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СОФИЯ - SOFIA
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СЪДЪРЖАНИЕ / CONTENTS

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ЗЕМЕДЕЛИЕ / AGRICULTURE

ФЕНОЛОГИЧНИ НАБЛЮДЕНИЯ ВЪРХУ ГРАХ ЗА ЗЕЛЕНО ТОРЕНЕ ОТГЛЕЖДАН ПРИ ЕКОЛОГИЧНИ УСЛОВИЯ НА ЯМБОЛСКИ АГРОРЕГИОН

Виолета Вътева, Красимир Трендафилов, Красимир Георгиев

Резюме: В настоящия доклад са представени резултати от изследвания върху фенологичното развитие на пролетен грах сорт „Богатир”. Грахът е отглеждан при екологични условия в Ямболския регион и във фаза цъфтеж е заоран, с цел зелено торене на опитен земеделски участък. Напълно са спазени сроковете и агротехниката по подготовка на почвата и сеитбата на граха.

Фенологичните наблюдения са извършени върху маркирани растения и включват: проследяване фазите на развитие на граха, темпа и динамиката на нарастване и цялостното вегетативно развитие на граха от поникване до заораване във фаза масов цъфтеж. Проследени са и климатичните параметри, и е отразено влиянието им върху фазите на развитие и продължителността на междуфазните периоди.

Пролетния фуражен грах сорт „Богатир” отглеждан по принципите на биологичното земеделие показва изключителна адаптивност към почвено климатичните условия на Ямболски агрорегион. При благоприятна обезпеченост с влага грахът пониква от 7-ия до 12-ия ден след сеитбата. Продължителността на междуфазните периоди варира от 7 до 22 дни. Най-къс е периода от първа двойка листа до същинска двойка листа, а най-продължителен е периода от начало на разклоняване на стеблото до начало на бутонизация - 22 дни. Продължителността на вегетационния

PHENOLOGICAL OBSERVATIONS OF PEAS FOR GREEN MANURING GROWN UNDER ECOLOGICAL CONDITIONS OF YAMBOL REGION, BULGARIA

Violeta Vateva, Krasimir Trendafilov, Krasimir Georgiev

Abstract: In this report are presented research results on phenological development of spring pea variety "Bogatyr". The pea has been grown in ecological conditions in the Yambol region, and in the phase of flowering it has been plough in for green manuring on experienced agricultural area. The terms and the agrotechnics for soil preparation and sowing of pea have been fully complied.

Phenological observations have been carried out on marked plants and include: tracking the phases of development of peas, pace and dynamics of growth and overall vegetative development of peas from germination to plowing in phase full blossoming. The climatic parameters are tracked and their impact on the phases of development and duration of periods between phases has been reflected.

The spring pea variety "Bogatyr" grown on the principles of organic farming showed exceptional adaptability to soil and climatic conditions of Yambol region. In good security with moisture, the peas germinate from the 7th to the 12th day after sowing. The duration of the periods between phases varies from 7 to 22 days. The shortest is the period between phases „first pair of leaves” and “real pair of leaves”, and the longest is the period between “beginning of the branching of the stem”

период от поникване до фаза начало на цъфтеж е 65 дни. За този период грахът нараства с 69.5 cm. Темпа с който нараства грахът за петнадесет дневен период варира от 13.2 до 18.5 cm.

Ключови думи: пролетен грах, фенологични наблюдения, вегетативно развитие, динамика на нарастване, зелено торене, биологично земеделие

Увод

Биоземеделието в България е сектор от земеделието, който бележи бързи темпове на развитие през последното десетилетие. По данни на МЗХ, Дирекция "Растениевъдство", Отдел "Биологично земеделие", през 2013 г. площите с Биологично производство у нас са се увеличили до 56 287 ha, или 9,4 пъти спрямо 2006 г. [http://www.mzh.government.bg/].

