adjusting parameter C it reaches a balance between accuracy and error tolerance. As the value of the parameter C is smaller as the final hyper surface is simpler from a mathematical point of view, whereas at high values of the priority C is the synthesis of such hyper surface whereby all the objects of the training sample is correctly classified.
The parameter gamma determine what is the impact of each element of the training sample, at high-degree m of gamma proximity of the elements to be classified to the class must be greater. When using the RBF kernel-type functions recommended joint search of parameters Capacity and gamma, as it is previously known which values for gamma and C are most suitable. For this purpose, the parameter is appropriate for both matrix to be scanned in the selected ranges in the process of cross-validation.
Decision tree learning is a method commonly used in data mining. The possibility to classify samples using General Classification and Regression Trees (GC&RT) is examined using CART algorithm. The term CART analysis first introduced by Breiman et al. (1984) is used to refer to both of the procedures – classifiaction and regression analysis. The so called Random Forest classifier uses a number of decision trees, in order to improve the classification rate. Algorithms for constructing decision trees usually work top-down, by choosing a variable at each step that best splits the set of items. Different algorithms use different metrics for measuring "best". These generally measure the homogeneity of the target variable within the subsets. These metrics are applied to each candidate subset, and the resulting values are combined (e.g., averaged) to provide a measure of the quality of the split. Used by the CART (classification and regression tree) algorithm, Gini impurity is a measure of how often a randomly chosen element from the set would be incorrectly labeled if it were randomly labeled according to the distribution of labels in the subset. Gini impurity can be computed by summing the probability of each item being chosen times the probability of a mistake in categorizing that item. It reaches its minimum (zero) when all cases in the node fall into a single target category.
Construction of a decision tree (Decision Tree) is a standard method in the systems for extracting knowledge and classification (Figure 3). There are different varieties, including algorithms CART, ID3, C4.5. Methods for building a decision tree to enjoy more popularity than other nonparametric because of its visibility (possibility of interpreting the results) and efficiency of training algorithms (Webb, 2002). The decision tree constitutes a tree root, usually binary, simple classifiers (a threshold value) in each internal node and classification decisions in the end nodes. In some algorithms measure of informativeness of the classifier using information entropy as defined by Shannon. The result of the classifier determines the unique path from the root to the end node. In any internal node route follows the left branch if the result of the function is +1 or right, if the result is -1. This time is called the time for evaluation. The value of the function T (x) obtained in the final node is the result of the classification. Decision tree is derived from a training process that starts from the root of the tree and choose incremental separation of data that maximizes a "price" function. After selecting the separation is that data on both arms and the process continues recursively until a satisfactory set criterion end.
If appropriate, the wood is subjected to a "pruning" by the search procedure from the leaves to the roots in order to eliminate redundant nodes. Usually classifiers in the internal nodes of the tree represent comparisons of input parameters with threshold. Thus, the output space is divided into areas parallel to the coordinate axes. Standard algorithm for this type of training is S4.5. Another possible strategy is implemented is to use hyper surfaces in any position.

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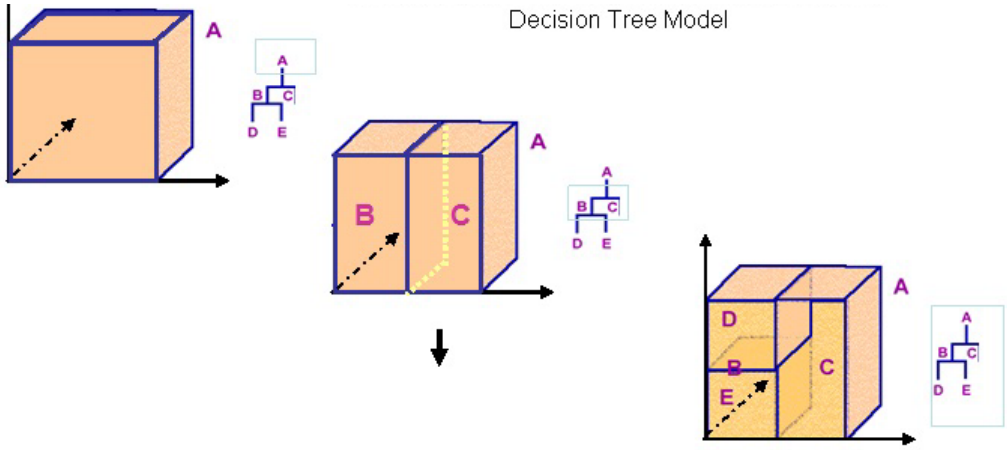

Figure 3. Graphic interpretation of classification method "decision tree"

The algorithm for classification review process determines the sequence - a set of logical if-then conditions, which may make subsequent classification or prediction of belonging objects. The purpose of the analysis is to be inferred classification model based on statistical estimates and allocations of available signs.
Advantages of using the "decision tree" Decision Trees:
• interpretation of the results obtained by this method is extremely simple (instead of linear equations is obtained a set of conditions of the type if-then);
• frequently classification model that is built by this method is considerably more simple, but no less effective;
• the method is non-parametric and nonlinear;
• there are no prerequisites for the presence of a linear relationship between the predictor variables and the dependent variables.
It allows to solve two types of tasks - for classification and regression.

2.3. Experimental researches

The obtained images of healthy and diseased vine leaves are distributed into two sets. The training set includes 20 images of healthy and 20 images of diseased vine leaves of each kind or totally 40 images. The test set includes 30 images of healthy and 30 images of diseased vine leaves of each kind or totally 60 images.
The informative colour components of all pixels in the image are shown in Table 1.
The results from classification of healthy and diseased wine leaves using k-nn and SVM classifiers are presented in Table 2. The results obtained with classifier decision tree are less than the others.

Table 1.
Methods for feature extraction of informative colour features combination of the vine leaves

	Methods for feature extraction		
Classes	**Discriminant Analysis**	**SFR**	**BFC**
Healthy - Diseased	G,B,H,S,V,a,Z,Ycbcr, cb,cr,ym	ym,b,cb,S,B,xm,Z	ym, b, B

Table 2. Classification results of healthy and diseased wine leaves

Class	Method for feature selection	Classification Accuracy,%	
		SVM classifier	k-nn classifier
Healthy - Diseased	General Discriminant Analysis GDA	95.75	97.14
	Scalar Feature Ranking - SFR	87.23	80.00
	Best Feature Combination - BFC	86.98	79.86

3. CONCLUSION

The paper presented assessment of classification accuracy of different complexes of informative features for classification of healthy and diseased wine leaves - Discriminant Analysis, SFR and BFC. Three methods are proposed for classification - support vector machines (SVM), k-nearest neighbours (k-NN) algorithm and decision tree. The experiment results show that the classification accuracy is in the range between 79.86% and 97.14% according to the selected complex of colour features. The best classification accuracy is achieved with General Discriminant Analysis for feature extraction and k-NN classifier for classification.

4. REFERENCES

[1] Alpaydin E., Introduction to Macjine Learning, Second ed., MIT Press, 2010, London.
[2] Berardo N., Pisacane V., Battilani P., Scandolara A., Pietri A., Marocco A., 2005. Rapid detection of kernel rots and mycotoxins in maize by near-infrared reflectance spectroscopy. Journal of Agricultural and Food Chemistry, 53, p. 8128-8134.
[3] Burges C., A tutorial on support vector machines for pattern recognition. Submitted to Data Mining and Knowledge Discovery.
[4] Damyanov Ch., V. Nachev, T. Titova, St. Jordanov. A Self-Learning Bayesian Classifier for Quality Evaluation in Automatic Sorting Systems of Fruit and Vegetables, Journal: Information Technologies and Control, 4, 26-31, 2010.
[5] Nashata S., A. Abdullah, S. Aramvith, M.Z. Abdullah, Support vector machine approach to real-time inspection of biscuits on moving conveyor belt, Computers and Electronics in Agriculture 75 (2011), p. 147–158.
[6] Tsang Chi-Ho, S. Kwong, H.Wang, Genetic-fuzzy rule mining approach and evaluation of feature selection techniques for anomaly intrusion detection, Pattern Recognition 40 (2007), p. 2373-2391.
[7] Webb A., Statistical Pattern Recognition, Second ed., Wiley, 2002.

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GENERALAZIED MODEL OF THE SECOND-ORDER OBJECT WITH FEEDBACK CONTROLLER

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Abstract: *The article offers a program for modelling and simulation of objects described by differential equations of first and second order. The programming system Mathcad (Parametric Technology Corporation) is used to achieve this purpose. Based on the generalized model of the object of second order with a PID-controller in its feedback, mathematical models of transfer functions of the closed system are derived. The generalized equations of amplitude-frequency and phase-frequency characteristics of the system are also derived. The graphical capabilities of Mathcad are used for visualizing the studied frequency characteristics.*
The created simulation model could be used not only for educational purposes, but also for choosing an actual controller in the feedback of an object to be controlled.
Keywords: *PID controller, Automatic control systems, Process automation.*

1. INTRODUCTION

1.1. Subject of regulation

The objects of regulation are different machines, processes and others whose working mode can be changed by a given law. They can be described with mathematical models, usually those models are of first or second order. Objects that restore its initial state after administration of disturbance to them are objects with self-regulation. There are also objects without self-regulation, who could cause troubles when integral (I)-controller is being used to control them [1]. Table 1 shows the different types of objects and their differential equations and also their transfer functions.

Table 1. Types of objects and their mathematical models.

<table>
<tr><td></td><td colspan="2">without self-regulation</td><td colspan="2">with self-regulation</td></tr>
<tr><td rowspan="2">System of first order</td><td colspan="2">integrating unit</td><td colspan="2">aperiodic unit</td></tr>
<tr><td>differential equation
$T\frac{dy}{dt} = K_o U$</td><td>transfer function
$W(s) = \frac{K_o}{sT}$</td><td>differential equation
$T\frac{dy}{dt} + y = K_o U$</td><td>transfer function
$W(s) = \frac{K_o}{sT+1}$</td></tr>
<tr><td></td><td colspan="4">oscillatory unit</td></tr>
<tr><td>System of second order</td><td colspan="2">differential equation
$\frac{d^2}{dt^2} + 2\zeta\omega\frac{dy}{dt} = \omega^2 KU(t)$
transfer function
$Wo(s) = \frac{K_o}{s(1+sT)}$</td><td colspan="2">differential equation
$\frac{d^2}{dt^2} + 2\zeta\omega\frac{dy}{dt} + \omega^2 y = \omega^2 KU(t)$
transfer function
$Wo(s) = \frac{K_o}{(1+sT)^2}$</td></tr>
</table>

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1.2. Controller

The controller is a device that aims to modify and maintain the value of any of the values of the object. Its main ingredients are P (proportional), I (integral)) and D (derivative). Combinations between the three of them are possible as well. Table 2 shows the transfer functions of the three components of the PID-controller.

Table 2. Main ingredients of controllers

P-unit	I-unit	D-unit
$W(s) = K_r$	$W(s) = \frac{1}{sT_i}$	$W(s) = sT_d$

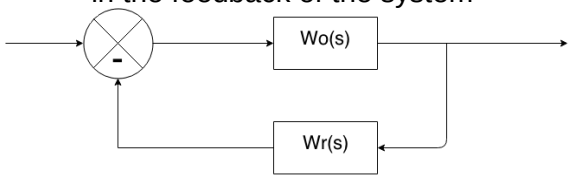
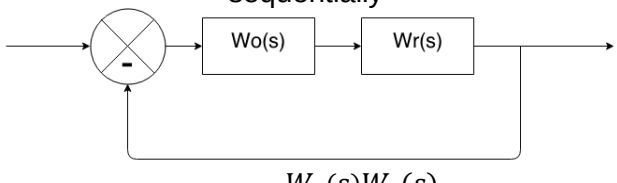
Every combination of controller (PI, PD, etc.) is possible to achieve by changing the parameters of the PID-controller.

$$Wr(s) = K_r(1 + \frac{1}{sT_i} + sT_d) \quad (1)$$

where: Ti = ∞ – PD controller
To = 0 – PI controller

Controller can be connected in the system in two ways - sequentially or in feedback.

Table 3. Ways to connect the controller.

in the feedback of the system	sequentially
 $W_e(s) = \frac{W_o(s)}{1 + W_o(s)W_r(s)}$	 $W_e(s) = \frac{W_o(s)W_r(s)}{1 + W_o(s)W_r(s)}$

Computer modeling and simulating the behavior of the system is used for this study. It is preferable to hardware implementation due to its low cost and flexibility. It is implemented easily and may be modified in a convenient way for us without too much difficulty.
The purpose of this study is to create generalized programming model of an object of the second order with PID-controller in its feedback in the environment of the software MathCad. The type of the object and controller can be modified by changing some programmable parameters. Using this property of the model the behavior and characteristics of the closed system “object-controller” can be studied and simulated.

2. MATERIALS AND METHODS

The programming system MathCad, Parametric Technology Corporation is used for the realization of the model [2]. It was selected for the following reasons:
1. User-friendly interface.
2. Capability for symbolic processing and analytical transformations.
3. Having an intuitive programming language for mathematical formulas.
4. Possibility for numerical assessment of the values of analytical expressions.

5. Easy to make graphs of functions.

MathCad has many more options but the above are the main which facilitated the implementation of the task.

2.1. Model of the object of regulation

The transfer function of a generalized model of an object from the second order is:

$$W_o(s) = \frac{K_o}{As^2 + Bs + C} \quad (2)$$

where: A, B, C – setting parameters of the object;
A=0 – object of the first order;
A=1 – object of the second order;
C=0 – object without self-regulation;
C>0 – object with self-regulation.

2.2. Model of the controller

In this case the selected controller is PID-controller. It has the following transfer function:

$$W_r(s) = K_r(1 + \frac{1}{sT_i} + sT_d) \quad (3)$$

2.3. Model of the closed system

The selected way of connecting the controller is in the feedback of the system. The formula from Table 3 is used to calculate the transfer function. The variable **S** is added in to define whether the controller is in negative or positive feedback. With it the model of the closed system will look the following way:

$$W_e(s) = \frac{\frac{K_o}{As^2 + Bs + C}}{1 + S\frac{Ko}{As^2 + Bs + C}\left[K_r\left(1 + \frac{1}{sT_i} + sT_d\right)\right]} \quad (4)$$

Where S = +1 in case of negative feedback
-1 in case of positive feedback

In this case the controller is in negative feedback.

3. PROGRAM IMPLEMENTATION OF GENERALIZED MODEL "OBJECT-CONTROLLER"

Using the "simplify" command in MathCad a simplified expression of formula (4) is derived. Figure 1 shows how that looks in MathCad environment.

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$$\frac{\frac{Ko}{A\cdot s^2+B\cdot s+C}}{1+\frac{Ko}{A\cdot s^2+B\cdot s+C}\cdot\left[Kr\cdot\left(1+\frac{1}{s\cdot Ti}+s\cdot Td\right)\right]}\ \text{simplify}\ \rightarrow\ \frac{Ko\cdot Ti\cdot s}{Ko\cdot Kr+A\cdot Ti\cdot s^3+B\cdot Ti\cdot s^2+C\cdot Ti\cdot s+Ko\cdot Kr\cdot Ti\cdot s+Ko\cdot Kr\cdot Td\cdot Ti\cdot s^2}$$

Figure 1. Simplified equivalent transfer function in MathCad

Then, by command “collect” the expression is arranged in order of s.

$$\frac{Ko\cdot Ti\cdot s}{Ko\cdot Kr+A\cdot Ti\cdot s^3+B\cdot Ti\cdot s^2+C\cdot Ti\cdot s+Ko\cdot Kr\cdot Ti\cdot s+Ko\cdot Kr\cdot Td\cdot Ti\cdot s^2}\ \text{collect},s\ \rightarrow\ \frac{Ko\cdot Ti\cdot s}{A\cdot Ti\cdot s^3+(B\cdot Ti+Ko\cdot Kr\cdot Td\cdot Ti)\cdot s^2+(C\cdot Ti+Ko\cdot Kr\cdot Ti)\cdot s+Ko\cdot Kr}$$

Figure 2. Arrangement of expression in Mathcad

In the resulting expression (Figure 2) the parameter **s** is replaced with the parameter **jω** to obtain the transfer function to the frequency of the system. That is showed on Figure 3.

$$\frac{Ko\cdot Ti\cdot j\cdot w}{A\cdot Ti\cdot(j\cdot w)^3+(B\cdot Ti+Ko\cdot Kr\cdot Td\cdot Ti)\cdot(j\cdot w)^2+(C\cdot Ti+Ko\cdot Kr\cdot Ti)\cdot(j\cdot w)+Ko\cdot Kr}$$

Figure 3. Transfer function to the frequency of the system in MathCad

The result is multiplied by the complex conjugate of **j** expression.

$$\frac{j\cdot Ko\cdot Ti\cdot w\cdot\left(Ko\cdot Kr-Ti\cdot B\cdot w^2+Ti\cdot Td\cdot Ko\cdot Kr\cdot w^2+j\cdot A\cdot Ti\cdot w^3-j\cdot Ti\cdot C\cdot w+j\cdot Ti\cdot Ko\cdot Kr\cdot w\right)}{\left(Ko\cdot Kr-Ti\cdot B\cdot w^2+Ti\cdot Td\cdot Ko\cdot Kr\cdot w^2\right)^2+\left(A\cdot Ti\cdot w^3-Ti\cdot C\cdot w+Ti\cdot Ko\cdot Kr\cdot w\right)^2}$$

Figure 4. After multiplying with the complex conjugate of **j** expression in MathCad

The resulting expression is simplified by substituting the function “denominator(w)” to have the value of the denominator in Figure 4 and put **j** before the brackets.

$$\text{denominator}(w):=\left(Ko\cdot Kr-Ti\cdot B\cdot w^2+Ti\cdot Td\cdot Ko\cdot Kr\cdot w^2\right)^2+\left(A\cdot Ti\cdot w^3-Ti\cdot C\cdot w+Ti\cdot Ko\cdot Kr\cdot w\right)^2$$

$$\frac{Ko\cdot Ti^2\cdot C\cdot w^2-Ko\cdot Ti^2\cdot A\cdot w^4-Ko^2\cdot Kr\cdot Ti^2\cdot w^2}{\text{denominator}(w)}+j\cdot\frac{Ko^2\cdot Kr\cdot Ti\cdot w-Ko\cdot Ti^2\cdot B\cdot w^3+Ko^2\cdot Kr\cdot Ti^2\cdot Td\cdot w^3}{\text{denominator}(w)}$$

Figure 5. Additional simplifying of the transfer function in MathCad

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The amplitude-frequency and phase-frequency characteristics can be derived using the real and imaginary units from Figure 5. The functions "ReUnit(w)" and "ImUnit(w)" are set as the values of the real and the imaginary units. Figure 6 displays the preceding actions in MathCad.

$$\mathrm{ReUnit}(w) := \frac{Ko \cdot Ti^2 \cdot C \cdot w^2 - Ko \cdot Ti^2 \cdot A \cdot w^4 - Ko^2 \cdot Kr \cdot Ti^2 \cdot w^2}{\mathrm{denominator}(w)}$$

$$\mathrm{ImUnit}(w) := \frac{Ko^2 \cdot Kr \cdot Ti \cdot w - Ko \cdot Ti^2 \cdot B \cdot w^3 + Ko^2 \cdot Kr \cdot Ti^2 \cdot Td \cdot w^3}{\mathrm{denominator}(w)}$$

Figure 6. Real and imaginary units in MathCad

Amplitude-frequency and phase-frequency characteristics are calculated using the real and imaginary units [1]. Figure 7 shows the frequency characteristics of the system.

$$\mathrm{Am}(w) := \sqrt{(\mathrm{ReUnit}(w))^2 + (\mathrm{ImUnit}(w))^2} \qquad \mathrm{Fa}(w) := \mathrm{atan}\left(\frac{\mathrm{ImUnit}(w)}{\mathrm{ReUnit}(w)}\right)$$

Figure 7. Amplitude-frequency and phase-frequency characteristics in MathCad

4. EXAMPLE

The created model was tested on an object that is used to regulate pressure in a real working environment. The object in this example is presented in the form of experimental data. The object's parameters – K_o and T_o are derived after approximation of its transient response. A law for controlling that would suit best this object is selected and the controller is set in the best way [3]. The object is of second order. The chosen controller is PID. Table 4 shows in a more detailed way all the parameters of the system that is used in the example.

Table 4. Parameters of the system "object-controller"

parameters of the object	Kr = 2.02
	To = 28 [s]
parameters of the controller	Kr = 1.04
	Ti = 32[s]
	Td = 6.4[s]
parameters of the model	A = 1 – the object is of the second order
	B = To = 28[s]
	C = 1 – the object is with self-regulation
	S = 1 – negative feedback

With that input data in MathCad are derived the graphs of amplitude-frequency and phase-frequency characteristics of the current system. Figure 8 shows the final results of the example system.

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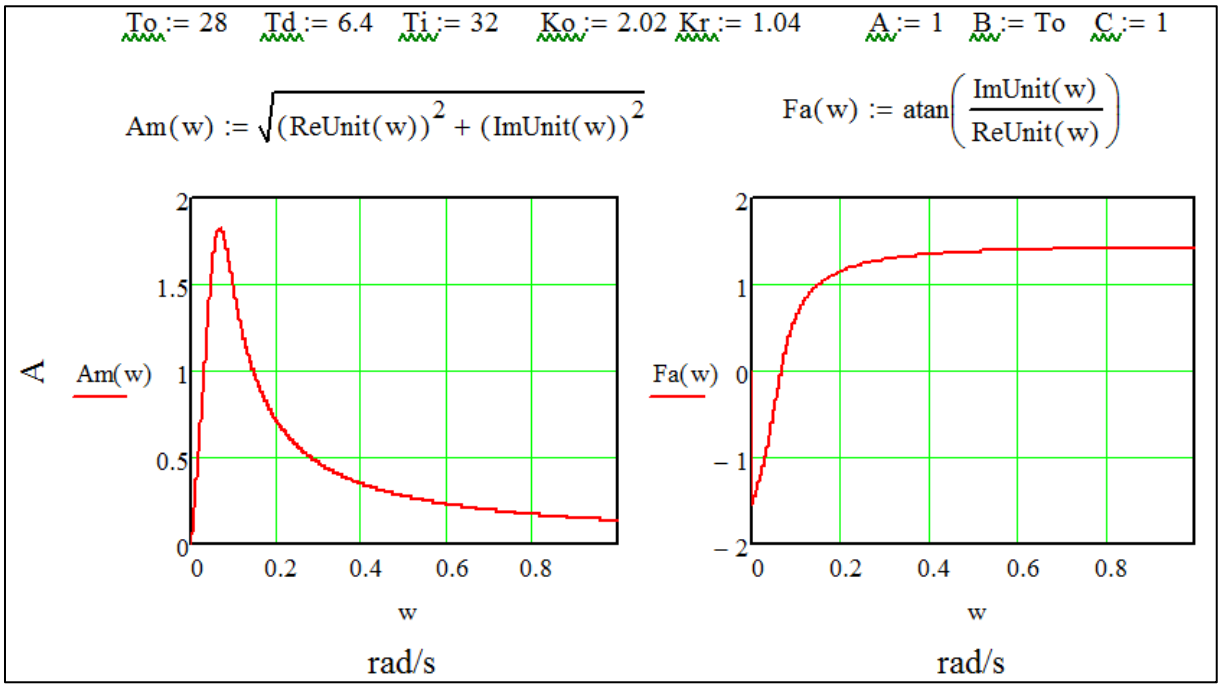

Figure 8. Graphs of amplitude-frequency and phase-frequency characteristics

5. CONCLUSIONS

In the process of work was reached:

- A generalized model that depends on 3 parameters was formed. Choosing the value of one parameter defines the order of the model, while the other determines whether the model is with or without self-regulation.
- As controller was chosen PID-controller. Assigning appropriate values to the controller's setting parameters can help turn on or off some of its main ingredients.
- By the means of MathCad was created a mathematical model for system "object-controller" with negative feedback. With the help of that model the amplitude-frequency and phase-frequency characteristics of the system can be studied and the appropriate parameters of the controller can be set.