При биологичното производство на земеделска продукция не е допустимо използването на минерални торове и пестициди. По тази причина се търсят алтернативни начини за добавяне на хранителни елементи в почвата. При съществуващият набор от органични торове, зеленото торене известно още като „сидерация" е особено актуален начин на торене. Въздействието на зеленото торене е подобно на влиянието на оборския тор - обогатява почвата с азот и ценни микроелементи [http://agronet.bg/agro/]. В България зеленото торене има бъдеще, тъй като за наличната обработваема био-сертифицирана площ оборските торове не са в достатъчни количества. Освен това трудно се намират по-големи количества оборски тор от животни отглеждани в биологични ферми.

Използвани в насока зелено торене, различните култури въздействат на свойствата на почвата по-различен начин.

and "beginning of budding". The duration of the vegetation period from germination to phase flowering is 65 days. For this period peas increased by 69.5 cm. The pace with which the peas grow up for fifteen day period ranged from 13.2 to 18.5 cm.

Keywords: spring pea, phenological observations, vegetative development, dynamic of growth, green manuring, organic farming

Introduction

Organic farming in Bulgaria is a sector of agriculture, which marks the rapid pace of development in the last decade. According to **Ministry of Agriculture and Food in Bulgaria**, Organic farming and plant growing Directorate, in 2013 the area under organic production in the country increased to 56 287 ha, or 9.4 times compared to 2006. [http://www.mzh.government.bg/].

In organic agricultural production is not acceptable use of fertilizers and pesticides. For this reason is looking for alternative ways to adding nutrients to the soil. In the existing set of organic manures, the green manuring known as "sideration" is particularly topical way of fertilization. The impact of green manuring is similar to the impact of manuring - enriching soil with nitrogen and valuable trace elements [http://agronet.bg/agro/]. Green manuring in Bulgaria has a future, as for the available organic certified arable land the manure is not in sufficient quantities. Moreover difficult to find larger quantities of manure from animals reared in organic farms.

Used in the direction of green manuring, different cultures affect soil

Житните култури подобряват водния и въздушен режим и структурата на тежките почви. Растенията от семейство Зелеви като рапица и синап отглеждани за зелено торене, не само повишават плодородието на почвата, но и служат като профилактично средство срещу разпространението на болести и неприятели [http://sinor.bg/]. Най-голямо приложение за зелено торене намират бобовите култури [Shaheen, A., at all., 2007; Topre, S., at all., 2011]. Приложението на бобовите култури идва от азот-фиксиращата способност на кореновата система на растенията и по-този начин обогатяване на почвата с азот [Herridge, D.F., at all., 2008]. На практика те са най-богатият източник на азот и подобряват азотният статус на почвата [Митова-Трифонова, Т., 2009; Каров, Ст. 2008; Янчева, Хр., 2003]. Така спомагат за повишаване на почвеното плодородие, намаляват използването на изкуствени торове и запазват структурата на почвата. Грахът е ценна зърнено-бобова култура с висока хранителна стойност, дължаща се на високото съдържание на суров протеин. Както всяка бобова култура и той притежава способността да обогатява почвата с азот. Тази му способност го прави и култура, която с успех може да намери приложение за зелено торене. Има кратък вегетационен период и не е много взискателен към почвените условия.

Материал и метод

Изследването е извършено през 2015 г. при полски условия в опитно-експерименталната база на Факултет „Техника и Технологии", гр. Ямбол (Тракийски университет, Стара Загора). Експериментът е проведен, във връзка с изпълнение на проект 2ФТТ14 „Опазване на околната среда чрез технологични решения за биологично земеделие в

properties differently. Cereals improve water and air regime and structure of heavy soils. Plants of the Brassicaceae family such as canola (Brassica napus) and mustard (Sinapis) grown for green manuring, not only increase the fertility of the soil, but also serve as a prevention against the spread of diseases and pests [http://sinor.bg/]. With the greatest application for green manuring are leguminous crops [Shaheen, A., at all., 2007; Topre, S., at all., 2011]. The application of the leguminous crops comes from the nitrogen-fixing ability of the root system of the plants and thus enriches the soil with nitrogen [Herridge, D.F., at all., 2008]. In fact, they are the richest source of nitrogen and improve soil nitrogen status [Mitova- Trifonova, T., 2009; Carow, St., 2008; Yancheva, Ch., 2003]. So they help for increasing of soil fertility, reducing the use of fertilizers and preserve soil structure. The pea is a valuable leguminous crop with high nutritional value due to high crude protein content. As every leguminous and it has the ability to enrich the soil with nitrogen. This ability makes it and culture that can successfully be applied for green manuring. It has a short growing season and not very demanding to soil conditions.

Material and methods

The study was carried out in 2015 under field conditions in the experimental base of the Faculty of Techniques and Technologies, Yambol (Trakia University, Stara Zagora). The experiment was carried out in connection with the performance of the project 2FTT14

Ямболска област". Идеята за експеримента идва от тенденцията повече земеделски площи в България да се включат в отглеждането на биокултури. В Ямболска област има предпоставки и перспективи за развитие на био-земеделието. [Vateva, V., 2016]

Експеримента е проведен с пролетен грах сорт „Богатир" (подвид Pisum sativum subssp. Arvense), който е вписан в листата за отглеждане на пролетни сортове грах в България. Сортът е от типа фуражни грахове, и е селекциониран в недалечното минало в Чехия. Отглеждането на пролетен грах в България е удачно за всички агрорегиони, но неоправдано през последните години намаляват площите засети с грах.

Обект на изследването е пролетен фуражен грах сорт „Богатир", който е предвиден да бъде заоран с цел зелено торене. Почвеният тип е излужена смолница (Haplic vertisol), със слабо алкална реакция. Съдържанието на хумус в хумусно акумулативния хоризонт е 2.3 %. Повърхностният почвен слой (0 – 30 cm) е сравнително добре запасен с азот – 20.66 mg/kg, добре запасен с подвижен фосфор – 2.30 mg P2O5/100g и много добре запасена с подвижен калии – 49.8 mg K2O/100g почва. Този тип почва е с по-тежък механичен състав, който влошава до голяма степен агрономическите му качества. Площта на земеделският участък е 1.215 da (15x81 m), като е ориентиран с дългата страна по посока север-юг. Дълги години върху този участък не са отглеждани земеделски култури, но е поддържан в състояние на „черна угар". За да се поддържа в това състояние, веднъж годишно площта е изоравана дълбоко и след това дискована. Така почвата остава чиста от плевели и по мнението на специалисти е добре „отпочинала".

"Conservation of the environment through technological solutions for organic farming in the Yambol region". The idea for the experiment comes from the trend more agricultural areas in Bulgaria to be included in the cultivation of organic cultures. In Yambol region has the prerequisites and prospects for development of organic farming [Vateva, V., 2016]

The experiment was carried out with spring pea variety "Bogatyr" (Pisum sativum subtype subssp. Arvense), which is in the list for the cultivation of spring peas in Bulgaria. The variety is of type forage peas, and is selected in the recent past in the Czech Republic. The cultivation of spring peas in Bulgaria is appropriate for all agro regions, but unjustifiably in recent years reduced the area planted with peas.

The object of the research was a spring pea variety "Bogatyr" which is scheduled to be dug in order to green manuring. The soil type is leached vertisol (Haplic vertisol), with weak alkaline reaction. The content of humus in the humus accumulation horizon is 2.3%. The superficial soil layer (0-30 cm) is a relatively good stocked with nitrogen - 20.66 mg/kg, well stocked with mobile phosphorus - 2.30 mg P2O5/100 g, and very well supplied with mobile potassium – 49.8 mg K2O/100 g of soil. This type of soil has heavier mechanical composition which worsens largely agronomic qualities. Total size of the agricultural area is 1.215 da (15x81 m), it is oriented to the long side in the direction north-south. Many years on this area are not grown crops, but it is maintained in a state of "fallow". To maintain this

През предходната календарна година предвиденият за експеримента участък е изоран на дълбочина 25 - 28 cm. В края на месец февруари площта последователно два пъти е дискована. Сеитбата на граха е извършена ръчно, разпръснато със сеитбена норма 24 kg/da. След сеитбата е извършено валиране. Грахът е отглеждан по принципите на биологичното земеделие, без минерално торене и неупотреба на растително защитни химически препарати.