6. ACKNOWLEDGMENTS

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7. REFERENCES

[1] Lehov G. (2012). "Control theory. Part 1", University press "A. Kunchev", Ruse, 2012 (in Bulgarian).
[2] Mathcad 14.0, User's Guide, Copyright © 2007 Parametric Technology Corporation.
[3] Mladenov M., Deyanov M. (2013). "designing systems for the design of technological objects" (in Bulgarian).

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DESIGN OF TEXTILE PATTERNS BY USING COLORS FROM THE BULGARIAN NATIONAL COSTUMES

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Abstract: *In this report the authors present programming tool for the implementation of procedures for analysis and processing of color digital images in order to make color palettes. These palettes are used to design the patterns with colors and forms borrowed from Bulgarian folkloric costumes from Trakia region.*
Keywords: *Textile patterns, Bulgarian national costumes, Color extraction algorithm.*

1. INTRODUCTION

This report presents textile patterns designed on the basis of colors and ornaments from Bulgarian national costume, including women costumes from Trakia region.
The main idea in the design process is a combination of colors borrowed directly from Bulgarian national costumes. The resulting patterns are colored in combinations of three, four or five colors with the use of flat rate. In the design process the resulting ornaments can be used to create a variety of textiles – fabrics for clothing, interior textiles, etc.
An algorithm is developed for obtaining of the colors of images of Bulgarian national costumes

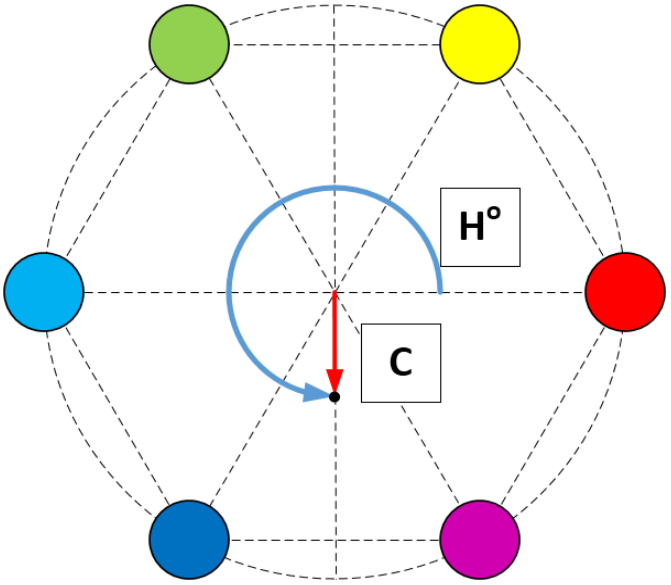
2. ALGORITHM FOR EXTRACTION OF COLORS FROM IMAGES

The choice of color is important in setting the visual character of the design developments. Important and requires time process is the choice of color combinations for inclusion in a project. These color combinations are known as color schemes or palettes.
There are many online palettes generators as Pictaculous [10], Adobe Kuler [11], Colour Lovers [7], Romanuke [5]. In these online palettes are shown the following trends:

- Generation of colors based on the color wheel;
- Generation of colors from the image specified by the user;
- Preliminary generated by the manufacturer palette from a particular picture.

From the literature are known studies related to automatically extraction of colors from images, through methods such as k-means, fuzzy logic, peaks in the histogram of the image. The purpose of applying these algorithms is to reduce the error in recolor the image obtained with a reduced number of colors [2,3].
The automatic selection of the colors from image differs from that from designer, because the selection methods when the program based averaging and retrieving the number of colors in the image taking into account the error of that process.
The designer chooses colors from selected images and grouped them according to cultural associations, psychological effect, the perception of a particular cultural community, personal characteristics of users of the developed product.

Ought take into account the consumer preferences for different nationalities, which affects psychology, consumer self-expression, cultural and fashion trends. In example in Europeans dominate white, black, silver and gray; Irish silver; Denmark - black and white; Belgium - gray; Czech Republic - blue [4].
For the purpose of this work was created a program in Matlab environment to extract the color gamut from images. The program has been tested on versions 2011 and 2013b, but can be started in later versions of the software.
As a result of the above analysis the developed algorithm must allow the designer to choose the number of generated colors and to selecting those that meet the needs of a specific project.
For example, one way of selecting the number of colors to fit the value from Fibonacci numbers (2, 3, 5, 8, 13, 21) [1].
The choice of the number of colors can also depend on other factors such as the number that the production machine can support. Physiological perception from the customer - the untrained human eye can not assimilate more than seven colors.



Parameter	description
H_{HSV} angle – in the interval $0 \div 360^{o}$ $(0 \div 2\pi)$	Calculated by function rgb2hsv in Matlab
Chromatic coordinates	$\alpha = \frac{1}{2}(2R - G - B)$ $\beta = \frac{\sqrt{3}}{2}(G - B)$
Chroma	$C = \sqrt{\alpha^2 + \beta^2}$

Figure 1. Color wheel of HSV color model

The developed algorithm for extracting colors from images operates in the following order:
- Read the image file;
- The number of needed colors are assigned in the variable “numcolors”;
- The image is converted to indexed to provide the color palette in variable map with command [X, map] = rgb2ind (rgb, numcolors, 'nodither'). The values of the components of the RGB color model in the range 0 ÷ 1 and correspondingly multiplied by 255;
- “numcolors” number of rectangles filled with the resulting colors are displayed;
- Identify the parameters of HSV color wheel according to the mathematical description presented in [12] and [6] (Figure 1) and the results are displayed graphically;
- For drawing of circles is used “circles” function proposed in [8], this algorithm uses the transition from rectangular to polar coordinate system.

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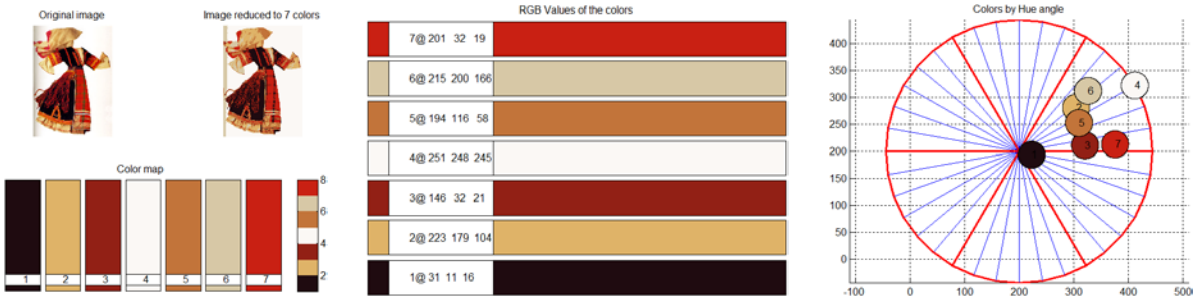

a) reducing and displaying the resulting colors

b) presentation of colors and their RGB values

c) presentation of the colors in the HSV color wheel

Figure 2. Example of operation of the proposed algorithm

The results of the proposed algorithm are presented in Figure 2. In Figure 2.a are displayed original image and this reduced to the seven colors and rectangles filled with the resultant colors, which are numbered. This numbering is used in Figure 2.b to indicate the RGB values in the range 0 ÷ 255 for each color component. The colors are presented on the HSV color wheel in Figure 2.c as their location on the angle H and radius C at the polar coordinate system. Along the periphery of the wheel are the colors mixed with white and towards the center are these interspersed with black.

3. DESIGN OF PATTERNS USING OF COLORS FROM BULGARIAN NATIONAL COSTUME

For the purposes of this work are used color digital images of traditional Bulgarian costumes from Trakia region, presented in [9]. This region includes Yambol, Tronska and Strandzhanska folk costume (Figure 3).

Thracian folk costume

Yambol folk costume

Tronsk folk costume

Strandja folk costume

Figure 3.Traditional Bulgarian costume from Thrace region

From representations by the proposed algorithm are derived primary colors from each image. The colors are reduced to 20 and for the design have been used 3, 4 and 5 colors chosen by the authors.

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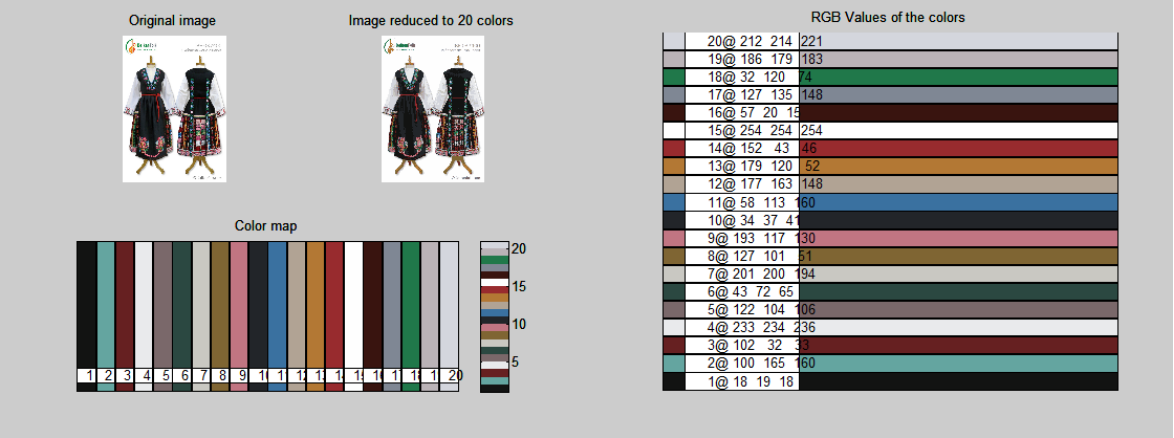

Figure 4. Obtained color palette from traditional female costume from Yambol region

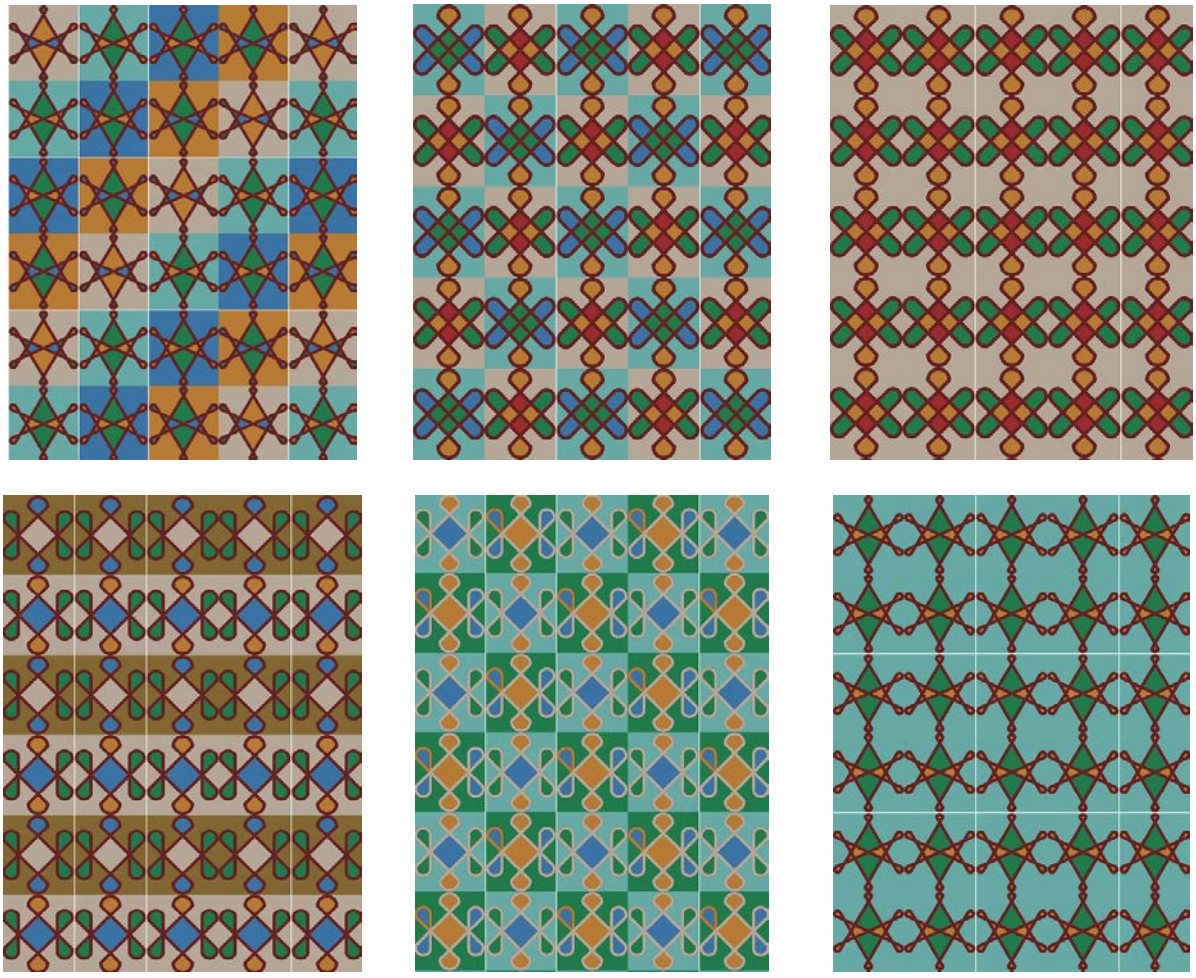

Figure 5. Projects of patterns using colors from traditional female costume from Yambol region

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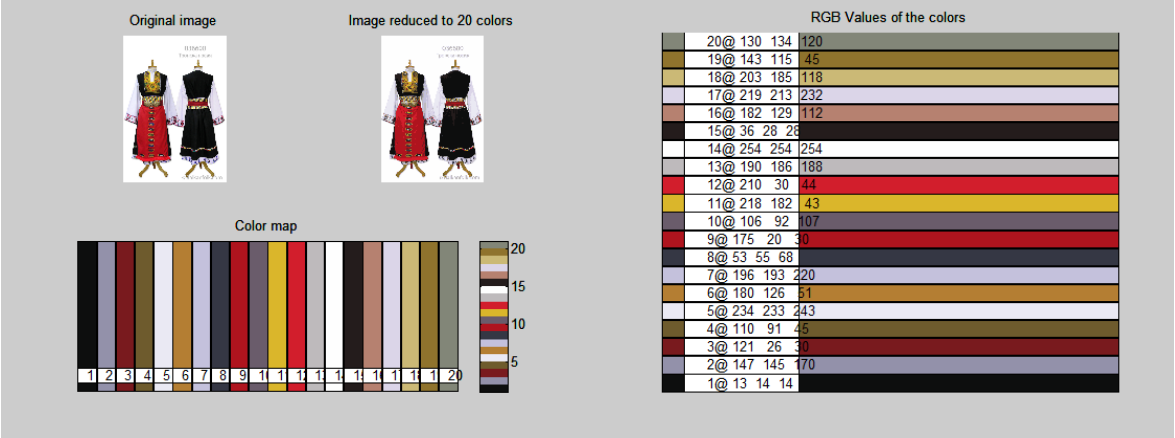

Figure 6. Obtained color palette from Tronski women costume

Figure 7. Projects of patterns using colors from Tronski women costume

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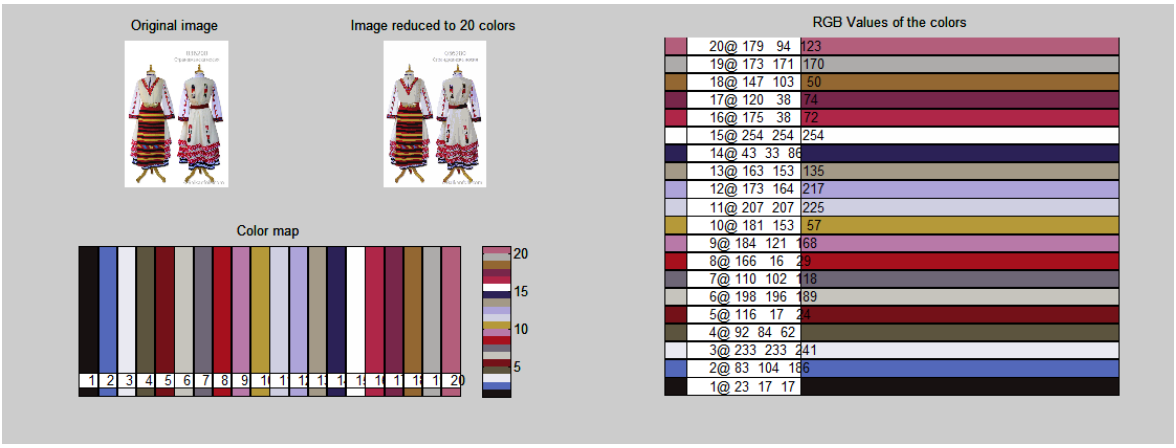

Figure 8. Obtained color palette of traditional women costume from Strandja region

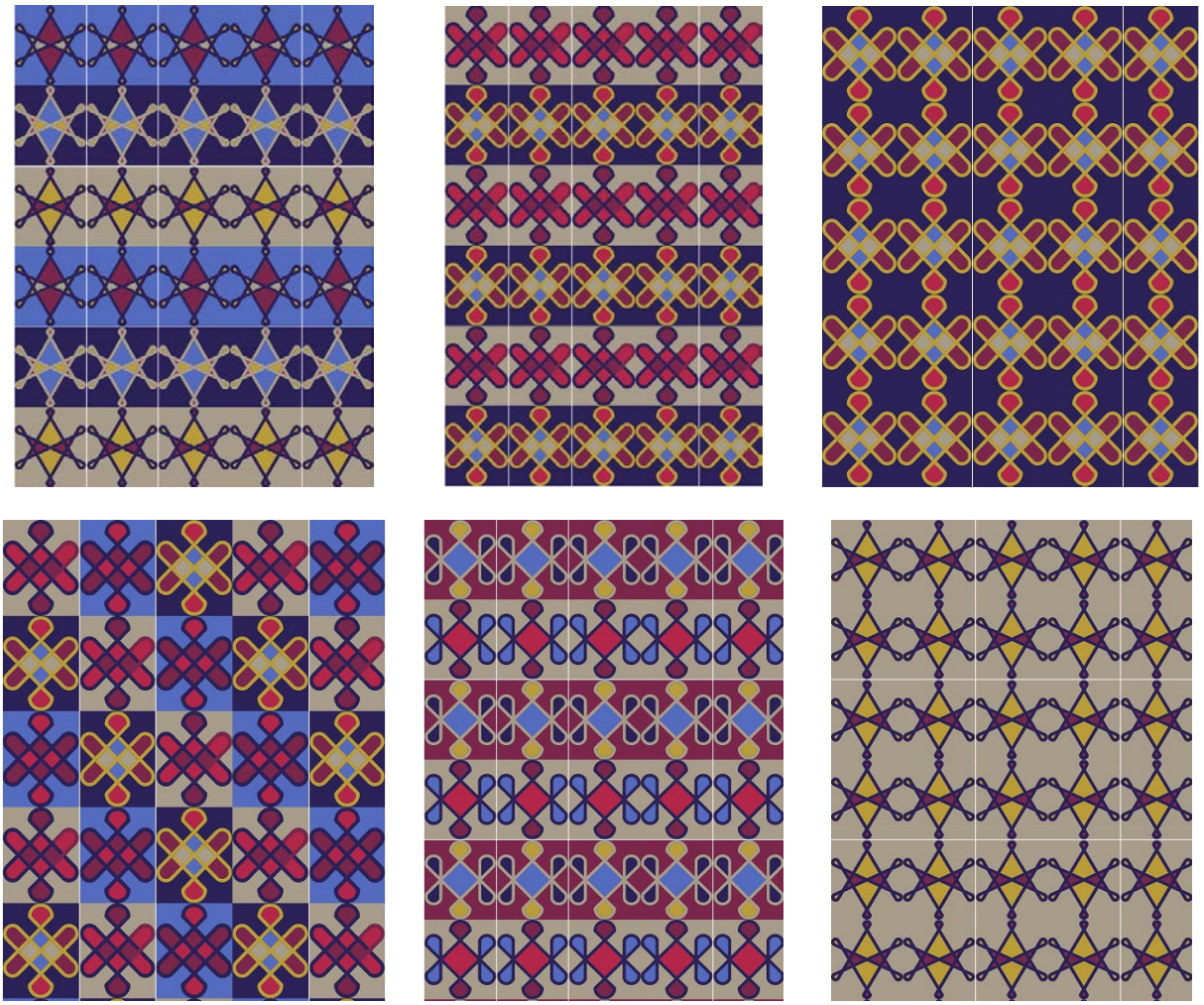

Figure 9. Projects of patterns using the colors of traditional women costume from Strandja region

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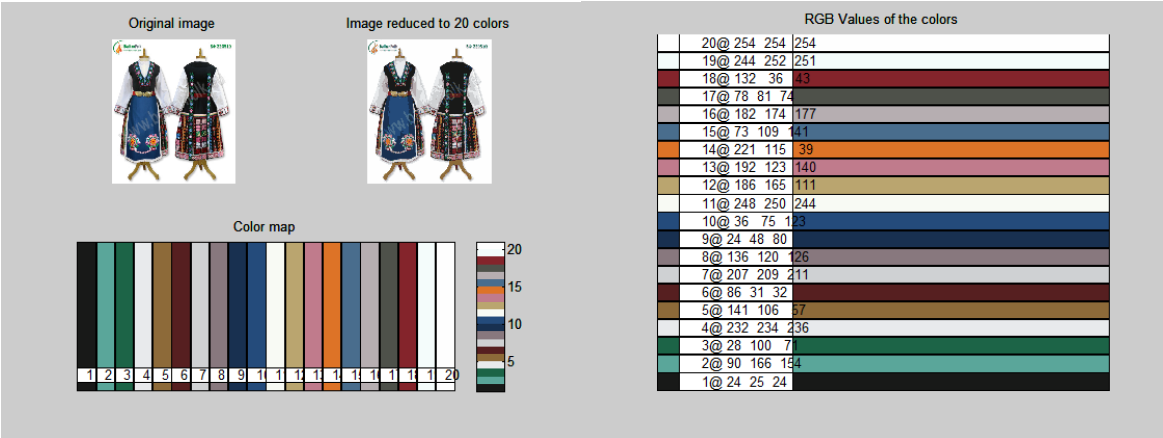

Figure 10. Obtained color palette of traditional women costume from Thrace region

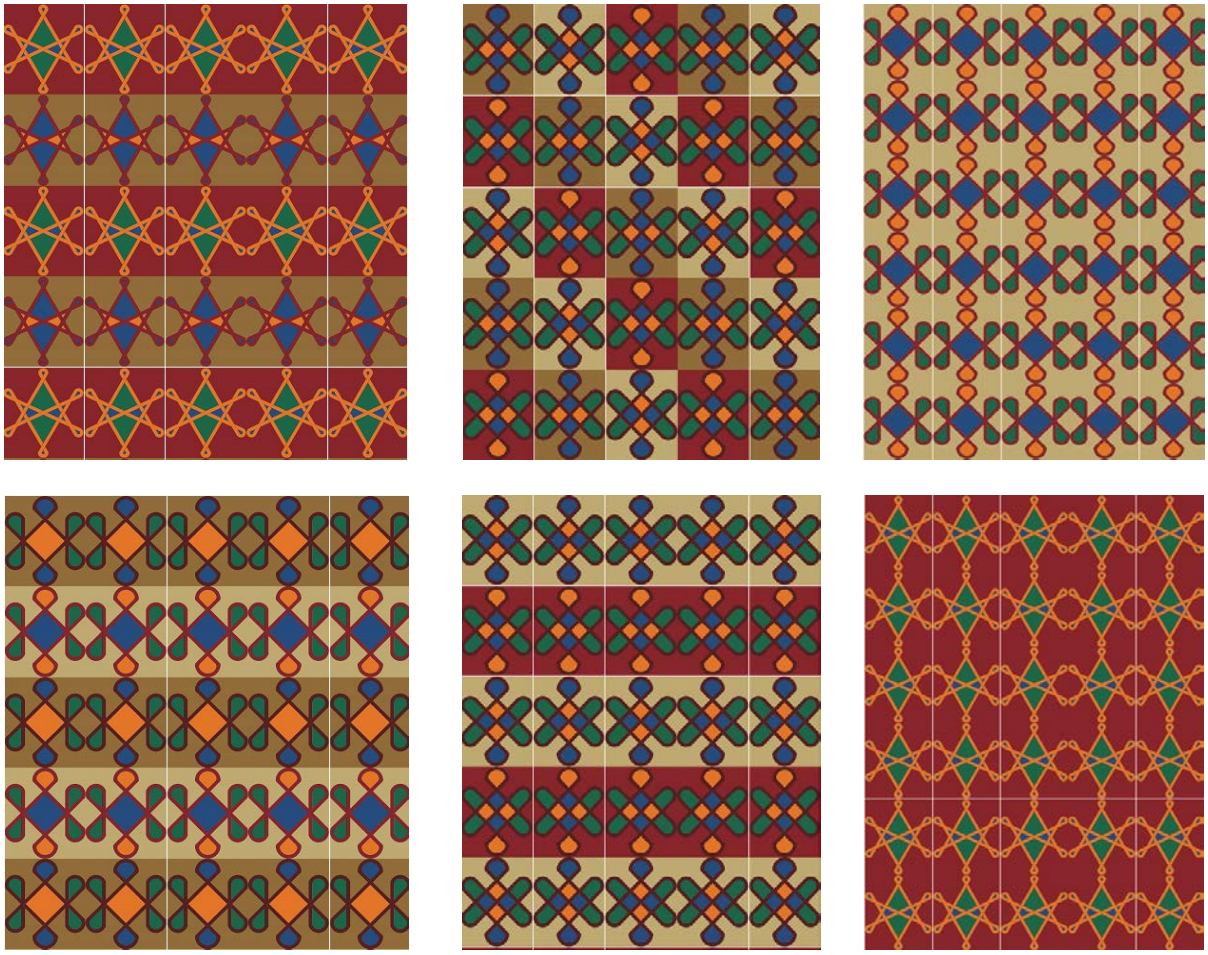

Figure 11. Projects of patterns using colors from traditional women costume from Thrace region

4. CONCLUSION

Developed are software tools for the realization of proposed procedures for analysis and processing of digital images of traditional Bulgarian costumes in order to make color palettes. The resulting colors are used for the design of 24 textile patterns that are formed in various geometric and color combinations. Used are three-, four- and five- colored models and patterns that are plains rhythms and repeats that directly can be used in textile design.

5. ACKNOWLEDGMENTS

The work is supported by the scientific project 3.FTT/ 2014 of Trakia University and the Fund of the National budget for scientific research in higher education in Bulgaria.

6. REFERENCES

[1] Kazlacheva Z., Fibonacci rose in fashion design, ARTTE Vol. 2, No.3, 2014, ISSN 1314-8788, pp. 224-230.
[2] Lin S., P. Hanrahan, Modeling How People Extract Color Themes from Images, CHI 2013, April 27-May 2, 2013, Paris, France.
[3] Ruchanurucks M., Clustering based color reduction -Improvements and tips, 60th Aniversary Kasetsart University, 2003.
[4] Zlatev Z., I. Lazarov, Car mass personalization and the consumer behavior, Eko Varna, 2014, ISSN 2367-6299, pp.256-263.
[5] http://color.romanuke.com/tsvetovaya-palitra-1900/ (available on 21.11.2015).
[6] http://gamedev.stackexchange.com/questions/38536/given-a-rgb-color-x-how-to-find-the-most-contrasting-color-y (available on 23.11.2015).
[7] http://www.colourlovers.com/ (available on 24.11.2015).
[8] http://www.mathworks.com/matlabcentral/fileexchange/45952-circle-plotter/content/circles_demo/html/circles_documentation.html (available on 20.11.2015).
[9] http://www.narodninosii.eu/strandjanska-nosia.php (available on 1.12.2015).
[10] http://www.pictaculous.com/ (available on 21.11.2015).
[11] https://color.adobe.com/create/color-wheel/ (available on 24.11.2015).
[12] https://en.wikipedia.org/wiki/HSL_and_HSV (available on 23.11.2015).

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DESIGN OF TEXTILE PRINTS BASED ON ORNAMENTS FROM BULGARIAN NATIONAL COSTUME

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Abstract: The *report presents textile patterns designed on the basis of ornaments from Bulgarian national costume. The resulting patterns are shown in combinations of three, four or five colors with the use of a flat rate. In the design process the resulting ornaments can be used to create a variety of textiles - fabrics for clothing, interior textiles, etc.*
Keywords: *Textile prints, Bulgarian national costumes.*

1. INTRODUCTION

The report presents textile patterns designed on the basis of ornaments and colors of the Bulgarian national costume, including female costumes from Trakia region. The main idea in the design process is the use of ornaments taken directly from Bulgarian folk costumes. The resulting patterns are shown in combinations of three, four or five colors with the use of a flat rate. In the design process the resulting ornaments can be used to create a variety of textiles – fabrics for clothing, interior textiles. Developed is an algorithm that is used to obtain colors from images of the of Bulgarian national costumes. [1]

2. ORNAMENTS FROM BULGARIAN NATIONAL COSTUME

Bulgarian folk art is not a product of personal aesthetics and artistic interpretation, and ancestral memory – SEMANTICS – of ancient knowledge transmitted through cultural traditions of ethnic groups. [2] In the Bulgarian folk costume has a great variety of different types and symbolic ornaments that can be divided into several groups:
- Geometric;
- Rosette shapes;
- Floral, vegetable;
- Zoomorphic, animal;
- Anthropomorphic, human.

In the folklore of the Thracians is fully unfolded exquisiteness of folk art. One of the ornaments common in Bulgarian folklore is the so called celestial turtle. Which is shown in Figure 1.

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Figure 1. Celestial turtle

The most persistent and systematic use from ancient times the symbol located in the Bulgarian traditional ornamentation: embroidery, carpets. Celestial turtle resembles three eights intertwined, forming an endless maze and is a symbol of protection (mascot) used by our ancestors.
In the stylized image of the turtle can be distinguished head, four limbs, tail and body. The mark is six pole in the center of harmonizing their unity between Heaven and Earth. It is believed that the Celestial turtle (called Space turtle Urman, symbol of infinity, Tangle Longevity) comes from the ancient Bulgarians and was a sign of god Tangra.
Animal have long been regarded as a symbol of wisdom, sense of measure into action, permanence and longevity, and its image was used as a sign of eternity. In Bulgaria was portrayed on musical instruments, seats, carpets, doors, iconostasis, ceilings, old books, carving houses and of course on the clothes - in the form of artful embroidery. Celestial turtle is displayed in the following ways Figure 2. [3]

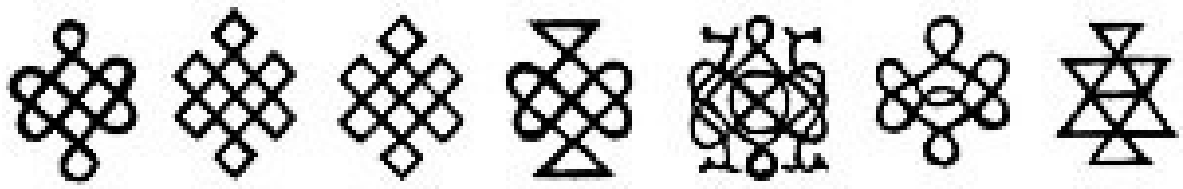

Figure 2. Stylization of celestial turtle

According to Bulgarian Kolobar tradition this symbol is a major esoteric codes - Turtle - is symbolized by three turtles, which means universe, stars and planets (Figure 3). [4]

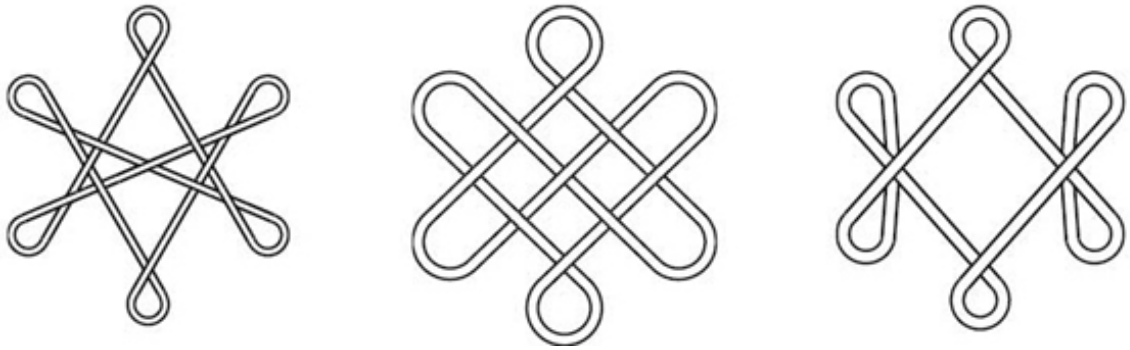

Figure 3. The three turtles

In the design of textile patterns are used ornaments presented in Figure 3, as colors are borrowed from the Bulgarian national costume, including female costumes from Trakia region. [5].

3. DESIGN OF TEXTILE PRINTS BASED ON ORNAMENTS FROM BULGARIAN NATIONAL COSTUME

On the basis of the used ornaments are designed patterns of three, four and five colors presented in Figures 4-7.

4. CONCLUSION

In conclusion it can be said that are adapted ornaments from Bulgarian national costume and used in the design of patterns in textiles. In this case used ornaments are included in the design of 24 textile pattern shaped in three-color, four-and five colored scales. The patterns are formed in planes rhythms based on symmetry parallel transmission and received repeat, which can be directly used in the textile design.

ACKNOWLEDGMENTS

The work is supported by the scientific project 3.FTT/ 2014 of Trakia University and the Fund of the National budget for scientific research in higher education in Bulgaria.

REFERENCES

[1] Zlatev Z., J. Ilieva, Design of textile patterns by using colors from the Bulgarian national costumes, ARTTE Vol. 3, No. 4, 2015.
[2] http://prarodinata.blog.bg/history/2012/05/25/smaivashtata-drevnost-na-bylgarskata-civilizaciia-chast-ii-n.958985. (available on 09.09.2015).
[3] http://beauty.fashion.bg/article/11394/34/Bylgarskiat-folklor-v-modata-Nebesnata-kostenurk. (available on 19.09.2015).
[4] http://www.iskri.net/articles.php?lng=bg&pg=39. (available on 01.10.2015).
[5] http://www.narodninosii.eu/strandjanska-nosia.php. (available on 1.12.2015).

Figura 4. Projects of patterns using ornaments and colors of traditional female costume from Yambol region

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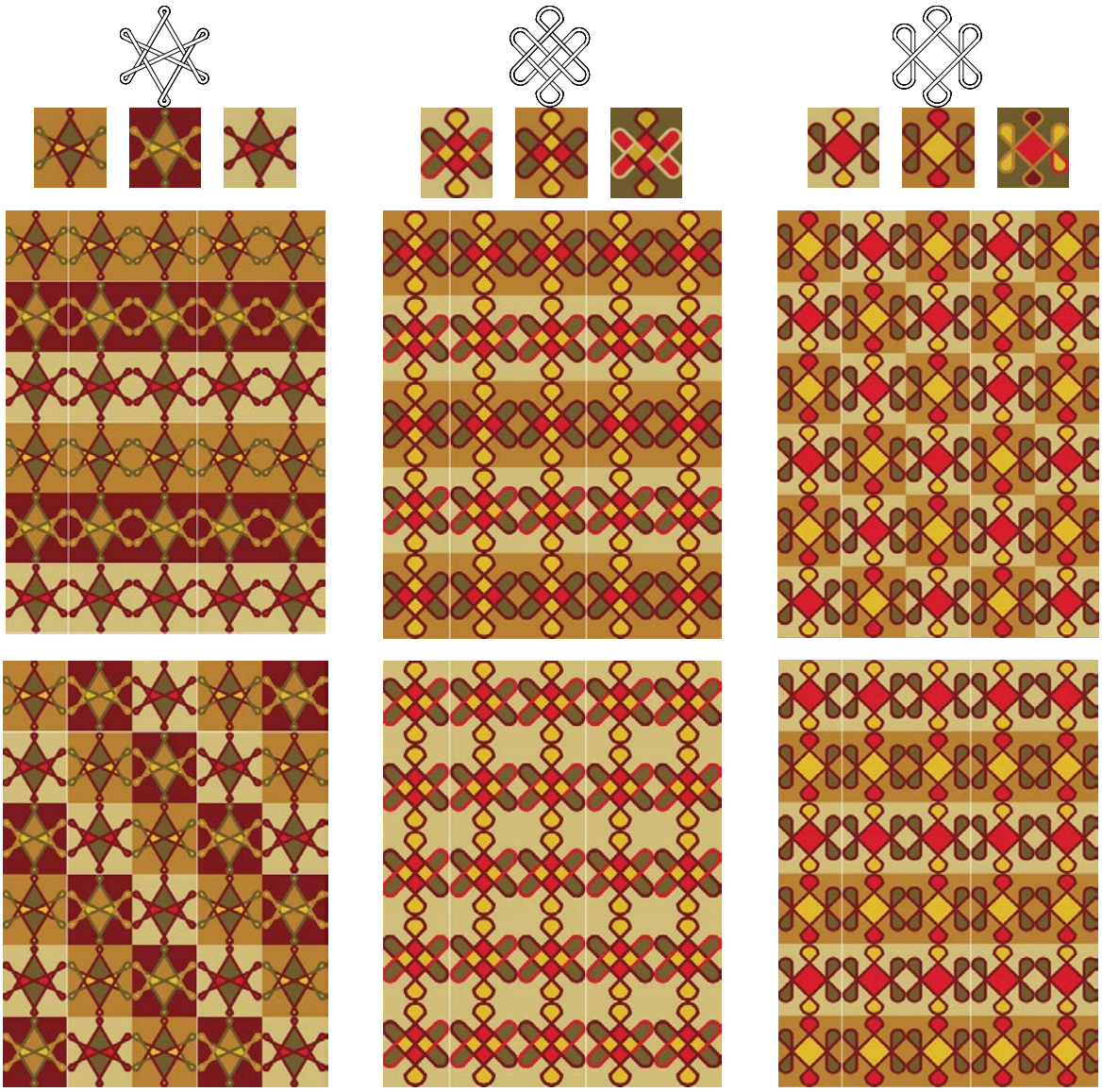

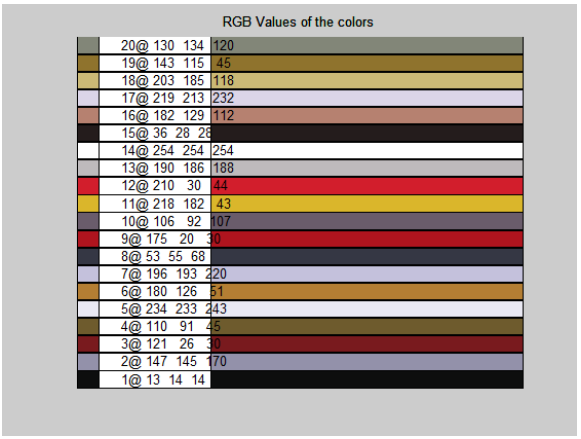

Figure 5. Projects of patterns using ornaments and colors from Tronski female costume

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Figure 6. Projects of patterns using ornaments and colors of traditional female costume from Strandja region

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Figure 7. Projects of patterns using ornaments and colors from traditional women's costume from Thrace region

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EXPLORING THE POSSIBILITIES OF USING THE REVERSE ENGINEERING TO RECREATING DIGITAL MODEL OF A GEOMETRICAL OBJECT WITH INSUFFICIENT INFORMATION

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Abstract: *This article presents the work of creating a digital model of the object of the technological equipment of the company "Palfinger - Produktsionstehnik" Bulgaria Ltd. - a division Tenevo, with insufficient input geometric information using the principles of the method "reverse engineering".*
Keywords: *reverse engineering, photography, CAD design, rapid prototyping.*

1. INTRODUCTION

Applying the reverse engineering allows reproduction of digital models of physical objects existing [2, 3, 4]. This method is particularly suitable for reconstruction of parts, assemblies or products, for which whatever reason there isn't design documentation. That field of application in area of machine building can be exemplary in the drafting of specific technological equipment, purchased long ago and it is already stopped production from the producer company.
When using reverse engineering, despite the wide variety of application areas and the use of specific techniques and technologies, there are several main stages during operation [1, 5]:
- Obtaining digital information on the form and size of the existing object through physical contact or contactless extracting of information (via coordinate-measuring machines, industrial scanners, 3D scanners, cameras and etc.);
- Processing of obtained information - input information is obtained as a "cloud" of points with certain coordinates in space, performed by specialized software that uses the tools of photogrammetry and calculates the spatial location of a large amount of characteristic points of the object;
- Creation of CAD models - geometric information from the "cloud" points is processed and converted into information that can operate CAD software; the result is frame or surface models that can subsequently be transformed into a solid model. It is the use of specialized software, the choice of which depends on the method used for obtaining the input digital information;
- Production stage - from developed CAD model is obtained a prototype using of NC machining or 3D printing.
Processing the input digital geometric information in the "cloud" of points is usually associated with the use of relatively expensive software programs which required minimum quality digital input information on the form and size of the existing physical object [6, 7].
This article is an attempt to reconstruct the object without processing the input data in the "cloud" of points. This method is particularly useful when the geometric information, e.g., derived from a series of images, it is sufficient for the software processing and the need for any other additional a priori information.

2. EXPLANATORY

Object of this study is boring three cutting head of the German company "Ecoroll AG", used for the treatment of open hydraulic cylinders in terms of "Palfinger - Produktsionstehnik" Bulgaria Ltd. - Tenevo division.
The company have such boring heads in a standard size for each of the ranges of the manufactured hydraulic cylinders. Tools (Figure 1) are provided with four guide plates spaced evenly around the circumference of the head and three cutting inserts arranged asymmetrically. All boring heads have a specific standard attachment to boring bars - square thread with a big step.