Резултати и обсъждане

Районът на провеждане на експеримента попада в Ямболска област, община Ямбол и се намира в извънградска зона, в близост до града. В климатично отношение Ямболският регион спада в умереноконтиненталната климатична подобласт на европейската континентална климатична област. За района е характерна не особено студена зима с краткотрайно задържане на снежната покривка, сравнително топли пролет и есен и топло и засушливо лято. Климатичната характеристика през годината на изследване показва значително отклонение от установените за района норми и при сумата на валежите и при средногодишната температура.

Важно за експеримента е да се проследят климатичните параметри през вегетационния период на пролетния грах. Месец февруари, когато е агро-техническият срок за предсеитбена подготовка на предвидената за сеитба площ е с количества валежи доста над нормата (фиг.1). При норма за месеца 35 mm, общата сума на падналите валежи е 64.7 mm. Преовлажняването на почвата през този месец е причина да се закъснее с предсеитбената подготовка на площта, тъй като е невъзможно да се навлезе с механизирана техника в участъка. През

condition once a year the area is plowed deeply and then is disking. So the soil remains clean of weeds and in the opinion of specialists is well "rested".

During the previous calendar year the provided area for the experiment was plowed to a depth of 25-28 cm. At the end of February the area was disking twice. Sowing of peas is done manually, scattered, with sowing norm of 24 kg/da. After the sowing was done rolling. Peas are grown by organic farming principles without mineral fertilization and non-use of crop protection chemicals.

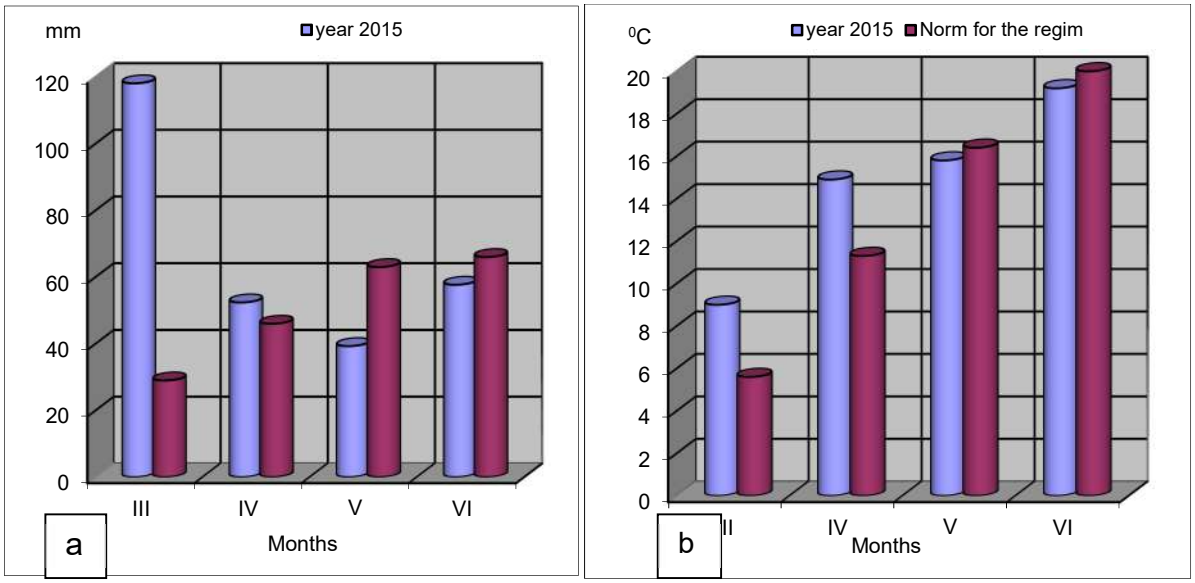
Results and discussion

The area of the experiment falls in Yambol region, Yambol municipality and is located outside the urban area, close to the city. In terms of climate Yambol region fall in temperate climatic sub-area of the European continental climatic region. The region is characterized not particularly cold winter with brief snow cover, relatively warm spring and autumn and warm and arid summer. The climatic characteristics during the year of the research showed a significant departure from established norms for the area in the amount of rainfall and average temperature.