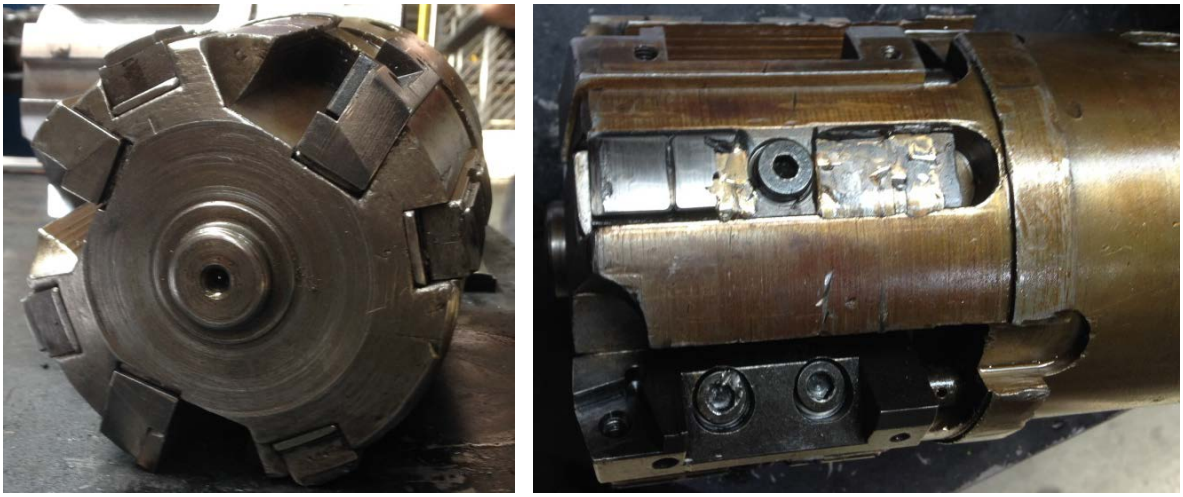

Figure 1. Boring head ø120mm

Guide plates are intended to guide the instrument while working and they have direct contact with the treated surface of the hole. This causes their intensive wear and need for replacement.
Guide plates of the boring heads are purchased by the company "Ecoroll AG" from Germany, but due to a change in their nomenclature of the manufactured instruments and supplies, the company stopped production of this kind of plates. Before the company "Palfinger" problem arises regarding the future use of the boring heads.
After an investigation by their engineers was accepted decision guide plates to be purchased by "Sandvik Coromant". This firm produce guide plates with different dimensions - with a smaller cross and longitudinal section. Changing the thickness of the guide plates has a direct impact on the adjusting dimension and leading of the instrument during the processing. This problem can be solved in two ways - by using underlay plates, which kind of decision will lead to the need for more time to set up the heads and the possibility of errors or development of new boring heads with beds for guide plates complying with the new sizes. The second option was adopted in the firm "Palfinger - Produktsionstehnik".
To be manufacture new boring heads, the company "Palfinger" needed design documentation, as actual boring heads hadn't. The assigned task involved developing a digital model of the existing type of tool from which will be possible to change the geometrical information in order to gain the fastest possible way drawings and other design documentation of all sizes boring heads.

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Capture the geometric dimensions had to be made under production conditions, as the instruments are single pieces and it was impossible their removal from the proceedings. A major problem was determining the uneven angular placement of three cutting inserts, because of there was no available suitable measuring device.
This task can be successfully solved by using the possibilities of the method reverse engineering.
As the base has been used boring head with diameter ø120mm. There have been a few photos of the instrument with a smartphone camera "iPhone - 5" on hand in the lighting conditions in the workshop, as the objective was to obtain quality images in two orthogonal directions - longitudinal and transverse.
For further processing were selected three key images - one in the transverse direction (Figure 2) for determining the angular position of the plates and two longitudinal (Figure 3), in order to specify the shape and dimensions of the grooves for the cutting and leading plates. The remaining images were used to specify the elements of the design of the object.

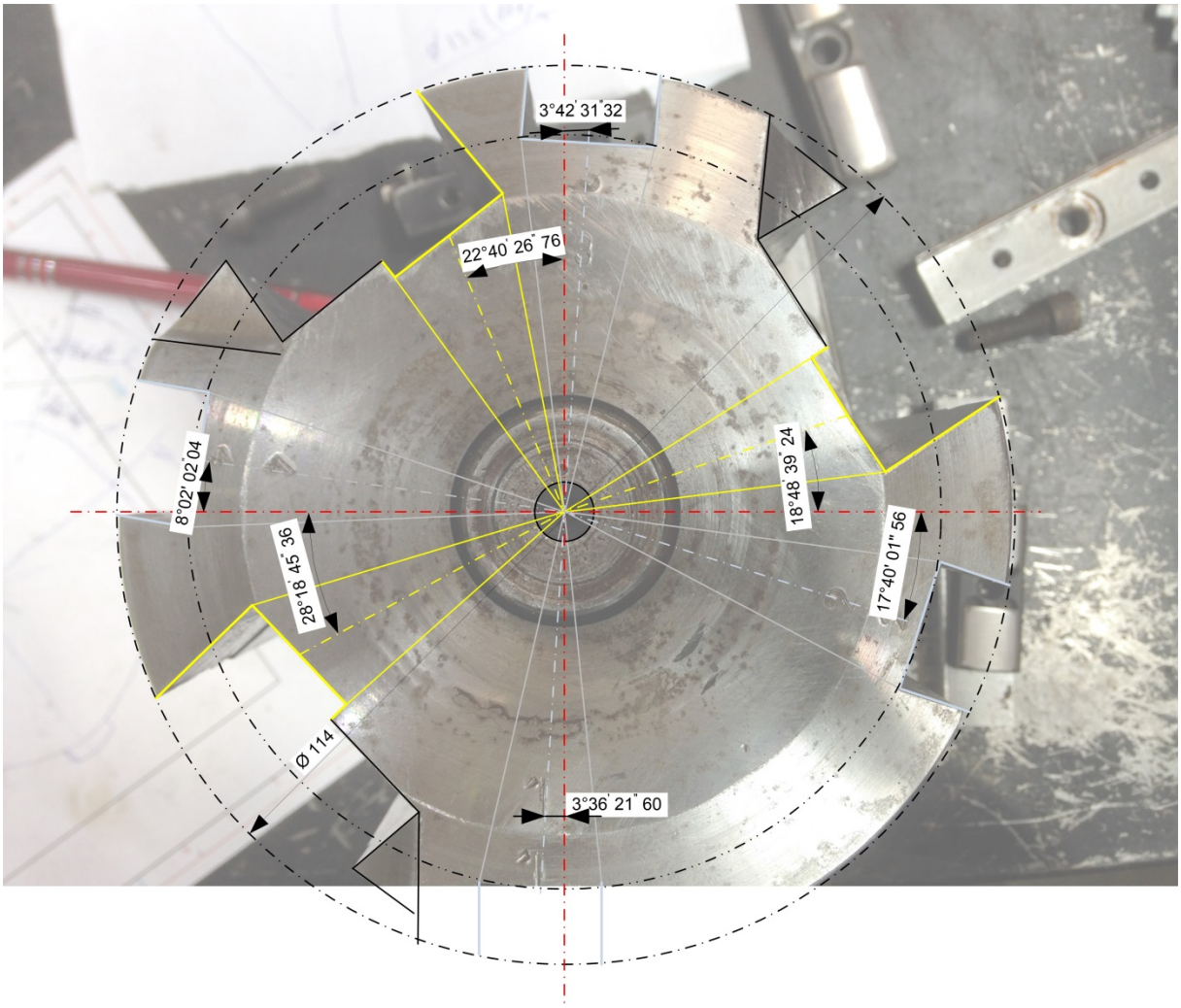

Figure 2. Determining of the angular position of the grooves for mounting the cutting inserts and guide plates:
- placement of the grooves for cutting inserts;
- plasement of the grooves for guide plates

Problem when it were selecting appropriate pictures was that for the qualitative determination of the structural geometry of the tool photos must have been right in the direction perpendicular to the respective longitudinal or transverse planes that is impossible without proper equipment.
Because the coupling part of the tool to the boring bars of the machine is a standard part and photos of this item weren't made, but for their construction was used a prior information.
The work was divided into two stages:
- The first stage were taken geometric dimensions of Boring heads of selected photos using the software program "Microsoft Visio 2010", which is part of the product "Microsoft Office 2010";
- At the second stage was created 3D digital model of the instrument using a CAD program "SolidWorks 2015" for which faculty "Technics and Technologies" - Yambol has purchased a license.
The hub boss diameter of Ø114mm was adopted as a base diameter, which is derived from a priori information from the company "Palfinger".
In the first stage after importing of the image, which show the top of the tool, it was scaled (i.e., increased) so that the base diameter of the hub boss to correspond exactly to the same diameter in the picture. After it was built the main profile, determining the angular position of the cutting and guide plates against the Cartesian coordinate system and among them, had plotted the size of the channels for their installation and other necessary geometrical dimensions.
The accuracy with which appointed angular dimensions is in fractions of a minute, and linear - fractions of a millimeter, this is the possibilities of the used program. On the accuracy of the specified size affects the quality of the image, which results in scattering the contours of the object.
The same procedure was repeated with two pictures in the longitudinal direction – it was taken the dimensions, determining the length of the channel for the cutting inserts and guide plates, the size and location of the screw holes for mounting the plate, the leading belt grooves serving eject tool, the angle at the tip of the tool, etc.

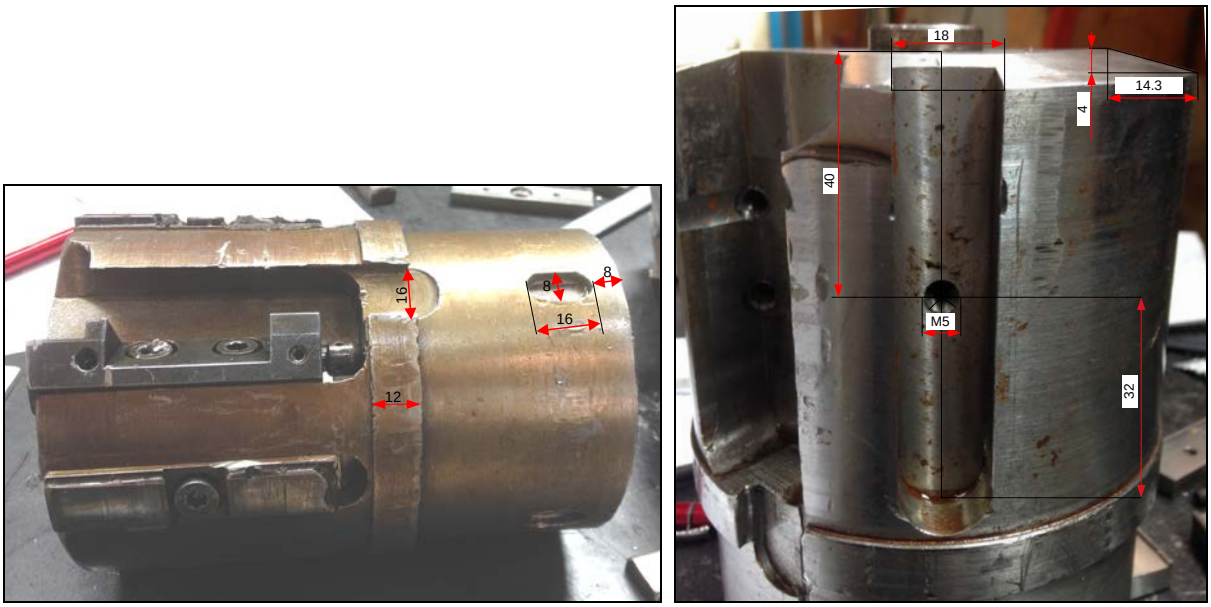

Figure 3. Determining of the longitudinal placement of elements of the boring head

After being specified basic geometric sizes it had begun construction of three-dimensional digital model of the boring head using CAD design software "SolidWorks 2015". In the process it had clarification on certain elements of geometry, because the simulation of three-dimensional object is received collisions. For example, the diameter of the guide belt, and the depth of the threaded holes, which cannot obtain information from the available images, were determined in terms of their functional purpose, after which were specified in the design into the model.
The main reason for the resulting inaccuracies due to poor image quality and no fraction of the relevant geometric information.
After completion, the final model was checked for errors such as unclosed surfaces rash of fillets and chamfers and others. Figure 4 show a rendering model of the developed tool.

Figure 4.
Digitized model of the projected boring head for processing holes of hydraulic cylinders with a diameter ø120mm

3. CONCLUSION

As a result of the examination can be formulated following conclusions:

- The application of the method of reverse engineering in the present case, when there is insufficient input geometric information, is very successful and the results show sufficient quality;
- It is possible the original geometric information can be received from photographic equipment with not very high resolution, but to obtain accurate and precise model was needed and a priori information about the function of the object, information about increased demands on some surfaces, standard elements and others;
- In the event of internal surfaces, blind holes, etc. additional information is needed;
- The resulting digitized model of the boring head can be modified quickly only by changing the diameter of the base the hub body Ø114mm so as to obtain patterns and size tools which are in the range of the same size of the attachment portion. For the rest it is necessary to change the dimensions of the threaded connecting hole of the tail.

4. REFERENCES

[1] Georgiev Georgi, Opportunities to reduce production costs through the use of new methods for the design and production of details, Scientific conference – RU & SU'15 „70 years tradition and innovation", 09-10.10.2015.
[2] Bakshi, Nikita; Gujral, Shruti. REVERSE ENGINEERING AND ITS REALISTIC APPLICATIONS. International Journal of Engineering Science and Technology, Vol. 6 No. 6 Jun 2014, pp. 370-372.
[3] Raja Vinesh and Kiran J. Fernandes (Eds.) Reverse Engineering An Industrial Perspective. Springer-Verlag London Limited 2008, ISBN-13: 9781846288555, p. 253.
[4] Robert J. Abella, James M. Daschbach, Roger J. McNichols Reverse engineering industrial applications, Computers & Industrial Engineering, Volume 26, Issue 2, April 1994, Pages 381-385.
[5] Page D., Koschan A., Sun Y., Abidi M. Laser-based imaging for reverse engineeringq Sensor Review, Special Issue on Machine Vision and Laser Scannersq Volume 23, Number 3, 2003, pp. 223-229.
[6] The International Academy for Production Engineering (ed.), CIRP Encyclopedia of Production Engineering, DOI 10.1007/978-3-642-20617-7, CIRP 2014.
[7] Wikipedia, URL: http://en.wikipedia.org/wiki/Reverse_engineering, accessed on 14/12/2015.

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LIPID COMPOSITION OF ROSE HIP FRUITS AND SEEDS

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Abstract: *The lipid composition of rose hip (Rosa canina L.) fruits and seeds was investigated. The fruits contain 2.88 % glyceride oil. Fatty acid composition of triacylglycerols was identified. In the triacylglycerols the main component were oleic, linoleic and linolenic acids.The total quantity of sterols in fruit and seed oil were 0.2 % and 0,1 % respectively. The main component was β - sitosterol (80,3% and 82,1 % respectively). The amount of tocopherol in the studied oils is significantly higher than the data in the literature. In the fruit tocopherol fraction (2664 mg/kg) α- (50,6%) and γ-tocopherol (42.7%) predominated. In the seed tocopherol fraction (1154 mg/kg) γ-tocopherol (81.4%). predominated*
Keywords: *rose hip, glyceride oil, fatty acids, sterols, tocopherols.*

1. INTRODUCTION

The Rose hip (*Rosa canina* L.) is traditional culture of our country. Most of the production comes from natural fields. Rosa hip is used as a medicinal plant and as a raw material for the food industry in the production of jams, baby food, rose hip wine, teas, juices, nectars, concentrates and others. Rosehip oil is extracted from rose hip seeds by the process of cold pressing. It is rich in oleic (19.1 to 41.14 %); linoleic (41.19 to 51.06 %); linolenic (14.3 to 19.66 %); palmitic (4,25 to 5,15%); stearic (1 to 3 %) acid [4, 13, 16].
Rosehip oil is used in radiation burns, skin diseases, eczema, dermatoses, ulcerative colitis [7].
The objective of this work was to investigate lipid fractions of rose hip seeds and fruits, in regard to fatty acid, tocopherol and sterol composition.

2. MATERIALS AND METHODS

2.1. Materials

Dried rose hip fruits (*Rosa canina* L.) from the area of the town. Kyustendil, Bulgaria, harvest 2012 are used for the research.

2.2. Extraction

The oils were extracted in a Soxhlet apparatus with n-hexane for 8 hours. After rotation vacuum distillation of the solvent, the extracted oils were weighed [3].

2.3. Fatty acid composition

The composition of the fatty acid was determined by gas chromatography [10, 11].

2.4. Sterol composition

The content of sterols determined spectrophotometrically, after saponification of the oil and following isolation of sterols from unsaponified substances by TLC [12].
2.5. Tocopherol composition
Tocopherols were analyzed by HPLC using fluorescence detection [9].

3. RESULTS AND DISCUSSION

The quantity of lipids obtained оидп dried rose hip fruits is 2.88 %, which does not differ from the literature data (1.02 to 3.18 %) [5, 15, 19].
Fatty acid composition of lipid fractions of fruits and seeds of rose hips were investigated (Table. 1). In the composition of the oil of the fruit have been identified eight fatty acids (100% of the composition) and in the seed oil - six (100 % of the composition). The main fatty acids are linoleic, linolenic and oleic. Of the saturated fatty acids palmitic acid prevails, as its content is 5.5 % in the fruits and 5.4 % in the seeds. The lower are the values of stearic acid.
The content of the main fatty acids in the tested rose hip fruits and seeds does not differ from literature data - oleic (19.1 to 41.14 %); linoleic (41.19 to 52.60 %); linolenic (14.3 to 19.66 %); palmitic (4,25 - 5,15 %); stearic (1 to 3 %) acid [4, 8, 13, 14, 16, 20].

Table 1. Fatty acid composition of rose hip fruits and seeds oils

Fatty acids, %	Content, %	
	Fruits	Seeds
Myristic acid $_{14:0}$	0,1	-*
Palmitic acid $_{16:0}$	5,5	5,4
Stearic acid $_{18:0}$	0,6	0,8
Oleic acid $_{18:1}$	20,3	18,7
Linoleic acid $_{18:2}$	52,5	53,5
Linolenic acid $_{18:3}$	20,4	21,1
Arachinic acid $_{20:3}$	0,3	-
Eykozenova $_{20:1}$	0,3	0,4

∗ - missing in the oil

The distribution on the groups of fatty acids in the lipid fraction of rose hip fruits and seeds are presented in Fig. 1 and Fig. 2. The oil can be referred to linoleic-oleic type as the ratio between the two essential fatty acids is approximately 3:1. This ratio is close to the oils of other non-traditional materials such as grape seedя (45,0 – 72,0 % and 12,0 – 33,0 %), melon (60,0 – 70,0 % and 13,0 – 20,0 %), tobacco (60,0 – 78,0 % and 15,0 – 24,0 %), paulownia (64,1 % and 21,2 %) and others [6, 17, 21].

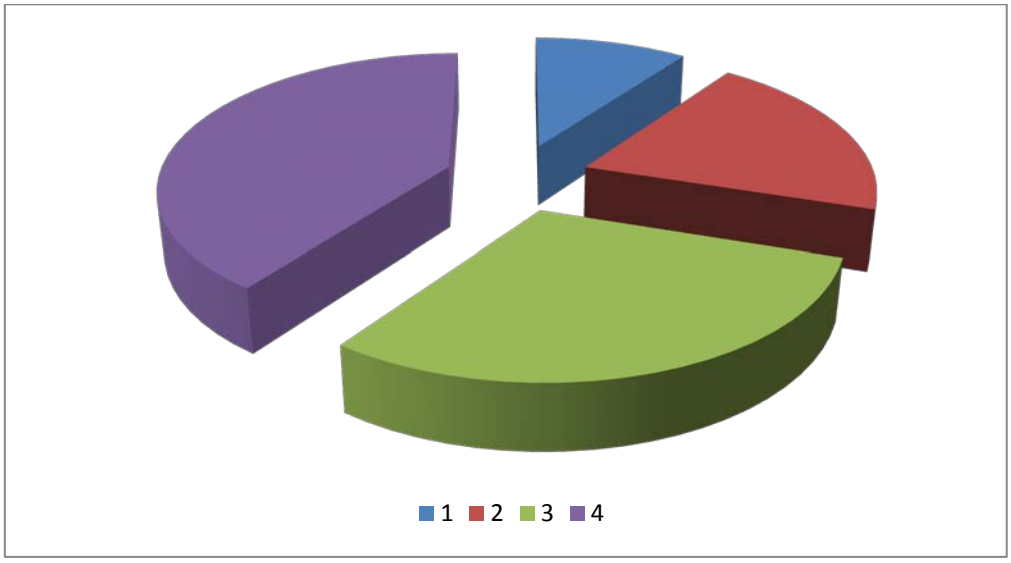

Figure 1. Distribution of the fatty acids in the lipid fraction of rose hip fruits
1 – saturated fatty acids (6,5%);
2 - unsaturated fatty acids with double bond (20,6 %);
3 – unsaturated fatty acids with two double bonds (52,5 %);
4 – unsaturated fatty acids with three double bonds (20,4 %).

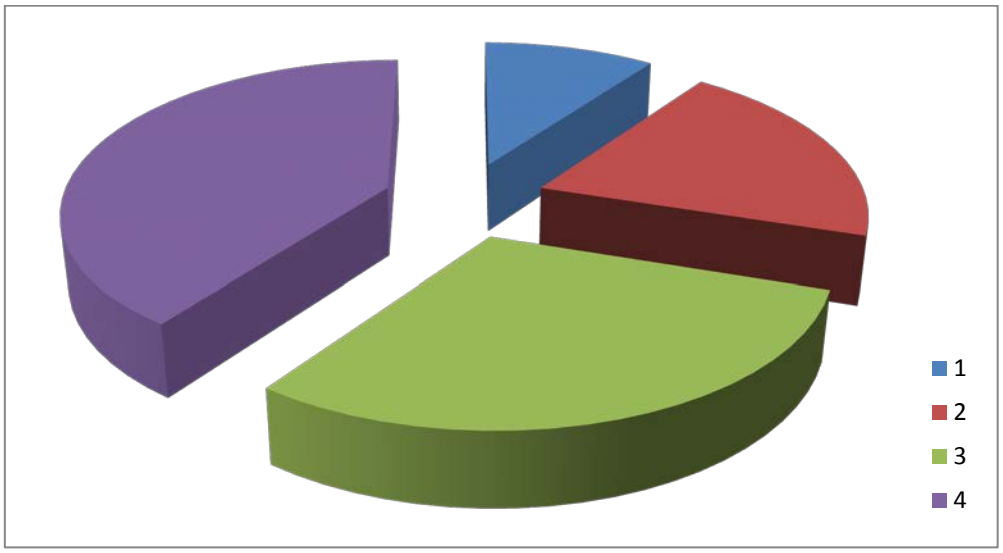

Figure 2. Distribution of the fatty acids in the lipid fraction of rose hip seeds
1 – saturated fatty acids (6,2 %);
2 - unsaturated fatty acids with double bond (19,1 %);
3 – unsaturated fatty acids with two double bonds (53,5 %);
4 – unsaturated fatty acids with three double bonds (21,1 %).

The sterols are an important component of glyceride oil founded in so-called «unsaponified» part. The unsaponified substances in fruits oil are 0.2 %, the content of sterols in them is 8.4%. The unsaponified substances in seeds oil are 0,1 % and the content of sterols in them - 2.5 %.

The total content of sterols is lower than that established by Zlatanov – 0,4 % [20], as well as that of eastern hawthorn – 0,7 % [6] и common hawthorn - 0,64 % [2]. It is comparable to other vegetable oils. In the sunflower oil it is in the range 0.2 – 0.6 % [17].
Individual sterol composition of the studied oils are presented in Table 2.

Table 2. Sterol composition of rose hip fruits and seeds oils

Sterols	Content, %	
	Fruits	Seeds
Cholesterol	1,4	0,9
Brassicasterol	6,6	2,8
Stigmasterol	5,4	5,8
Δ^7- Campesterol	3,3	3,7
β - Sitosterol	80,3	82,1
Δ^5 – Avenasterol	1,2	0,5
Δ^7 – Avenasterol	0,4	0,5
Δ^7 – Stigmasterol	1,4	3,7

Data show that the rose hip fruits and seeds oils contain the highest amount of β-sitosterol (80.3 % and 82.1 % respectively). These data don`t differ from the data in the literature – 81,5% [20]. The values obtained are similar to those from other nontraditional materials: chokeberry - 82,6 % [1], common hawthorn fruits - 80,3 % [2], as well as seeds of paulownia – 79,2 % [6].
The high content of brassicasterol in the lipid fraction of the fruits and of stigmasterol in fruits and seeds, confirm data of Zlatanov [1999]. Similar results were reported for glyceride oils of different representatives of the family. Rosaceae [22].
Tocopherols are good antioxidants and in the nature present in various forms, which are characterized by different activity and functions. They protect the human body from the adverse impact of toxic substances.
The total content of tocopherols in the study lipid fraction from the fruits is 2664 mg/kg, and in this from the seeds - 1154 mg/kg. This amount is significantly higher than that established in the literature – 89,4 mg/kg [20].
Identified are α-, β-, γ- and δ-tocopherol. In the oil from fruits prevails biologically valuable α-tocopherol (50,6 mg/kg), and in this from the seeds - γ-tocopherol (81.4 mg/kg). Individual tocopherol composition of the investigated oils is shown in Table 3.

Table 3. Tocopherol composition of rose hip fruits and seeds oils

Tocopherols	Content, %	
	Fruits	Seeds
α- Tocopherol	50,6	2,3
β- Tocopherol	0,8	0,1
γ-Tocopherol	42,7	81,4
γ-3 Tocopherol	4,6	11,5
δ- Tocopherol	0,3	0,4

The α-tocopherol is antioxidant which is capable of preventing the food products from change of color due to the oxidation processes. Its amount in the rose hip fruits oil is significantly higher than the values found in the literature (19,0 mg/kg) [20]. The amount of γ-tocopherol in rose hip seeds oil, which has antioxidant properties, is higher compared to the values established in the literature – 71,0 % [20].

The amount of β-tocopherol in the fruits and seeds is low and not different from that mentioned in the literature – 0,5 - 0,7 % [18].

4. CONCLUSION

Established a fatty acid, tocopherol and sterol composition of rose hip fruits and seeds lipid fractions.
Studied fruits and seeds are low in glyceride oil, it can be refer to linoleic-oleic type.
The content of sterols is comparable with other vegetable oils. The content of β-sitosterol is the highest (80.3% and 82.1% respectively). The amount of tocopherol in the studied oil is significantly higher than the data in the literature. In the rose hip fruits oil quantitative prevail α- (50,6 %) and γ-tocopherol (42.7 %) and in this of seeds - γ-tocopherol (81.4 %).

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6. REFERENCES

[1] Angelova-Romova M., P. Merdzhanov, P. Denev, M. Zlatanov, A. Stoyanova, M. Kratchanova (2012). Lipid composition of chokeberry fruits, Bulletin MGUP - Scientific-methodical journal, v. 12, № 1, 76-80.
[2] Angelova - Romanova M. M. Stoyanova, G. Antonova, A. Stoyanova (2010). Lipid composition of hawthorn fruits (*Crataegus monogyna* Jacq.), Research Papers, Union of Scientists, Plovdiv, v. 8, 116-120.
[3] BDS 11374. Combined feed. Protein concentrates. Rules for sampling and research methods.
[4] Çelik F., F. Balta, S. Ercişli, A. Kazankaya, I. Javidipour (2010). Seed oil profiles of five rose hip species (*Rosa* spp.) from Hakkâri, Turke-Journal of Food, Agriculture, Environment v. 8, 482- 484.
[5] Craita M., C. Manzu, Z. Olteanu, L.Oprica, A. Oprea, E. Ciornea, M. Zamfirache (2001). Several fruit Characteristics of *Rosa* spp. genotypes from the northeastern region of Romania, Notulae Botanicae Horti Agrobotanici, v.39, № 2, 203- 208.
[6] Damyanova S. (2015). Technology aromatic products from medicinal and aromatic plants, Dissertation, DSc, UFT, Plovdiv.
[7] Ercisli S. (2007). Chemical composition of fruits in some rose (*Rosa* spp.) species, Food Chem, v. 104 , 1379-1384.
[8] Ghazghazi H., M. Miguel, B. Hasnaoui, H. Sebei, M. Ksontini, A. Figueiredo, L.Pedro, J. Barroso (2010). Phenols, essential oils and carotenoids of *Rosa canina* from Tunisia and their antioxidant activities, African Journal of Biotechnology v. 9, №18, 2709-2716.
[9] ISO 9936 (1997). Animal and vegetable fat and oils. Determination of tocopherols and tocotrienols contens – Method using HPLC.
[10] ISO 5509 (2000). Animal and vegetable fat and oils – Preparation of methyl esters of fatty acids.
[11] ISO 5508 (2000). Animal and vegetable fat and oils – Determination of methyl esters of fatty acids (Gas chromatographic method).
[12] Ivanov S., Bitcheva P., Konova B. (1972). Des phytosterols dans les huiles vegetales et les concentres steroliques, Rev. Fr. Corps Gras, 19 (3), 177-180.

[13] Martinson E, M. Zhukov (2003). Improvement of the method to obtain medicine "Oil of rose hips," Rastitelnie resources, v. 39 (3), 137-143.
[14] Musa Özcan (2002). Nutrient Composition of Rose (Rosa canina L.) Seed and Oils, Journal of Medicinal Food, 5 (3), 137-140.
[15] Negmatullaeva N., G. Dubcova V. Vaskina (2011). Use of rosehip powder in the production of whipped delight, Magazine "Confectionery and Bakery", №4, 30-32.
[16] Pimenova S. (1986). The mechanism of action of a number of anti-oxidants and stabilizing lipid vitamins, Theses, Ph.D., Moscow, 173.
[17] Popov A., P. Ilinov (1986). Lipid Chemistry, ed. Science and Art, Sofia.
[18] Pironen V., Syvaoja E., Vazo P., Salminen K., Koivistonen P. (1986). Tocopherols and Tocotrienols in Finnish Foods: vegetables, fruits, berries, J. Agric Food Chem, 742-746.
[19] Ul'chenko T., P. Bekker, A. Aripov, I. Glushcnkova (2009). Lipids of Rosa canina pericarp, Chemistry of Natural Compounds, v. 45, № 6, 867-868.
[20] Zlatanov M. (1999). Lipid composition of Bulgarian chokeberry, black currant and rose hip seed oils, J Sci Food Agric v.79, 1620-1624.
[21] Zlatanov M, G. Antova (2004). Composition of biologically active lipids of lamiaceae seed oils, Grasas y Aceites, v. 55, № 2, 143-147.
[22] Zlatanov M, S. Ivanov, G. Antova, L. Kouleva (1997). Study of phospholipid composition of Rosaceae seed oils, Riv Ital Sost Grasse, v. LXXTV, 409-410.

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INTERACTIVE MODELS OF E-LEARNING FOR ACTIVE LEARNING

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Abstract: *The usage of modern information and communication technologies in the educational process is a prerequisite for the creation of interactive learning environment. In this environment, alongside traditional training models new approaches and techniques can be used that are based on the active participation and interaction between all participants in the learning process. Interactive training models based on the use of electronic tools help to increase motivation and activity of students, which leads to the implementation of effective learning process. The purpose of this work is to explore and assess the potential of e-learning environment Moodle for organizing different types of interactive models of learning.*
Keywords: *e-learning, educational technologies, interactive model, management of the learning process.*

1. INTRODUCTION

During many educational forums authors focus on e-learning using the term interactive as its special characteristic. One could have an impression that every time a teacher or lecture uses any electronic tools in education process the interactive teaching/learning is achieved. The question is if the implementation of Information and Communication Technologies (ICT) always results interactive education as Figure 1's equation shows. Is it true that the usage of modern ICT in the educational process is a prerequisite for the creation of interactive learning environment? The first answer we need is what does the term interactive mean in the field of education.

Figure 1. The main equation

Wikipedia offer the following definition of Interactive Learning: "It is a pedagogical approach that incorporates social networking and urban computing into course design and delivery. Interactive Learning has evolved out of the hyper-growth in the use of digital technology and virtual communication, particularly by students." [1] This time the Wiki answer is not satisficing somehow. The role of the educators is not clear. What conclusion one could make if he/she is not a pedagogical specialist? Most reasonable is to understand that it is necessary to search more answers to this question, and then to concentrate on implementation of any interactive model on some practical and narrow area. Educators must be interested in how they could organize interactive learning using a specific education environment. This explains the goal of our current work to explore and assess the potential of e-learning environment Moodle for organizing different types of interactive models of learning.

2. METHODS

2.1. Interactivity

In general, in the pedagogy science three main models are described and considered: passive, active and interactive. Passive model explains the process of learning where the educator is the main source of information and knowledge. With other words such kind of education is teacher centered. It is a traditional model and many university lecturers are still using it. Such situations produce negative attitude to the knowledge and the education process itself. The lecturers should consider that we are teaching now a different generation – so called digital native. And they expect from us to use active methods. Active model involves methods stimulating cognitive activity and independence of students, their creativity.
Interactivity is the ability to interact with or be in the mode of conversation, dialogue with anything or anyone. The word "interactivity" came to us from the Latin language the word «interaktio», which means «inter» - «common between" and «aktio» - action. Thus, interactivity is one of the characteristics of the dialogue forms of process of learning. The purpose of which is to create a comfortable learning environment where the student feels to be successful with its intellectual consistency, which makes the learning process productive [2].
Interactive models describe the learning process where student interact with their educators, classmates and the knowledge itself. It also could be organized without any ICT, for example, using games. Presence of ICT tools obviously does not mean interactivity but it means e-learning.

2.2. Models of e-learning

Models of e-learning describe where technology plays a specific role in supporting learning. [3] This can be described at the level of pedagogical principles and at the level of detailed practice in implementing those principles. Table 1 presents some of possible e-learning models classifications using different criteria.

Table 1 Classifications of e-learning models

Types of organizational models of e-learning:	Criteria
1. Non, blended, fully distance	Assists or replaces other learning and teaching approaches
2. Synchronous or asynchronous	Interacting time – real time communication or individual work
3. Computer-based E-learning or training (CBT) or web-based training (WBT) or linear learning	Aproaches to the learning materials
4. Team working: 4.1. Collaborative learning or 4.2. Computer-supported collaborative learning	4.1. Instructional methods designed to encourage or require students to work together on learning tasks; 4.2. Uses blogs, wikis, and cloud-based document sites (such as Google Docs and Dropbox)

The 4th type is connected with interactivity. Evolution in understanding the process of teaching new generation of students is supported by researches on the design of student-

centered methods and environments: research on problem-based, project-based, enquiry-oriented pedagogies producing constructivist tasks and environments, placing emphasis on reflection and feedback. The following methods have been extensively researched [3]:

- Problem-based learning;
- Anchored instruction;
- Cognitive apprenticeships;
- Reciprocal teaching;
- Goal-based scenarios;
- Project-based learning.

The teacher training is required on at least one of these methods. It is true the student is the center of any contemporary education models but the educator must design and create the tools, learning object and teaching scenarios.

2.3. Building interactive e-learning educators should follow the next advices [4]:

- Relevant content, on topic - high quality and meaningful content will keep learners fully engaged and motivated to learn. Two questions: What the lecture thinks is important and what students are interest in. The cross section will be the relevant content.
- Exploration - Include links that learners can just click on in order to learn more about the topic, create stories that they need to interact with, integrate visual components that make the topic more eye-catching, and encourage them to explore the module by hyper-linking to other pages that may be of interest.
- Interactive, reality-based scenarios - Integrating real life examples and problems into an eLearning course will give teacher the chance to draw in the learners and show them, first hand, how knowledge acquired can be applied outside of the learning environment.
- Integrated quizzes or assessments at the end of each module or lesson - Assessment the effectiveness of the eLearning course; Offer learners the opportunity to see their progress and summarize the content they have learned. Make the quizzes interactive, such as including real-life problems that learners must solve by using their newly acquired skills.
- Elicit an emotional response - Including videos that may elicit an emotional response or images that may allow them to personally relate to the subject are keys to interactive experiences. Find human interest pieces- real life events and news.
- Encourage group collaboration – using chats, blogs, forums, social media, wiki and etc. to share information and to co-work.
- E-Learning course aesthetically appealing. (Figure 2).

2.4. Models of interactive elements

Many experts in designing instruction courses or e-courses for education provide the information and teacher training materials as well as tools for creating interactive elements. The usage of such elements is going to the higher level. The most up to date information can be found in some blogs, where collective intelligence produces and shares innovations in learning process. E-books, videos and text documents are available for free for those who would like to become good educators. [5, 6, 7]

Using a series of PowerPoint slides with bullet points is not a good idea to attract students' attention during the lectures. We have to find ways to add a level of interactivity to our learning solutions because interactivity is connected with engagement and motivation. [8]

Often recommended interactive elements to involve in digital resource and e-courses are: drag-and-drop page or information tabs, a VoiceThread, wiki page, crossword puzzles, fill-in-

the blank questions, jumbled sentence exercises, a branching simulation, a video or animation, virtual worlds, Augmented reality, gamification and etc. Each of them could assure that students will be more engaged in the process of learning. They will be in a position of researchers, explores and creators.
There are numbers of free or inexpensive tools designed to facilitate the process of creating instructions for the lecturers. [9, 10]
Raptivity is one of interactivity builders that offer collections of hundreds templates for creating eLearning interaction elements. [10] Usually the method of work is quick and easy, and most of vendors emphasize “without any programming”. The templates are organized in categories like games, simulations, brainteasers, interactive diagrams, virtual worlds, and others. Good feature is that most of created elements could be implemented in learning management systems like Moodle.
Some examples of Raptivity models of interactive elements are Flash cards, Rollover Word definition, Drag and Drop – Image on Image, Flow chart presentation with audio, Show me. The interactive elements have the feature reusability like all electronic resources. This could save time and elicit effectiveness.

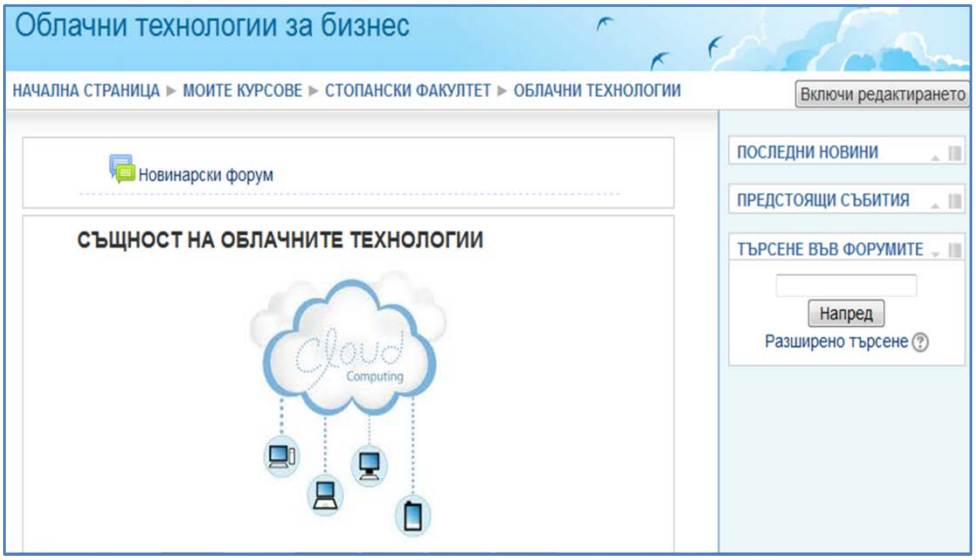

Figure 2. The view of an e-learning course Cloud computing for Business

3. EXPERIMENTAL

3.1. LMS of Trakia University

Learning management system Moodle is used in Trakia University as a platform for developing e-courses. [11] (Figure 3). Basic work for populating the data base with learning resources is done. What is needed now is to go on the next level of e-learning- move to the interactive models of education.
According our observation and what students share about the common practice that offering lections into electronic formats is considered like interactive teaching. Usage of Enter and navigation keys is not interactive way to educate and teach.

Figure 3. The main page of Trakia University LMS

3.2. Taxonomies

New interactive methods for teaching we have to implement must be driven by cognitive/learning principles rather than for "audio-visual" enhancement. All learning objects included in our e-courses must have specific pedagogical goals. This is the reason to discuss about taxonomies.
Taxonomy in this context proposes a mapping of the theories of learning, the pedagogical frameworks, and the models of e-learning. [3]
We consider two taxonomies – Bloom's and Guerra's and tried to match their cognitive levels with activities provided my Moodle.

3.2.1. Bloom's taxonomy

Bloom's taxonomy consists of six levels of cognition - remembering, understanding, application, analysis, evaluation, creation. Each resource or activity in Moodle can be used in a different way and to conform to the different levels in this taxonomy, starting from the lower, reaching to the higher. (Figure4).

- **Remembering** - At this level one can use the resources in a variety of formats - files, dictionaries, pages, hyperlinks to external sites. Rich and diverse content is useful for better understanding and retention of information.
- **Understanding** - most commonly used is Test activities through which knowledge is assessed. And the student performs an assignment with some tasks or satisfies online issue, which will be valued by the teacher. Uploading files –own work or an answer to some questions.
- **Application -** The usage the dictionary as a task - students fill in their own terms and their definitions.
- **Analysis** - Discussion forums are a great tool for exchanging views on a topic, which can be set by the teacher as a role-playing game.
- **Assessment** - The use of Workshop for each evaluation. This is an activity that produces the theory of social constructivism, enshrined in Moodle.

- **Creation** - Continued accumulation of knowledge is embedded in the theory of "learning by doing". Create a Wiki pages; Work in project groups on various topics; Asking questions and comments between the different groups.

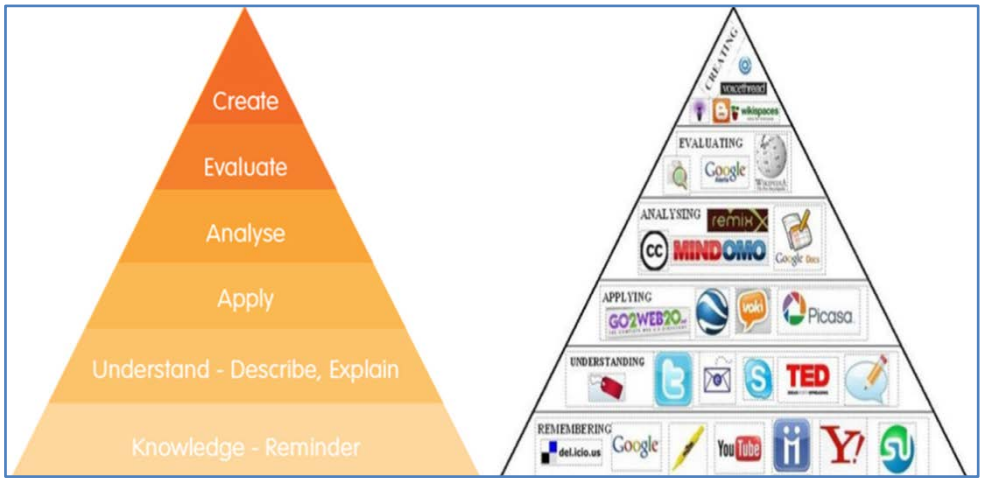

Figure 4. The pyramid of Blum's taxonomy with ICT tools picturing corresponding levels

3.2.2. Guerra's taxonomy

The Guerra's taxonomy contains ten levels scale of the interactivities; it is used in different online resources. Each step of the scale presents the level of increasing complexity, functionality, time for processing, programming skills, needs flexibility of pedagogical design and need more attention from content experts. The following are the levels:

- GS1 – ordinary document;
- GS2 – scroll page;
- GS3 – refers to the dynamic addition of feedback in tests;
- GS4 – integrate movement into text and graphics;
- GS5 – added multimedia elements, audio, video
- GS6 – allows users to add information that is reflected in the print version after completing the module.
- GS7 – provides users with various storage of materials
- GS8 – adds realistic simulation, which uses branched methodology;
- GS9 – added guidance in real time by the best managers and contractors
- GS10 – simulations with virtual reality.

4. RESULTS

As a result we created tables where to each level of the both scales appropriate Moodle activities are conformed. Any resource or activity in Moodle can be used in different ways to correspond to the different levels in both taxonomies, starting from the lower, reaching toward higher.

According to us the scale level GS8, GS9 and GS10 will be difficult to be implemented in Moodle in general, but in our LMS we have a web conferencing module Big Blue Button which could make possible to organize a real time communication and consultation with best specialist in given field. The simulations must be created in outside tools, or hyperlinks to free resources of this kind to be inserted in e-courses in Moodle.

Table 2. Bloom's taxonomy levels matched to resources/activities in Moodle

Bloom's taxonomy level	Resource/activity in Moodle	Approaches for usage the activities
Remembering	File, Hyperlink, Book, Page, Vocabulary	Provides content in different formats.
Understanding	Test, Workshop	Check how the material is absorbed. The task may be in the form of uploading a file with any development or response to a question.
Application	Dictionary Database	Filling the definitions by the students. Filling records in the database with found by some students resources on the topic (creating repository) and sharing with rest to use.
Analysis	Forum	Discussion on a particular topic, role games
Assessment	Workshop	Mutual assessment/evaluation
Creation	Wiki, blog	Create Wiki pages, work in project groups on various topics, asking questions and comments between different groups.