To the experiment is Important the climate parameters in the growing period of the spring peas to be tracked. The month of February, when is the agro-technical term for sowing preparation of the area, is with rainfall amounts above the normal range (Fig. 1). With norm for the month of 35 mm, the total amount of rainfall was 64.7 mm. Waterlogging of the soil in this month was the reason the sowing preparation of the area to be late,

месец март положението е още по-критично. За този месец падналите количества валежи са четири пъти повече (фиг. 1a). Месец април също е с по-висока водообезпеченост, но разликата спрямо нормата за района не е голяма. През месеците май и юни се наблюдава спад в месечното количество валежи. По-значителна разлика спрямо нормата за района се наблюдава през месец май. Средномесечната температура на въздуха по месеци за вегетационния период е отразена на фиг. 1b. Значително по-високи с 3.4 – 3.6 °C са температурите през първите два месеца от вегетационния период. За следващите два месеца средно-месечните температури на въздуха са малко по-ниски, но близки до нормата за района.

as it is impossible to enter with mechanized equipment in the area. In March, the situation is even more critical. For this month the fallen rainfall are four times more (Fig. 1a). In April also has higher water availability, but the difference compared to the norm for the area is not large. During the months of May and June has seen a decline in the monthly rainfall. A significant difference from the norm for the region is observed in May. The average monthly air temperature by months of vegetation period is reflected in Fig. 1b. Significantly higher by 3.4 to 3.6 °C are temperatures during the first two months of the growing season. For the next two months the average monthly air temperatures are slightly lower, but close to the norm for the area.



Фиг. 1. Сума на валежите (mm) [a] и средномесечната температура на въздуха (^{0}C) [b], по месеци за вегетационния период на граха (III-VI) през 2015 г. и норма на валежи и температура за Ямболски регион

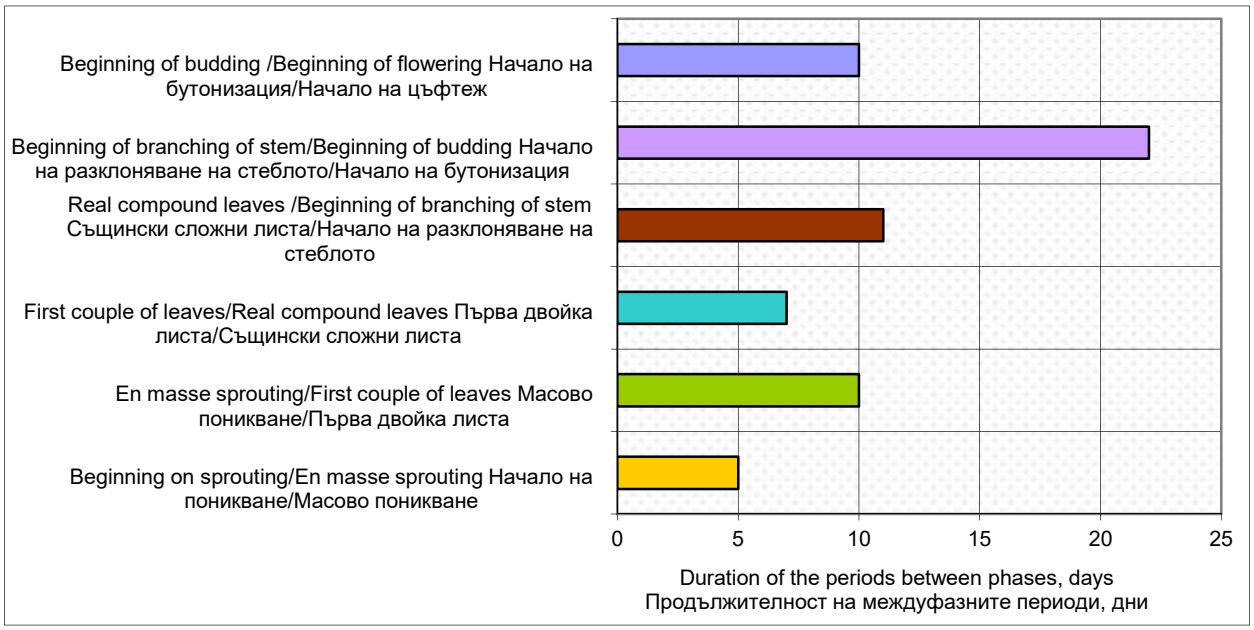
Fig. 1. Amount of rainfall (mm) [a] and the average air temperature (°C) [b] by months for the vegetation period of peas (III-VI) in 2015 and the norm of rainfall and temperature for Yambol region