Table 3. Guerra's scale levels/activities matched to resources/activities in Moodle

Guerra' scale	Resource/activity in Moodle	Pedagogical activities
GS1	Document – pdf, doc Resources in Moodle	Lectures, new knowledge acquiring Preparation for individual or team work, using lessons and manuals for learning
GS2	Presentation, Lesson without media, Lessons in Moodle, Dictionary	Acquiring new knowledge during lectures, lessons, leaning definitions and using manuals
GS3	Tests in Moodle	Self-learning and feedback
GS4	Presentation with flash animation	During lectures to demonstrate more complicated events, relations and etc.
GS5	Lesson with media, Screen recording, Video demo, Animations	Lectures, self-learning, sharing knowledge, learn how to train you, using manuals,
GS6	Assignment Moodle (online text), Assignment – with online text, uploading file, Dictionary	Create Wiki pages, work in project groups on various topics, Mutual assessment/evaluation
GS7	Chat, Forum, Forum from type - questions and answers, Wiki, Wiki (with grade), Workshop	Team working, organizing discussions, database of questions, learning how to answer to questions, learning how to evaluate and asset materials, work results and knowledge resources.

5. CONCLUSIONS

We expect that the interactive training models based on the use of electronic tools help to increase motivation and activity of students, which leads to the implementation of effective learning process.

The question is how many hours we can devote to our preparation to teach with interactive methods. Interactive models demands more efforts from the teachers but the good thing is their reusability as learning resources. Many efforts must be done for working with

pedagogical side of teaching process – defining the goal of each learning portions, consider the needs of the learners and creating scenarios for teaching and learning, including interactive elements to engagement of e-learners.
Learners learn well when they have to do something practical, when they could show others their success. And when they see the knowledge could increase their further professional performance.
Interaction elements are special kind of learning objects that make the teaching more attractive for both sides – educators and learners.
If the lecturer understands the pedagogical side of the learning process he/she will be more successful even with a simple image or animation but used on the right place, on right moment and with right activities.
An Idea about Moodle come as an important conclusion: to use a scenario where the appearance of the course to allow the limitation in the choice of resources and activities depending on the levels of Bloom taxonomy. For example, if we work for the level Remember, to provide the students with reading materials. From the list of resources and activities to be active only resource.

6. REFERENCES

[1] Interactive learning. https://en.wikipedia.org/wiki/Interactive_Learning. (accessed 09.2015).
[2] Selevko G. K. (2005). Pedagogical technologies based activation, intensification and effective management of the learning process. Research Institute of Technology School.
[3] Mayes T. and de Freitas S. (2004) Review of e-learning theories, frameworks and models. London: Joint Information Systems Committee. http://www.jisc.ac.uk/whatwedo/programmes/elearningpedagogy/outcomes.aspx. (accessed 10.2015).
[4] Pappas Chr. (2014). 7 Tips To Develop a Successful Interactive eLearning Strategy. http://elearningindustry.com/7-tips-to-develop-successful-interactive-elearning-strategy. (accessed 10.2015).
[5] E-learning heroes. https://community.articulate.com/. (accessed 10.2015).
[6] CDC Learning Connection. http://www.cdc.gov/learning/about.html. (accessed 10.2015).
[7] Nair Uday (2014). Instructional Design Models in the 21st Century: A Review. http://edtechreview.in/trends-insights/insights/1058-instructional-design-models-in-the-21st-century-a-review. (accessed 10.2015).
[8] Bailey V. (2013). Interactive Elements in E-Learning. https://www.td.org/Publications/Blogs/Learning-Technologies-Blog/2013/04/Interactive-Elements-in-E-Learning. (accessed 12.2015).
[9] Casimiro L. (2015). Engagement-for-Achievement: Creating a Model for Online Student Engagement. In S. Carliner, C. Fulford & N. Ostashewski (Eds.), Proceedings of EdMedia: World Conference on Educational Media and Technology 2015 (pp. 11-20). Association for the Advancement of Computing in Education (AACE).
[10] Raptivity - The Best in Class Interactivity Builder! http://www.raptivity.com/. (accessed 12.2015).
[11] Kotzer Sh., Elran Y. (2012). Learning and teaching with Moodle-based E-learning environments, combining learning skills and content in the fields of Math and Science & Technology. 1st Moodle Research Conference, Heraklion, Crete-Greece September, 14-15, 2012, pp. 122-131.

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METHODS FOR INTENSIFICATION OF THE TRAINING IN TECHNICAL SUBJECTS

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Abstract: *One of the most valuable resources in today's world is time. So it should not be wasted, but to use properly. For each goal, a man has to spend the least possible time. This can happen if you work more intensively. In education should also apply intensive training methods by which with less time for auditorium achieves high utilization of educational content. The report presents the results of survey of student's opinion about the application of intensive training methods. The aim of this study was to select the most appropriate teaching methods and improving the quality of education in technical subjects. It is made inquiry with 123 students, regular and part-time training of professional field of Electrical and Electronic Engineering in the Faculty ofTechnics and Technologies of Yambol, Trakia University of Stara Zagora, Bulgaria. The results are analyzed and the teaching methods in which students quickly and easily perceive educational content are defined.*
Keywords: *intensive training methods, education, technical subjects.*

1. INTRODUCTION

One of the most valuable resources in today's world is time. So it should not be wasted, but to use properly. For each goal, a man has to spend the least possible time. This can happen if you work more intensively.
In education should also apply intensive training methods by which with less time for auditorium achieves high utilization of educational content.
In this regard, the provision of intensive training is an important factor for increasing the quality of education of students in technical subjects.
Intensive training or intensification of the training is teaching a large amount of learning information, based on intensive educational technology under fixed duration of training and without lowering the quality requirements of the established knowledge.
Intensification of training is particularly relevant for part-time training where auditorium work provided for in the curriculum is 50% of that of full under same volume of educational content. Due to the need to combine the learning with work, the time for extracurricular work is also limited.
Accelerated learning methods are comprehensively developed mostly for training in foreign languages. In the training in technical subjects that experience has not yet sufficiently implemented.

2. METHODS

Increasing the pace of learning is possible in two ways:
1. Improvement of educational content - rational selection redistribution in time learning new information levels, logical continuity of the new information with information already utilized.
2. Improvement of training methods - group work, problem training, individual training, and application of advanced technological and informational tools (multimedia, e-learning, simulations and more.
In the intensification of the process of teaching of technical subjects aims activating the spare capabilities of students to improve the quality of their training. This is achieved with the use of such methods of teaching as a combination of various forms of training, presentation of the material in large blocks with an excess of information, individual approach to the organization of the laboratory, taking into account the individual circumstances of students, the use of modern information and technical means.
For the implementation of intensive training methods need to be met the following conditions

- preparation of teaching staff in computer technology;
- provision of multimedia equipment, computers and respective software;
- laboratory equipment;
- continuous monitoring of the achievements of learners;
- developed educational-methodical materials.

3. EXPERIMENTAL

Successful implementation of intensive training methods depends on the situation - the type of disciplines, the age of the students and others. In order to select the most appropriate training methods to improve the quality of education in technical subjects studied by students from the vocational area of Electrical Engineering and Electronic Engineering in the Faculty of Technics and Technologies of Yambol, Trakia University of Stara Zagora, Bulgaria it is made a study of the opinions of the students. It is made inquiry with 123 students, regular and part-time training It includes 20 questions related to the application of intensive methods of teaching at the university.

4. RESULTS

The results are analysed and the teaching methods in which students quickly and easily perceive educational content are defined.
Students' opinion on the question in which cases the most appropriate to use presentations in teaching technical subjects was examined (Figure 1).
The highest percentage 55% approve the use of presentations for display of complex charts and diagrams, especially if they are drawn in stages, resembling the drawing of the scheme by the teacher on the blackboard. This combines the gradual acceptance by the sequential addition of more complex elements and the possibility of reducing the time for teaching.
Intensification of education is impossible without introducing e-learning? It can be used both during the school classes and at home for self-study. The advantages of e-learning can be summarized as follows:

- The user has the liberty to choose the time and place where he will train, and the sequence in which he will traine. It usually depends on his knowledge in the field;

- E-learning environment providing rich opportunities for using multimedia, which allows for a greater degree of acquiring knowledge. Visibility and interactivity of the multimedia attract and hold the interest of students;
- With the use of e-learning, it is possible students to communicate with each other and together to seek the decision of tasks for group work. Thus they acquire habits of teamwork, develop communicativeness and skills for personal presentation;
- E-learning environment interact with users by means of feedback, and thus assist them in the learning and the training itself;
- Implementation in educational materials simulation allows to provide students not only theoretical but also practical knowledge;
- Simultaneous use of multiple sources of educational information (digital libraries, databases, etc.);
- The communication through the communication networks of students and their teachers is possible.

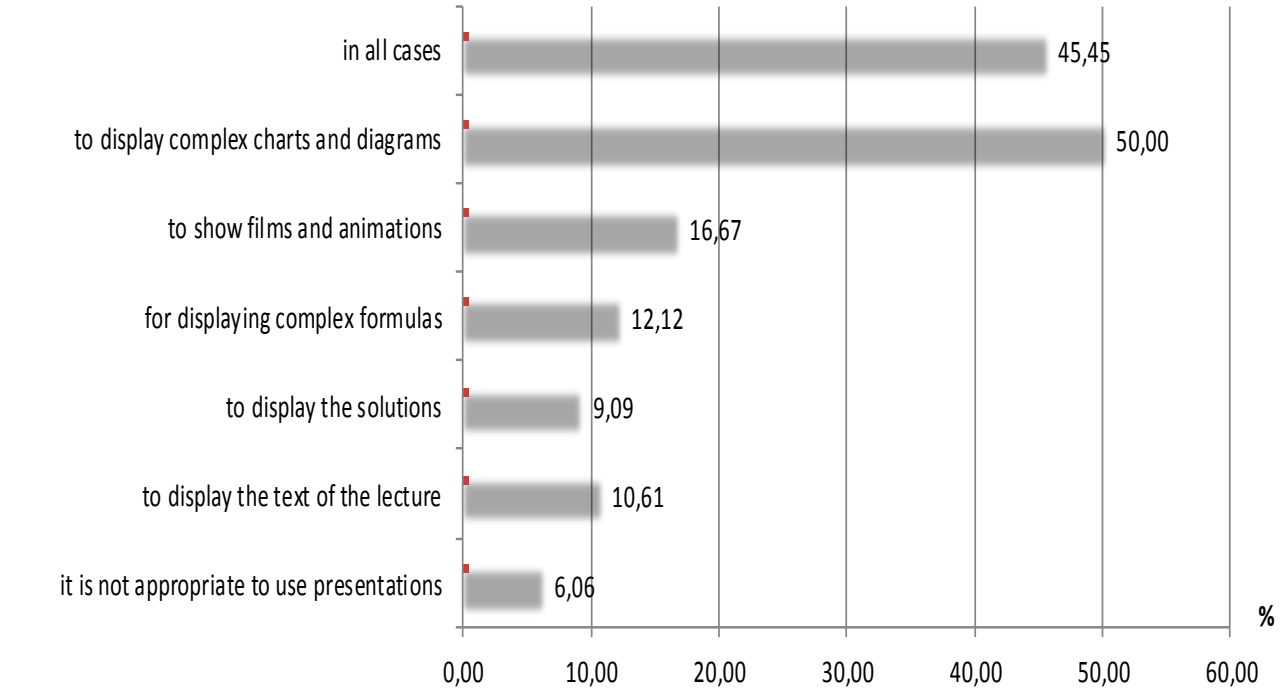

Figure 1. Use presentations in teaching technical subjects

Surveyed students answered the question "Which of the possibilities of e-learning are best suited for teaching technical subjects?". Most students 84.85% approved the use of e-learning for self-study at home by doing tests and reading lessons. 80.37% use e-learning as a source of academic information - electronic textbooks, methodological tools, dictionaries and more. The other results are shown in Figure 2. The number of percentages is greater than 100, because they give more than one answer.

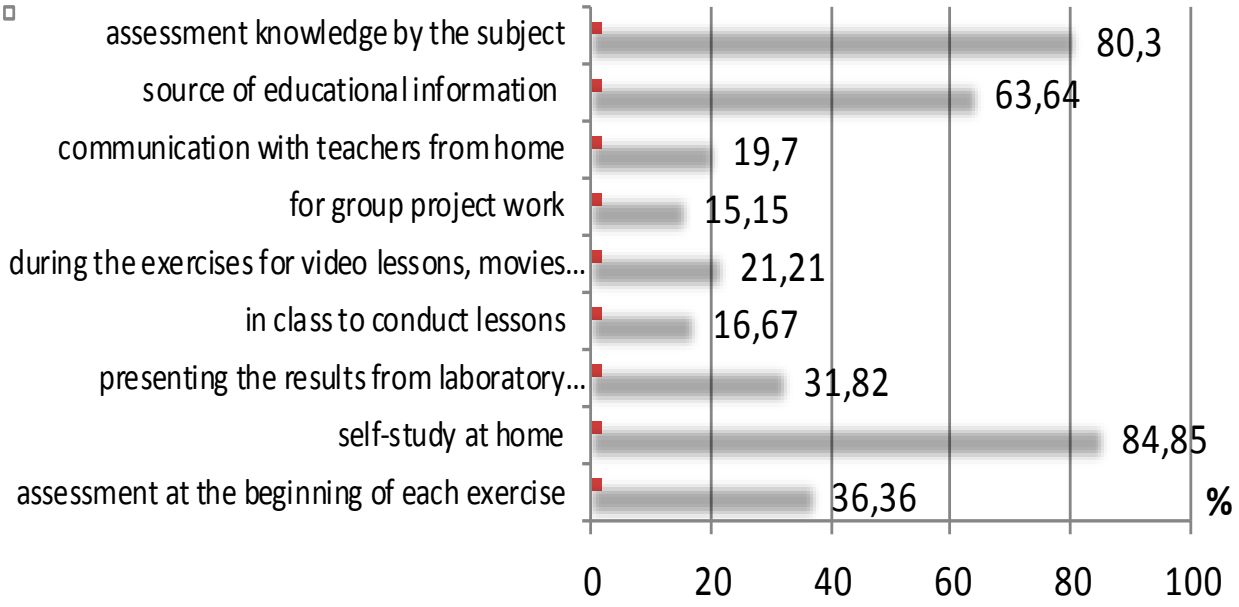

Figure 2. Use of e-learning in technical subjects

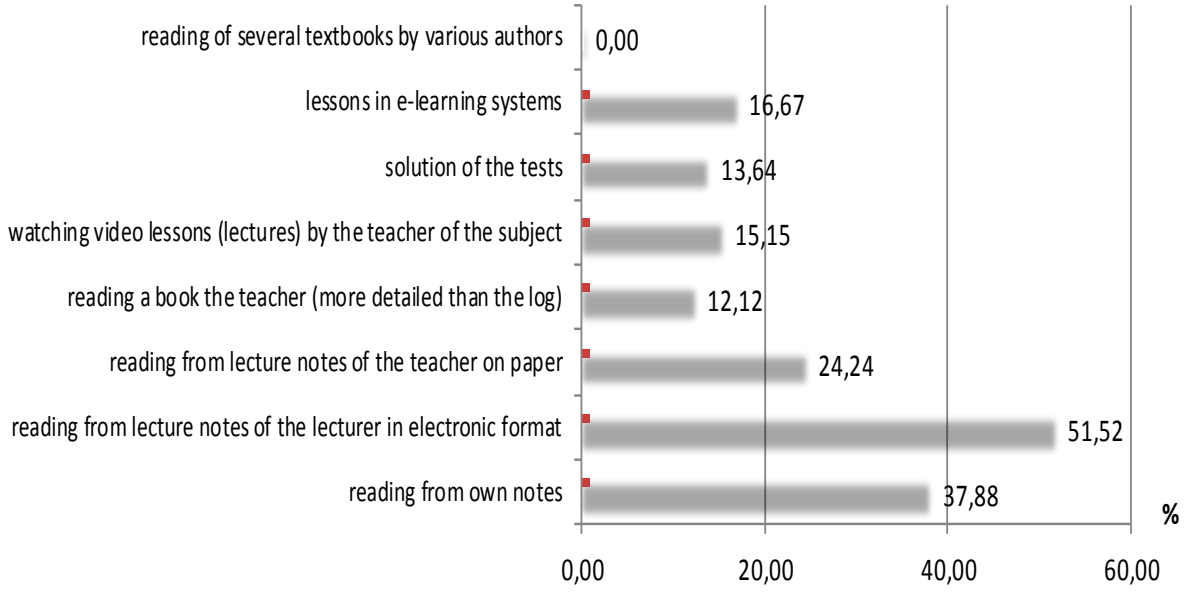

Figure 3. Learning resources

In the study it was found that most students prefer to prepare from lecture notes from the teacher in electronic form (Figure 3). Thus, by the modern development of computer technology, they have access to lectures anytime and anywhere. Trips, waiting on queues and other free moments can be used for training. Less preferred is reading from own notes and the notes of the lecturer on paper. Follows: reading lessons in the e-learning system,

reading from a textbook, written from the teacher, solving tests. No student thinking that it is appropriate preparation from various books from various authors, which until recently was common practice and almost the only option for training [2].

When students begin learning a new discipline must first be familiar with the basic concepts and structure of the discipline. Teachers need to prepare and give to students a short lecture course and a glossary of key terms used in the discipline - a clear, functional, totally transparent and comprehensible, so that with its help students to easily read lectures. The terms must be submitted in accordance with the structure of the object. After each section included in short lectures must be provided tests in paper or electronic form, which verifies the understanding and memorization of concepts.

Full understanding of the content of the technical disciplines is not possible without the development of a course project. The content of the project, students need to learn about on the very first lecture. For this purpose, students should get another material - representing an example of a course project with written formulas for calculation. It is good both materials be available in both in text and electronic form.

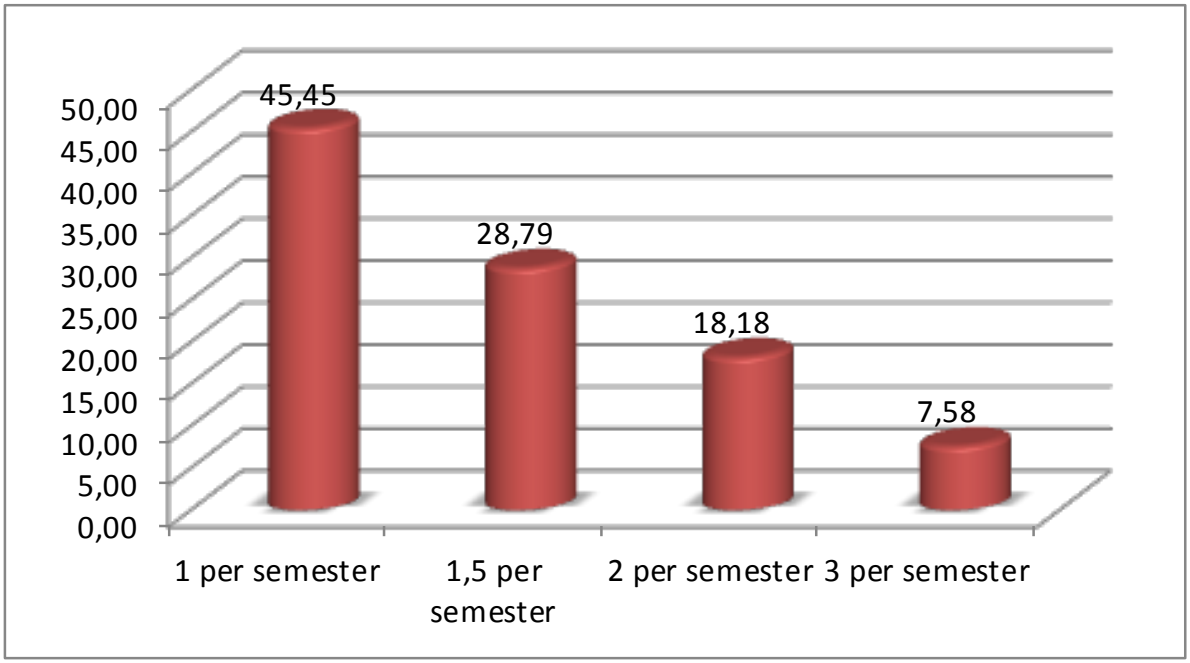

Figure.4. Number of individual work

In conducting the lecture teacher must bring the simple examples using everyday experiences of listeners. Thus the terms are flown in memory and allow the filling of vocabulary in an unusually short time. The new terms are absorbed better by a system of associations. Simple examples help to build an association and a new idea based on old knowledge.

The study of the terms must start with these concepts that can most quickly be mastered.

Particularly effective associative lines are built when to students are presented stimulus in the form of diagrams, charts, drawings or symbols. This effect is widely used in the implementation of multimedia systems.

After completion of the planned lectures in this course students need to naturalize the given material and to practice. The practice consists of two activities - conducting laboratory exercises and implementation of a course project.
The inquiry shows that now the students are not fully realized the usefulness of the course project and tasks. Most of them replied that the optimal average number of solo work is one or 1.5 per semester (Figure 4). This shows that the future work of the teachers needs to focus on promoting the benefits of individual work and motivation of students for its quality performance.

5. CONCLUSIONS

Intensification of education in technical subjects in Faculty of Technics and Technologies of Yambol should be directed to:

- Development of learning resources to all technical disciplines - notes on lectures and glossaries of key concepts in electronic form;
- Development of presentations using all possibilities to visualize the educational content;
- Work to increase the students' motivation for self-development course projects and assignments;
- Enrichment of material base for better visualize and providing conditions for the acquisition of practical skills;
- Development of lessons and tests in the e-learning system.

6. REFERENCES

[1] Pehlivanova T. & Keremidchieva Kr., Intensity of training students in major "Electrical engineering" in Faculty of Technics and Technologies - Yambol, Applied researches in technics, technologies and education, vol. 1, no. 1, pp. 74-78, 2013.
[2] Pehlivanova T. & Keremidchieva Kr., Application of intensive training methods in technical subjects, International Scientific Conference eRA-8, T.E.I of Piraeus, Greece, 25-23 September, 2013.

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THE CHOICE OF TEACHING PROFESSION IN THE NEW EDUCATIONAL REALITIES

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Abstract: *The development of the educational system and the choice of the teaching profession are changing under the impact of the economic and financial crisis, the economy, the society and the demographic collapse and their impact on the labour market. Since education and training are means of increasing the productivity and the innovations, it is very important to retain the investments in the education and to encourage the entry and retaining of motivated and competent teachers.*
The Report makes comparative analysis of research with employed teachers (with work experience up to 5 years). There are indicated the characteristics of the new educational realities and how they affect the professional choice and professional self-determination. The study included students who are preparing for teachers. The results from the surveys of students and teachers, who enter in the profession, are compared with modern scientific theories and standards for teachers.
In response to the changed educational realities, the views of the surveyed and the studied literature are proposed current optional subjects that contribute to the professional adjustment of future teachers in the school environment. It has been made conclusion for part of the new dimensions of professional self-determination of teachers.
Keywords: *teaching profession, competent teacher, professional choice, professional self-determination, professional adjustment.*

1. INTRODUCTION

The development of the educational system and the choice of the teaching profession are changing under the impact of the economic and financial crisis, the economy, the society and the demographic collapse and their impact on the labour market. Since education and training are means of increasing the productivity and the innovations, it is very important to retain the investments in the education and to encourage the entry and retaining of motivated and competent teachers.
In the context of the Lisbon Strategy (March 2000. Lisbon) and in the subsequent EU's growth strategy for the coming decade, EU should become a dynamic and competitive economy based on knowledge and competences are taken a number of policy initiatives: the European and national, subordinated to open method of coordination and cooperation. In these initiatives is emphasized the importance of the better education as a factor and lifelong learning as an indicator of progress. Teachers are key participants in the reform and the development of educational systems, which can make the EU economy one highly-developed and knowledge-based economy. They play a crucial role in supporting the education of young people and adults. High-quality education provides the students personal realization, better social skills and more diverse employment opportunities. Teaching

profession has a strong influence on the society and has a vital role in the advancement of human potential and forming the face of future generations.
In Bulgaria, during the last years are developed and implemented: Model for career development of teachers (2009), Regulation of differentiated payment (2010), National Programme for the Development of School and Pre-school Education (2006-2015) - "Increasing of prestige and social status of the teacher". They are aimed at:
• enhance teachers' motivation to participate fully in the educational and training process in school and creating conditions for competition;
• predictability in the career development according to personal plans and opportunities of the teacher;
• linking of the professional career: with a growing prestige; with more responsibilities and appropriate reward by integrating the Model in the system of differential payment.
The current state of the regulatory framework related to the profession of the teacher directly influences the choice of profession, the remaining in it, and the horizontal or vertical career development. In modern conditions, the characteristic of the profession, expectations and requirements of society have changed as: to the teacher are set new tasks, increased responsibilities, complicates the interaction with more and different participants in the activities. This reflects on the status of the teacher, but is also associated with increased competence, acquiring higher professional qualification requires and new commitments and adapting to the dynamic environment.
Despite the statements for the importance of the education and the teacher for development of the future generations and the society in the National Programme for the Development of School and Preschool Education and Preparation (2006-2015) states that "low social status, particularly low economic status of teachers is largely reflected in the loss of self-confidence and motivation for self-expression. This often leads to insufficient efforts to keep and provoke the students' attention, which further lowers the self-confidence of teachers".
The study authors have continuous interest in the problems of the teaching profession - the choice, the preparation, the adjustment and identification to it. They developed several research projects and publications.

2. THEORETICAL TREATMENT

Choosing a career is one of the most important decisions which young people make in order to determine future plans for life and realization. This problem stands in front of their parents who have to guide and support them, because this decision has an impact on their life and is connected with the feeling of happiness and satisfaction. According Spittle M., K. Jackson, M. Casey the structure of the motivation for the choice of the teaching profession is not one-dimensional, but multidimensional - economic, social, interpersonal, intellectual, and ethical reasons. (Spittle M., K. Jackson, M. Casey, 2009). The choice is one of the most important aspects of human activity and the teaching profession is sotsionomic and we can say that it is more of a vocation which determines the overall life path. The personal decision to dedicate to it largely depends on the values associated with the activities and perceptions of the teaching profession. The authors of several studies emphasize that the choice of the wrong profession because of lack of information, guidance and counselling, advices of parents, teachers and friends, peer pressure can lead young people into inappropriate jobs that do not meet the needs and interests. Research suggests that the key factors which influence the choice of the profession of the teacher are: desire to work with children and adolescents, social mobility, more time for family, work-related benefits such as insurance, pension, vacation, evaluation of teaching skills. (Watt & Richardson, 2007) The way of worldview and perception of professional activity and interactions with other participants in

the educational process (students, colleagues, leadership, parents, community members, NGOs, institutions) determine the choice of the teaching profession. The factors that influence the professional choices of young people are not only the family, but the gender characteristics and stereotypes. (Creed & Patton, 2003) The hierarchy arranging of the profession according to its status in society has great influence on the professional choice.
In a time of economic crisis, in a dynamic and uncertain labour market, young people should be informed which profession provide them a chance to realize during the crisis. According to Mackenzie's quarterly reports, publications in the Financial Times and studies of Arthur Adams ® Bulgaria, made the following rating to the status of various professions (Table 1.):

Table 1. Security of professions according to Arthur Adams® Bulgaria

Profession	Security of profession
Healthcare	10/10
Jurists	10/10
Teaching profession	*10/10*
Engineers and technicians	5/10
Economists and Accountants	4/10
IT and computers	4/10
Power engineering	3/10
Millwright	3/10
Entrepreneurs and small business owners	3/10
Financial Services	2/10
Media	2/10

Even assuming conditionally the data from the study above, we can state that in the last year the interest in teaching profession has increased, especially in big cities where they developed not only state and municipal, but also private educational institutions. In our previous research related to professional identity and adjustment of teachers have been identified as factors the need to communicate and support the development of young people's appreciation of the society towards the work of the teacher, but also factors such as working conditions, availability of self-development, leisure, payment and others. As a factor we can point and the personal experience of young people, emotions and memories of school life and particular teachers, and the role of university professors. Watt and Richardson developed a framework of factors affecting the technology of choice of profession (FIT-Choice), as a model for the study of this crucial issue. (Richardson & Watt 2006, p. 31)
The model consists of three major components:

- The first component includes: abilities, values of the profession, backup profession, job security, time for family, ensuring the future of children, promotion of social justice and social influences.
- The second major component aims at identifying the perceptions of prospective teachers for teaching – experiences, difficulties, social status, salary and social dissuasion.
- The third major component includes satisfaction from choice of profession (Watt, H. M. G., & Richardson, P.W. 2007)

Watt and Richardson (2008) developed a scale of professional engagement and career development aspirations (PECDAScale), to investigate the relationships between motivation and skills for teaching, beliefs about learning and professional engagement and career development aspirations.

3. METHODOLOGY AND RESULTS OF THE STUDY

The tools were designed after a series of preliminary interviews with students and working teachers. Based on the literature review was written questionnaire, which contains questions for teachers with similar the issues of surveyed students. The questions are related to what has determined the choice of the teaching profession (personal choice or other circumstances) with the initial perception of the teachers' work and its real nature and evaluation of significant differences between theory and practice and stay in the profession or exchange the professional choice with another. The study included 54 students and 37 working teachers with experience up to 5 years, 24 of the teachers are women and 13 - men.
Our reasons for selecting this research contingent are that students have clear impressions of school life and teachers and the beginner teachers have an idea and memories of his education at the university. At the beginning of their careers, they can make easier and more realistic comparison of professional competences acquired a kind of direct professional practice.
The comparative analysis of the responses what has predetermined the choice of the teaching profession to students and teachers, is showing nuances. As a general trend we can point out that the percentage of the interest and desire to the teaching profession are similar - 16% of students and 14% for teachers. 13% of students have used the possibility for the additional qualifications that have been offered during the training.

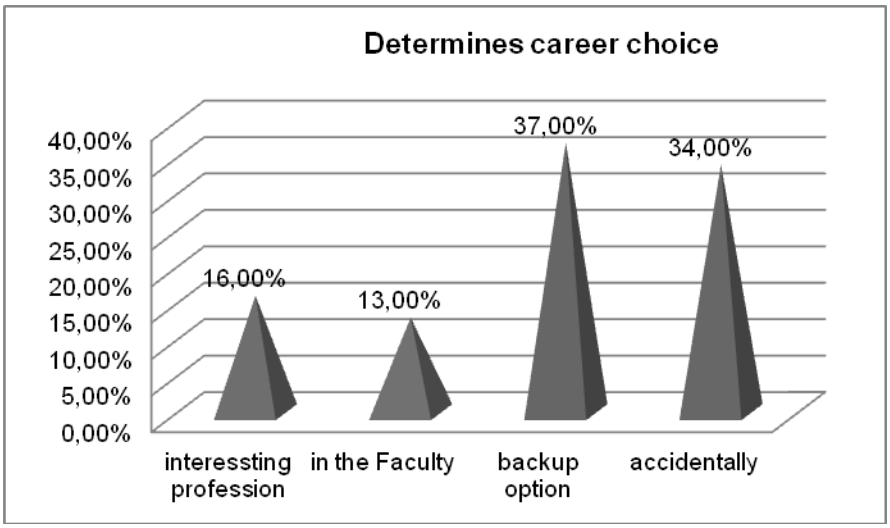

Figure 1. Determinants in the choice of profession according to students

Unlike the data of some researchers pointed out in the theoretical part, only 7% of teachers were influenced and directed the choice of profession by relatives engaged in teaching profession. A positive trend can point out that the memories of the good teachers have a decisive impact on the orientation and the choice (17%). This fact again highlights the important role of teachers to guide educated, intelligent and motivated young people to the profession. Here we can mention the overall impact of the personality of the teacher ranging from the look, professional qualifications communication skills, emotional intelligence, dialogue model of learning and use of technology. 11% of beginning teachers are oriented and chosen occupation at the university under the influence of university professors who have emphasized the importance and humanity of the teaching profession and its importance in building a knowledge society, subordinated to general democratic principles.

Students and teachers who chose answer "backup professional version" and "lack of other choice" we explain with economic crisis, with the desire to get more and different qualifications that increase chances on the labour market.

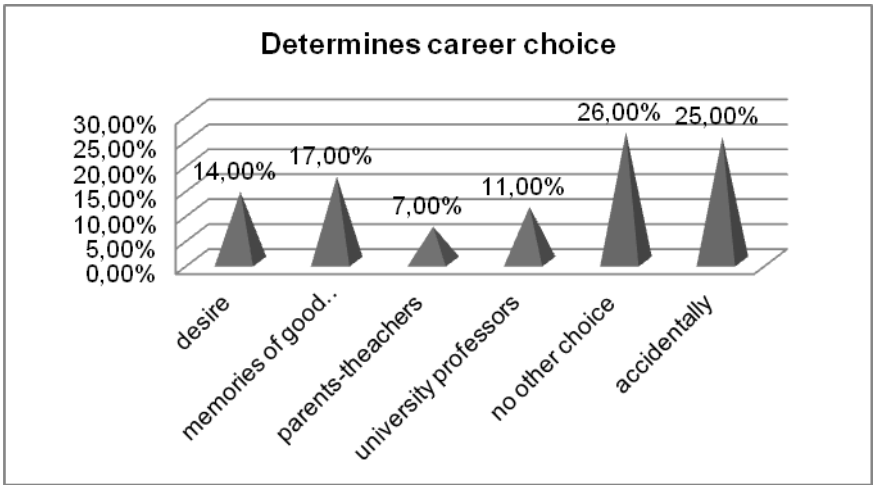

Figure 2. Determinants in the choice of profession according to teachers

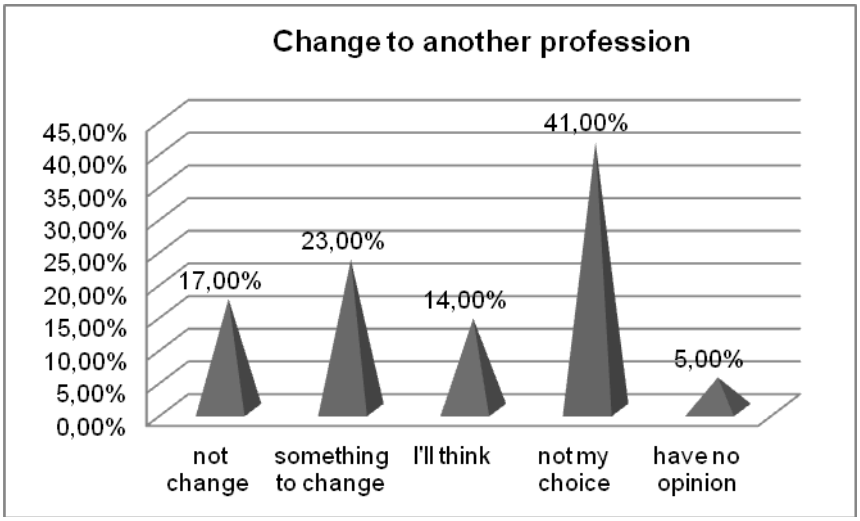

Figure 3. Desire for another profession according to teachers

Data from our study suggest that preliminary information and an idea of the character of the activity and profession of the teacher are an important factor for the adjustment and stay in it or leave. And the students (51%) and teachers (47%) emphasize that the theory does not provide an accurate idea and idealize teaching practice. From the standpoint of professional experience already gained, surveyed teachers, by comparing the theoretical and practical training on university with reality, emphasize that the practice is much more complex and unpredictable and do not always meet the claims of contemporary reality. Students who have a bright and close in time impressions of the school, also saw the differences between an idea and the realization of the teaching profession, indicating individual differences and teaching style of the teacher and the specific tasks which should be decided together with the teacher.

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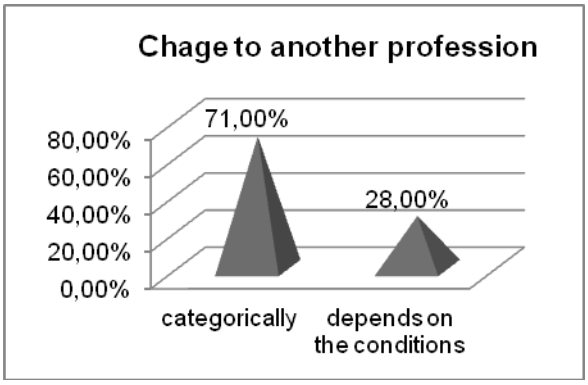

Figure 4. Desire for another profession according to students

It is worrying that more than half of the respondent students are made a random choices or under pressure and if given the opportunity would definitely change their choice. These data cover a much larger scale studies of other authors indicate that the option for students in the field of natural and mathematical engineering sciences to choose the teaching profession is smaller than the representatives of the humanitarian and social sciences.
Recent data from the National Statistical Institute, on the distribution of teachers in vocational schools by gender and age did not differ from the trend of feminisation and aging of the profession. We can point out that gender ratio in vocational schools is more beneficial than general. The largest relative share in both men and women is between 55-59 years and 50-54 years. Continues the trend of a slow and hard entry of today's young people to the teaching profession, and in both genders the rates of the first three groups were approximately 9.83% in men and 9.9% in women.

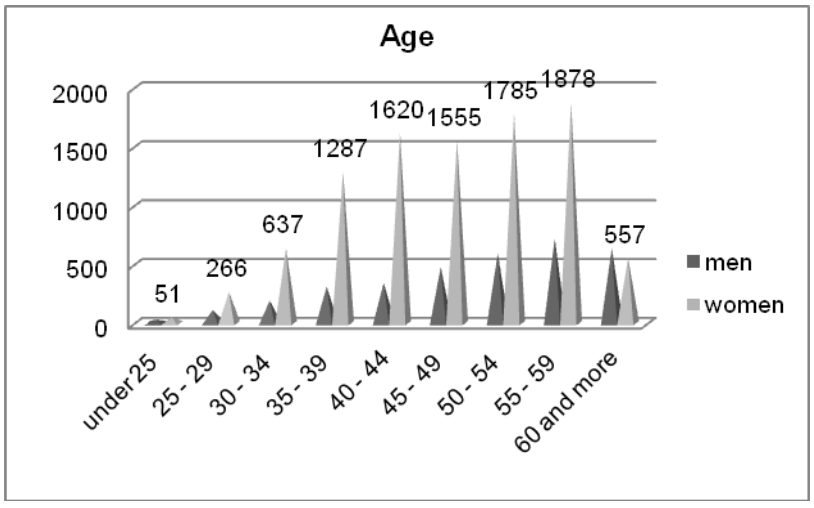

Figure 5. Distribution of teachers by gender and age according to National Statistical Institute

For the choice of teaching profession important condition is the requirement to complete educational degree that guarantees the necessary theoretical and practical training, and development of core competencies and the terms of the new educational environment in the 21st century. As a positive fact may indicate that the majority of teachers with bachelor's and master's degrees, ensuring quality basic training and is a prerequisite for professional adjustment and creative development.

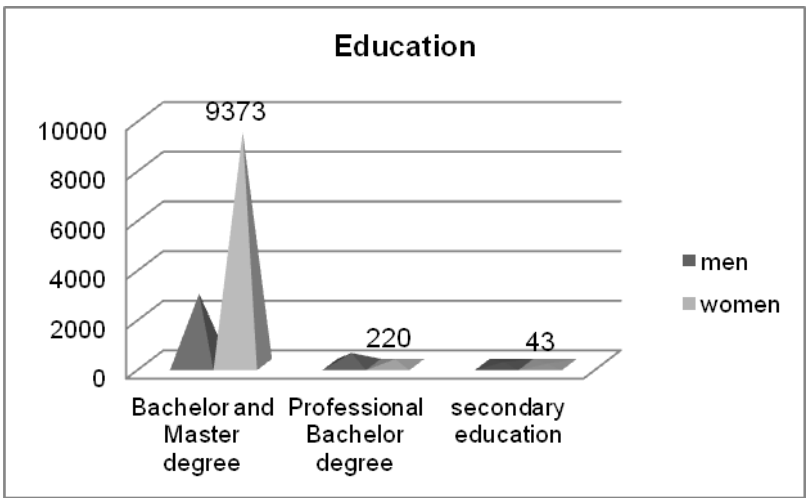

Figure 6.
Distribution of teachers by education and gender according to National Statistical Institute

The processed answers from question 4 on beginners' teachers indicated that 17% of respondents have made a motivated and informed choice, and regardless of the contradictions and problems of the profession in the modern world, they would not replace it with another. To this group we can treat the other 23%, which will remain in the profession, but will not reconcile to the status quo and hope that their work and professionalism will make changes and will meet the expectations and requirements of the society. Alarming evidences are that, in times of economic crisis, shrinking labour market and expansion of the private sector, a significant part of the students and the teachers, have chosen the teaching profession accidentally or due to lack of other options. Based on the statistical data from researches of other colleagues and the changes in the regulations in order to stimulate teachers' work, the trends suggest that financial incentives are very important factor in the penetration and retention in the teaching profession, particularly with regard to the representation of men, but the impact of socio-economic and cultural backgrounds and acceptance of teachers' work as a valuable and worthy of respect is bigger. (Gorard and Rees, 2002)

4. CONCLUSIONS

In the research we have included people who knowingly have made their professional choices and identify themselves as teachers, and others who have not chosen the teaching profession and do not want to practice it. This allows us to conclude that young people who perceive teaching as an opportunity for intellectual stimulation, to receive public recognition and popularity would remain in the profession.
The young teachers, who regardless all the problems of the profession would remain and continue to develop, have fond memories and positive experiences of the school as an institution and of their teachers.
Although the majority of teachers believe that their work is loading, not sufficiently appreciated and rewarded, they will not leave their job because they find it as a vocation.

5. REFERENCES

[1] Creed P. A., W. Patton. Differences in Career Attitude and Career Knowledge for High School Students with and without Paid Work Experience. http://www.choixdecarriere.com/pdf/5873/25.pdf.
[2] Spittle M., K. Jackson, M. Casey. Applying self-determination theory to understand the motivation for becoming a physical education teacher. http://www.selfdeterminationtheory.org/SDT/documents/2009_SpittleJacksonetal_TTE.pdf.
[3] Watt, H. M. G., & Richardson, P.W. (2007). Motivational factors influencing teaching as a career choice: development and validation of the FIT-choice scale. Journal of Experimental Education, 2007, 75 (3), 167e202.
[4] Watt, H. M. G., & Richardson, P.W. (2008). Motivations, perceptions, and aspirations concerning teaching as a career for different types of beginning teachers. Learning and Instruction, 18 (5), 408e428.

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LAND ART – ART OF LANDSCAPE

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Abstract: *"The rule of nature is smugly interpreted as an adequate substitute for governing themselves." - Rejnhold Nejbur. Land art or the art of landscape art is that should not be surprising, to fascinate, leaving question marks, but also to give answers that challenge the current definitions, to break existing collective awareness of art and a new model. Land art is created outdoors, organic or conceptual art that uses natural materials opens the dimension of nature that was unknown until now. This art has redefined landscapes in the world, creates an ambivalent relationship with the recipient. Land art is becoming more interesting and provocative subject in contemporary art that is challenging for a specific engagement in various natural spaces.To create this specific form artist often use materials found in the environment where they build and ask themselves objects, the choice is often the elements that are sustainable and associated with the space hire.*
Keywords: *land, designer, art, landscape architecture.*

1. INTRODUCTION

"You do not actually conquer the mountain. You conquer himself. Exceed the difficulty and everything else - anguish, pains, and fears - just to get to the top. "- James Whitaker.
Nature is an art by itself, and we as drivers mediate its extreme simplicity of elements and forms. In that way we are creating a symbiotic relationship between work and nature.
Land art can be found in almost every country in Europe and America.
Land art can be called the art of landscape or landscape art where the design- and work are inextricably linked. One of the routes that began to develop contemporary art is the conceptual art organic or also called land art.
Land art is an art that is created in nature directly landscape sculpture on the ground or making objects using natural materials found in the area, such as soil, rock, organic media (trees, branches, leaves), water introduced materials such as concrete, metal, asphalt, mineral pigments and so on.
The sculptures are placed in the space, but the landscape is the means of their creation.
The works are often outdoors, located far away from the civilization, left to change and erode under natural conditions. Many of the first works, created in the deserts of Nevada, New Mexico, Utah and Arizona were ephemeral in nature and now only exist as video recordings or photographic documents.
Land art has become part of the wider conceptual art in the late 1960s and early 1970s.
Land art designer or artist uses all elements of nature on the spot. As a result of work, often on a massive scale is subject to all physical changes, such as temperature variations, light and darkness, wind and erosion.

2. LAND ART

We can make the following classification for Land art :
- Natural Land art (created by nature) – Figure 1.
- Artificial Land art (created by designer i.e. artist) – Figure 2.

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Land art artificial occurs thanks to designers and artists who first art should be sought beyond the usual space - gallery. The works are on display out in the open city squares or in remote inaccessible parts of the world. They are exposed to the canvas on the streets in the form of an artist who turns into sculpture. Small and large cities around the world become a hotbed of new trends. In the early 60s Pop Art is developed in America.