В тази климатична обстановка, закъснява подготовката на почвата за сеитба и самата сеитба. Последвалите благоприятни климатични съчетания за

In these climate conditions the soil preparation for planting and sowing was delayed. The subsequent favorable climatic routines for germination,

покълване, поникване и вегетативно развитие на граха са причина той да премине нормално фазите си на развитие и в началото на месец юни да е във фаза начало на цъфтеж. Именно това е фазата при бобовите култури, когато с тях ще се извършва зелено торене, и момента за тяхното заораване [Georgieva, N., 2015]. В тази фаза, растенията все още са с крехки и сочни стебла и листа, и след като бъдат заорани в почвата по-бързо и лесно се разлагат. Макар и с малко закъснение в срока на засяване на граха, при последвалите благоприятни климатични условия грахът започва да пониква на 7-ия ден. Масово поникване на посева се наблюдава на 12-ия ден след сеитбата. Продължителността на междуфазните периоди при проучваният пролетен грах сорт „Богатир" е отразена на фиг. 2.

sprouting and vegetative development of peas are reason to pass normal phases of development and at the beginning of June is in the phase beginning of flowering. That is the phase of legumes when with them will be carried out green manuring, and it is the moment of their plowing [Georgieva, N., 2015]. In this phase, the plants have still fragile and juicy stems and leaves and more quickly and easily decompose after their dug into the soil. Although with some delay in the sowing of peas, with the subsequent favorable climatic conditions, the peas began to grow on the 7th day. En masse germination was observed on the 12th day after sowing. The duration of the periods between the phases of growth of the pea variety "Bogatyr" is reflected in Fig. 2.



Фиг. 2. Продължителност на междуфазните периоди при пролетен фуражен грах сорт „Богатир" от поникване до начало на цъфтеж

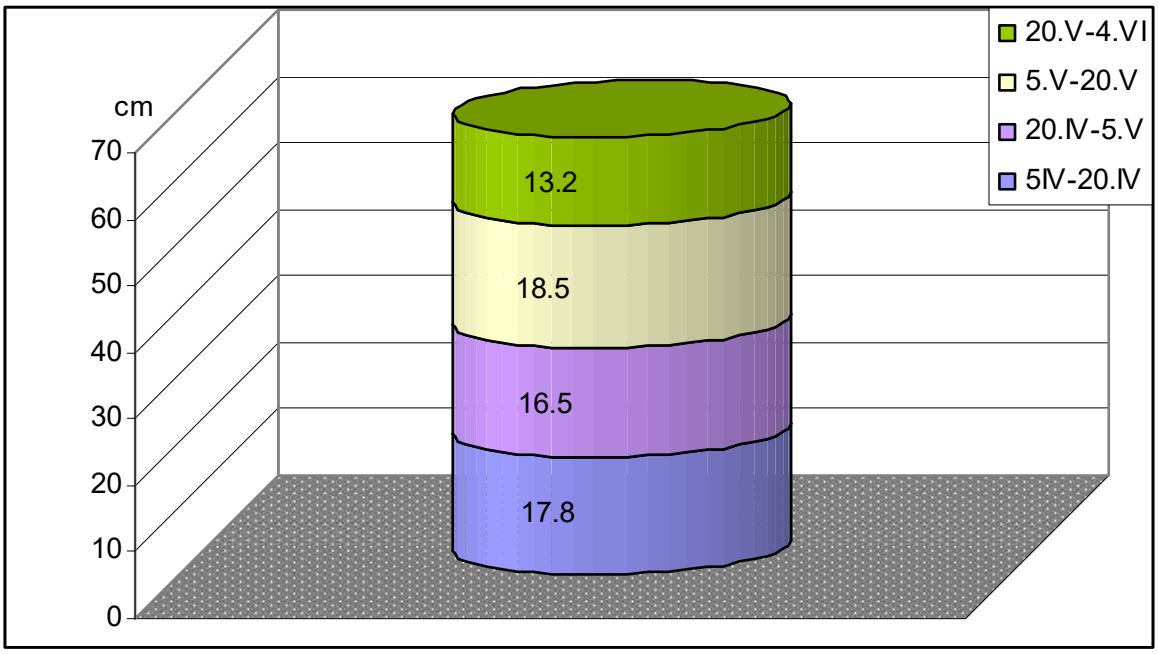
Fig. 2. Duration of the periods between the phases of growth of the pea variety "Bogatyr" from sprouting to the beginning of flowering

Видимо от фигурата е, че са кратки междуфазните периоди начало на поникване►масово поникване, и първа

Apparent from the figure is that the periods between phases "beginning on sprouting" ► "en masse sprouting", as

двойка листа►същинска двойка листа, съответно 5 и 7 дни. Най-продължителен е междуфазният период начало на разклоняване на стеблото►начало на бутонизация - 22 дни. Фактически това е периода при граха, през който става интензивното нарастване и образуване на вегетативната маса. Продължителността на вегетационния период, от поникване до фаза начало на цъфтеж е 65 дни. В предвид на това, че условията за вегетативно развитие на граха са благоприятни, то той успява за сравнително кратко време да образува богата вегетативна маса. През този период динамиката на нарастване на граха е измервана през 15 дни (фиг. 3). Темпът, с който нараства грахът за петнадесет дни варира от 13.2 до 18.5 cm. Последователността на динамиката на нарастване на височините на растенията през 15 дни е следната: 17.8 cm → 16.5 cm → 18.5 cm → 13.2 cm (фиг. 3).

between phases “first couple of leaves ” ► ”real couple of leaves” are short, respectively 5 and 7 days. The longest is the period between phases “beginning of the stems branching” ► ”beginning of budding” - 22 days. In fact this is the period during which become intensive growth and formation of vegetative mass of the peas. The duration of the vegetation period from germination to flowering phase is 65 days. In view of the fact that the conditions for vegetative growth of peas are favorable, it succeeded in a relatively short time to form a large vegetative mass. During this period, the dynamics of growth of the peas was measured in every 15 days (Fig. 3). The pace with which peas grew for fifteen days ranged from 13.2 to 18.5 cm. The sequence of the dynamics of growth of the height of plants in 15 days is as follows: 17.8 cm → 16.5 cm → 18.5 cm → 13.2 cm (Figure 3).



Фиг. 3. Динамика на нарастване на пролетен фуражен грах сорт „Богатир” от фаза масово поникване до фаза начало на цъфтеж, cm

Fig. 3. Dynamics of growth of the spring forage pea variety "Bogatyr" from phase “en masse sprouting” up to phase “beginning of flowering”, cm

В първите дни след поникване темпът на нарастване на грахът е по-бавен. От начало на поникване до масово поникване на посева (за 5 дни) грахът нараства едва с 2 – 2.5 cm. Най-интензивно той нараства през периодите масово поникване ► същински сложни листа и начало на разклоняване на стеблото ► начало на бутонизация. Сравнително бавно е нарастването през периодите начало на поникване ► масово поникване и начало на бутонизация ► начало на цъфтеж.