The artists in the country are turning away from the urban limits in search of open spaces that breathe interact. The nature of their work can be best described as a combination of romantic aspiration of passengers and Dadaist avoiding traditional ways of artistic expression.

While in Europe the artistic changes a delay after 10 years occurring important events - rallies of artistic scenes in various parts of Europe. But, paradoxically, it is that many of the advanced projects going on the path of complete freedom and availability sided Dada in achieving the connection between art and life. Art distracted the audience apart in introspection and experimentation.

To create this specific form artist often use materials found in the environment where they build and ask themselves objects, the choice is often the elements that are sustainable and associated with the space hire. Topics are selected with a wide range, but usually processed headlines related to the history of a particular place, (re) animation space and lighting specific creative visions and ideas.

Figure 1. Natural Land art (where nature has done its own without inserting a man)

Figure 2. Artificial Land art (created by designer ie the artist)

Also Land art can be divided in:
- Time – Figure 3.
- Very old – Figure 4.

Figure 3. Time Land art

Figure 4. Very old Land art

Observers must follow the path of the artist, communicating with nature in the dimension that is beyond the usual experience; otherwise you will have to accept his world and unavailability to be content with drawings and photographs. But the artwork that exists, has not been seen bordering abstraction.

For the first time art should be sought beyond the usual space - gallery. The works are on display out in the open and squares of distant or inaccessible parts of the world. Exposed to the canvas on the streets in the form of an artist who turns into sculpture. Small and large cities around the world become a hotbed of new trends.

The last few years conceptual art started getting new creature, projects and works to regain form, the authors use different methods and approaches, and target message and aims to become multifaceted.

Artists and designers from Land art:

- Robert Smithsonian
- Robert Morris
- Christo & Jean Claude
- Junihi Kakizaki
- Richard Long
- Ana Mendijeta
- Dennis Openhajm
- Michael Hajzer
- Hirakava Sigeko
- Cornelia Conrads etc.

Land art should be understood as an artistic protest against the perceived artificiality, plastic aesthetics and ruthless commercialization of art at the end of the 1960s in America.

Land art exponents of the art rejected museums or galleries in the formation of artistic activity and develop monumental landscape projects that are beyond the reach of traditional portable sculpture and commercial art market.

Land art was inspired by conceptual art, but also by modern minimalist movements such as De Stijl, cubism, minimalism and the work of Constantin Brâncuşi and Joseph Beuys. Many of the artists associated with Land art has been involved with art and conceptual art.

Isamu Noguchi's 1941 designer of playgrounds in New York, sometimes interpreted as an important designer of land art. His influence on contemporary land art, landscape architecture and sculpture of the environment is evident in many ways today.

Alan Sonfist pioneered an alternative approach to the work he began in 1965, his most inspirational works is time landscape, indigenous forest planted in New York. He also created several other weather landscapes around the world, like the circles of time in Florence, Italy. According to critic Barbara Rose, writing in Artforum in 1969, she became frustrated by the commercialization and insularity of gallery bound art.
Land art's most famous artwork is created artificially by the author Robert Smithson spiral Jetty 1970, an earthwork built out into the Great Salt Lake in the United States. - Figure 5.

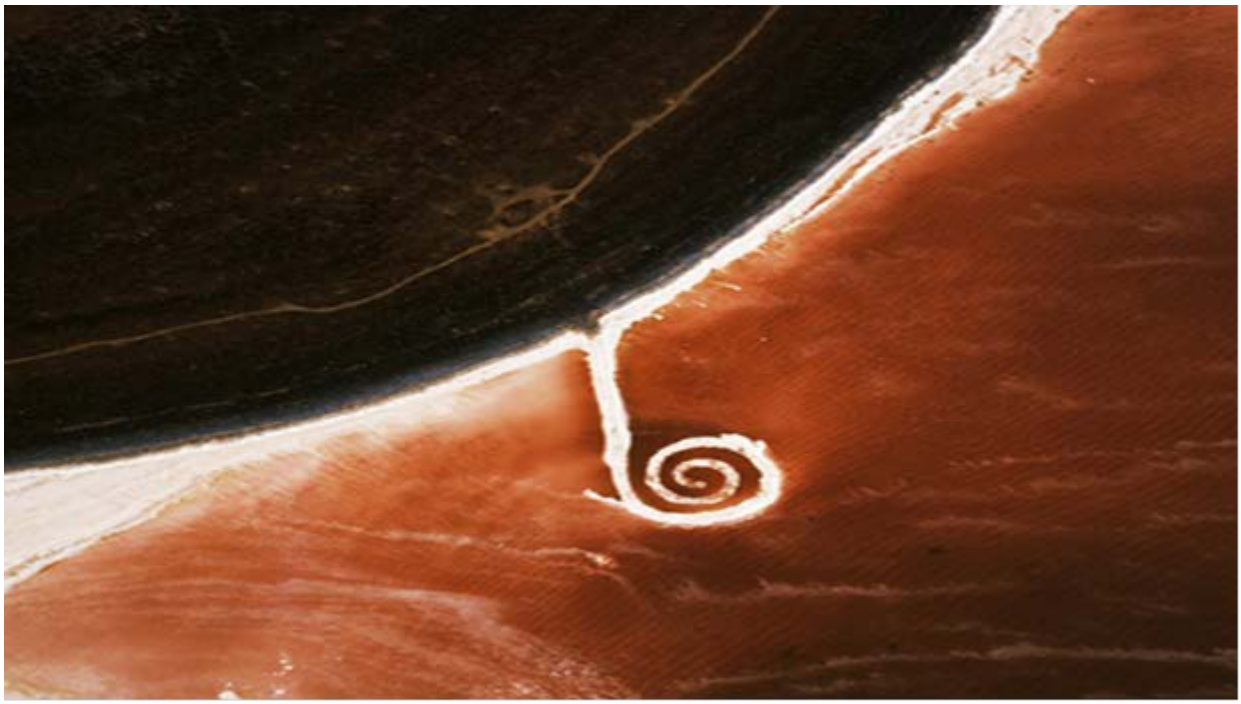

Figure 5. Great Salt Lake in Utah-piece spiral mound

Smithson used stacked rocks, soil and algae, as to form (1500 ft.) spiral that enters the Great Salt Lake in northern Utah -What is called spiral shaped jetty. His work is visible dependent on fluctuating water levels. Since its creation, the work is completely covered and then uncovered again, with falling water level.
Another prominent artist of the 21st century Conrads Cornelia (Cornelia Konrads) evoking a distorted perception of objects that are specific to the public space in which it operates.
Her work is often interrupted, suggests the illusion of weightlessness, where items which she cleverly sorts giving the idea that certain logs, fences and entrances crumble or evaporate before your eyes. It first explores the environment, investigates local natural materials, and then the same creates her artwork. Its facilities toying with gravity, they seem to levitiraat in mid-air. Use branches, rocks and other natural objects, and stunning way bring the audience to its installations.
Her work touches the heart of nature, it may seem ephemeral because it uses natural elements that look as eaten by the ravages of time, but to achieve such an effect is needed and the vision to be a transitory period, part of the history function in a parallel time, reflecting a parallel dimension, a process that is only achieved if the result transcendence and is incorporated within the surrounding area.
Author is trying to strengthen the definition of the temporary nature of things, their transience and transience. - Picture 6.

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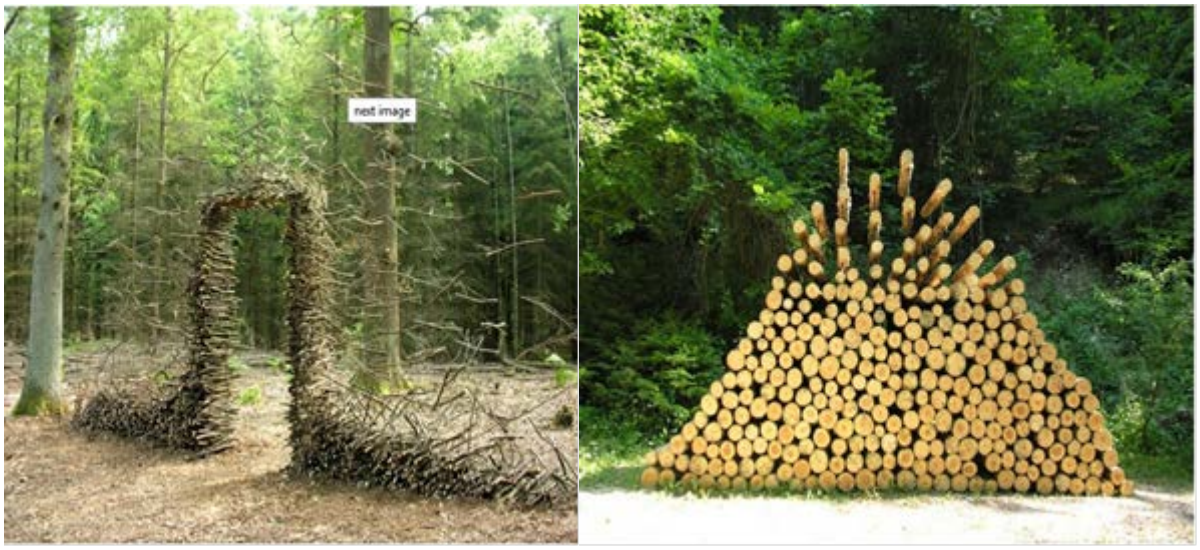

Figure 6.
Cornelia Conrads - works that challenge the current examples of (anti) gravity sculptures and installations, objects in its projects receive a form that seemed to float before your eyes

3. CONCLUSION

Eksplicitnatata interskulpturalnost the core of Land, Art gives tenderness with which each designer or artist approached the buildings and the relationship that is created between existing facilities makes the work generally documentary original, typological creative, recognizable and unambiguously.
The works in the Land Art are both mesmerizing and moving, separated and merged, play gravity, but exceed, create a new reality, and separate simulation.
Land art direction in the designer or artist uses all elements of nature on the spot. As a result of work, often on a massive scale is subject to all physical changes, such as temperature variations, light and darkness, wind and erosion.
We can make the following classification for Land art Natural Land art (created by nature), Artificial Land art (created by designer i.e. the artist).

4. LITERATURE

[1] Max Andrews (Ed.): Land, Art: A Cultural Ecology Handbook. London, 2006, ISBN 978-0-901469-57-1.
[2] John Beardsley: Earthworks and Beyond. Contemporary Art in the Landscape. New York, 1998, ISBN 0-7892-0296-4.
[3] John K. Grande: New York, London. Balance: Art and Nature. Black Rose Books, 1994, 2003, ISBN 1-55164-234-4.
[4] Alan Sonfist Official Website. (http://www.alansonfist.com/).
[5] http://www.landarts.org/.
[6] http://landarts.unm.edu/.
[7] http://www.lasersol.com/art/ turrell/ roden_crater.html.
[8] http://reper.net.mk/organski-vlezovi.

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LIGHTING AS MELODIES RESIDENTIAL OBJECTS

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Abstract: *It's easy to put a number of lights on the ceiling, but this is not the best strategy. Many households tend to illuminate the home as a convention - too bright in the upper room. Such lighting is sometimes not enough. If you omit floor lamps and table lamps, reading books in the room can cause upsets. Chandeliers on the ceiling are great when you want to organize a big party, but small table lamps are suitable for more intimate atmosphere. Also emphasized lights highlight images or walls can add luxury to any room. The lighting in the home is a specific category because each region with their demands require a different lighting and priroa space and forms have a clear dimension. Changing the light changes the whole ambiance and it changes the mood of consumers. Good lighting can enhance the effects and highlight the quality of the interior and poor lighting missed the whole concept interior. Lighting is one of the most important factors in the interior. With proper light your home will become safer and more comfortable place to live. Lighting can make a stimulating atmosphere for fun or quiet and relaxed atmosphere.*
Keywords: *space, light, lighting fixtures, furniture.*

1. INTRODUCTION

Since ancient time the importance of lights in the interior the effect of light and shade when space is frugal and nesosvetlenite lit areas and areas with scaling of not so dark horse has a huge role in creating the interior.
The main task of the designers was to create the best lighting without hampering the psychological effect of light and aesthetic rhythm of man. Arranging and lighting move in parallel in a single space. Most often it is obeyed fully functional zoning of the interior, because from the beginning we should have a decision on the types of lighting and illuminating bodies.
The lighting can completely change impact in the interior. The best in space where possible variants, it can be adjusted according to the mood or the subject to be able to change the light into the space. In any interior space has a joint and local lighting. Zaesnichkoto osvetlucanje replaces daylight and at night local complements the atmosphere in the space.
Prior to making the concept of lighting the first to have to take into account the statement of the room and lighting should always be subordinate to the functional content in the interior.
The way the lighting can be different, and of course a distinction between the organizations of the lights in the office premises of those are intended for rest and relaxation. The best choice is an organization of lamps that can operate flexibly and multifunctional, which means means a good mix of different types of luminous bodies at a time can be adjusted to achieve the right atmosphere and the desired effect.
Each room in the residential space can get a new dimension with light effects. Setting the central lighting in the large part of the premises is a very practical solution, with a good selection of spectacular chandeliers or ceiling lighting gives the desired effect and it is the lighting of the space.

2. THE LIGTHING

2.1. Common or general lighting

That is pinpointing which include entering into a space and no one can work. It provides uniform lighting and should be closest to the effect of daylight.
Suited for general lighting is reflected (indirect) light - it is the light that comes directly from a light source and reflected from the wall or ceiling. It provides uniform light in the room and creates sharp shadows.
From a psychological point of view is good lighting to resemble daylight - like color, strength and direction, especially in dark autumn and winter days .For general lighting commonly used chandelier - they give a good light, but many shadows, how he knows it is adequate light for reading or working.

Figure 1. General lighting

Figure 2. Local lighting

2.2. Local lighting or additional

It can be separated in different corners of the room, highlighting architectural elements (walls, furniture) or object (image, a small sculpture). Local needs proper lighting is glowing body with targeted (direct) lighting - for reading corner, above the kitchen work in the workplace or as a decorative element.

We must not forget about the different atmosphere that create different types of bulbs - free standing lamps (so-called because they are lamp shades) can be upwards, downwards or on the wall and are very suitable for the creation of a more intimate atmosphere or to emphasize a detail in the area; lamps depending on the lamp can also be used for reading, and in the dim light only have a decorative effect; halogen, embedded in the ceiling, as well as the independent videos can be fixed and moveable with halogen or ordinary light bulb - they can serve as general lighting, and the emphasis on an element of the home (for example painting, sculpture or decorative object).
The trends represent a new concept of integrated living at the time in which we live. Trends in the market for equipment vnatresniot space are changing very rapidly, and it is very difficult to be completely true to everything that emerges as a trend.
However trends than by design, color, material, texture and represent a new concept of living which are regularly incorporated into the time in which we live. The wave of lack of housing in terms of actual needs, the opportunity for easy maintenance and maximum comfort, impose trends of modern living.
If this trend is seen as a way of life and adapted to real needs, then it deserves consistency, and how its transformation into "work" can be in a variety of styles, materials and colors.

2.3. Daycare

For common day room lighting is commonly used centrally placed luminous body in the attic. But it's definitely the best decision because directed lighting makes shadows of persons in the room that creates a cold effect to the interior and connecting parts of the area are poorly lighted.
Therefore, for general lighting is better to choose a reflective light - indirect lighting, reflected in the ceiling (through installation of lighting in suspended ceiling, in niches, with light directed toward the ceiling, through systems of halogen lamps or incandescent light source hidden behind the lampshade).
The most important are the decisions with lowered ceilings and concealed lighting in them, making the ceiling appear even higher and lighting of individual corners are put embedded headlamps. Very suitable for general lighting in the day room is the lighting systems in which the wires or rails and placed halogen they can continue on the wall, can be moved to "descend" down over the low table in the living room, and such a system does not require setting up a new installation.

Figure 3. Light living room

Directed lighting are used to feed additional functional or decorative parts in space. Necessarily need to think about the soft, diffuse light, while watching TV, as viewing the screen in total darkness is harmful to eyesight. This may be the chair lamp, built-in light sideboards glass holes, the lights over the images.

Because, to light a lounge of 30 m^2, we need about seven or eight light sources (do not forget that to have enough light, the required power is 20-40 watts per square meter of floor area).

The lighting in the living room allows the most creative possibilities, you can play with lamps of different type and shape of the intensity and color of light, lighting integrated in the ceiling, floor or furniture elements with direct or indirect reflection, achieving effects lighting aquarium with glass partitions, flashing billboards in space they make light effects that are seen and felt in the interior. In any case the possibilities are numerous and feelings that occur relaxing.

In the dining room

Here is the most appropriate general lighting chandelier with variable height. The best amount of is such a lamp, that is placed centrally on the table, 160 cm from the floor, not shining in the eyes, or to prevent the watch others sitting around.

It's good to be able to vary the power of light - dimer (rheostat) will help to reduce the candles at dinner or to strengthen the dark day. If the table is not a permanent place - moved stretches and we find it difficult to determine its centres, above which to set the chandelier, we can use indirect lighting with halogen lamps directed toward the ceiling.

If the ceiling is white, it is the lamp that stands 80 cm below it, so you are not making a dark stain. And that is when we have a dining room for dining momoda accessories, service technicians and others. It is better to choose those with matte glass and hidden light in them. Here, as in the living room is better to choose a chandelier and lighting a whole family (with a similar design).

Very often in a family house living and dining room in general - in this case only with the help of light can assess areas as appropriate.

Lighting in the dining room is emphasized by lowered lamps or some heavily accented decorative lanterns. This kind of lighting creates a pleasant soothing ambient during the long feeding and makes dining aesthetic active Corner dining.

To avoid unpleasant opacity, good it is to combine light directed to the table (moons of ceiling pendants) with diffuse light, oriented walls. When lighting up a dining table with a chandelier, the amount of suspension is 1,40 m height because of the greater area. If during dinner intensity increased to 1000 lux, cutlery and glasses receive "precious" shine.

Figure 4. Illuminated dining

2.4. Lighting in the kitchen

Here it is particularly important to look good, to avoid accidents - especially strong demand we have light on work surfaces. Besides the general lighting which can be the ceiling, good to embed the top line lockers halogen (low-voltage) or fluorescent lighting, because both do not emit a lot of heat and are suitable for installation?
Ordinary fluorescent lighting changes color products and food, so at the best option is to set a hot fluorescent light near the living room. Some companies offer halogen projectors, hung above the top row elements - they are appropriate, in the event that cast a shadow over the area.
Many warm light coming from the lamps embedded in the above items (fluorescent or halogen, to a lower temperature), where the holes are not thick, and glass mat of wooden or aluminum frame. Of course, this light cans only supplement, and sconces on the walls, especially if you usually eat in the kitchen.
The kitchen lighting is organized as a multifunctional center that apart should be placed lighting and workspaces. If it remains about the dining room and the living room is permitted to make the game different ceiling light effects that at times be the only source of illumination in the entire area and thus will accommodate intimate atmosphere in the living room.

Figure 5. Lighting in the kitchen

2.5. Lighting in the bedroom

Here, as in the living room as bad solution is just hanging chandelier or lamp in the geometric center of the room - so it will hang over your feet in bed, will shine in the eyes, and makes sleeping uncomfortable.
If you leave this source for general lighting, then at least we have to change with hanging lamps Ceiling matt glass, not shining in his eyes. Best general lighting section is indirectly - on the wall; hidden in the false ceiling in the cornice above the window to remind daylight, etc.
Good and can regulate its power. For the night table lamp with a power of 40 watts is sufficient for reading, and will not interfere with the sleeping to us. Besides the familiar incandescent shade for table lamps are now used lamps with shoulder movement as drawing, only that the halogen lamps and hung on the wall.
Some models bedrooms designers think about lighting - lamps on both sides of the board behind their heads, burned his back on the bed, glowing tables and more. In the wardrobe can make a luminous fluorescent tube, built-in holder rack, which lights up when opening the door to us to choose the most appropriate outfit.

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Figure 6 Light bedroom

2.6. Illuminated hallway

If there is no natural light corridor should be well thought about the type of lighting. Usually hallways are narrow and long because the central bright lighting makes it uncomfortable space. A hallway is the first impression edne prostoer when entering into it. Lighting should be allocated on the ceiling as embedded or additional walls to a violation of light so achieve specific visual effects and make visual proportion of space.

Figure 7. Light corridor

3. CONCLUSION

The lights are timed is essential for any home. They allow you to control the lights at night and during the day for certain events and according to your raspolozhenie. Lighting has more relevance in modern architecture - in addition to lighting, its role is decorated lighting effects in the interior design and lighting fittings and opportunity for hands operation and maintenance.
Although different lighting effects more commonly used in public and commercial buildings, where they will feel most intensely can enjoy them just inside your dom. Lighting allows smooth movement and work at home. For proper lighting there are few rules and tricks that

will make life easier and to make the area more attractive, more dynamic, more subtle depending on what space we want to get.
If you place a light in the wrong place, you can create only a problem and not a solution.
For example: Wrong sizes
1.In the bathroom, put lights on both sides of the mirror, not only the upper part because so shadows would fall on your face. The working masses are inevitable small table lamps.
2.Too small chandelier over a large dining table or a large chandelier above the small masiche is completely disproportionate. To choose the dining room chandelier that is at least 30 cm. higher than the width of the dining table.
3.No matter how you put the lights in a room, you will not get the necessary light if the walls are too dark, because paint the walls in bright colors.
Poor lighting in the home can cause headaches, frustration and even awkward mood in the bedroom of who turn to exclude light. The key is to create a flexible "way" through the space and all the rooms during the day and thereby provide light switches accessible places, whether they are all over the rooms and good lighting if the lighting in your house helps or hinders movement.

4. LITERATURE

[1] Carla J. Nilsson and David A. Taylor. Interior Design – Introduction.
[2] K. T. Urlich, S. D. Eppinger. Product Desing and Development. Fourth edition, Mc Graw-Hill.
[3] D. Quarante. Osnove industrijskog dizajna. Arhitektonski fakultet Sveučilišta u Zagrebu – Interfakultetski studij dizajna, 1984.
[4] I. Šverko. Splitska škola za dizajn. Biblioteka znanstvenih dijela 131, Književni krug, Split, 2003.
[5] M. Tambini. The look of the century – Design icons of the 20th century. Dorling Kindersley, London, 1999.
[6] J. de Noblet. Dizajn – pokret i šestar. Golden marketing, Zagreb, 1999.