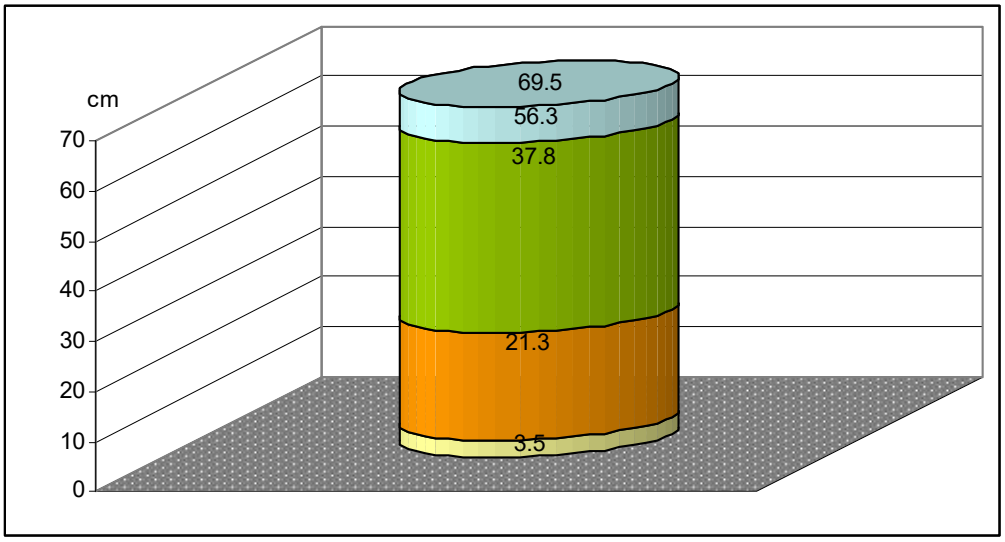
Височината на растенията е динамично променяща се величина, която корелира с климатичните условия. От височината на растенията зависи устойчивостта им на полягането и възможността за механизирано прибиране. През своя вегетационен период, от начало на поникване до момента на заораване в почва, когато е във фаза начало на цъфтеж, грахът достига височина 69.5 cm (фиг.4). Отчетената височина е нормална в предвид на това, че фуражните сортове грах отглеждани в конвенционалното земеделие достигат височина до 1 и над 1 m.

Отглежданият сорт „Богатир” за краткият вегетационен период развива богата вегетативна маса, в която влизат множество странични разклонения към главното стебло и прилежащи към тях същински сложни листа. Сортът през вегетативното си развитие и към момента на цъфтеж не поляга. Стеблата са устойчиви като цялата вегетативна маса стой стабилно изправена. Дружното поникване след сеитбата гарнира посева равномерно. Визуално погледнато посевът е изравнен с приблизително еднаква височина, като не се наблюдават по-ниски или по-високи участъци (фиг. 5).

In the first days after sprouting, the degree of growth of peas is slower. From the beginning of sprouting to masse sprouting of the crop (for five days), the peas grew only by 2 – 2.5 cm. Most intense it grew during the periods “masse sprouting”►”real compound leaves” and “beginning of branching of stem” ► “beginning of budding”. The growth is relatively slowly during the periods “beginning on the sprouting” ► “masse sprouting” and “beginning of budding” ► “beginning of flowering”.

Plant height is a dynamically changing value that correlates with climatic conditions. The height of the plants depends on their resistance to lodging and the possibility of mechanized harvesting. In its vegetative period from the beginning of sprouting until plowed into the soil when peas are in phase "beginning of flowering ", the pea reaches a height of 69.5 cm (Fig. 4). Reported height is normal in mind that the feed varieties of pea grown in conventional agriculture reach a height of 1 and over 1 m.

The variety "Bogatyr" for the short growing season develops rich vegetative mass, which includes many side branches to the main stem and adjacent to them real compound leaves. In its vegetative development and at the time of flowering the variety is not leaning. The stems are stable and the vegetative mass stands firmly upright. The simultaneous germinating after sowing makes the crop evenly. Visually the crop is aligned approximately on the same height as are not observed lower or higher sections (Fig. 5).



Фиг. 4. Височина на пролетен фуражен грах сорт „Богатир”, от фаза поникване до фаза начало на цъфтеж измервана през петнадесет дни, cm

Fig. 4. Height of spring forage pea variety "Bogatyr" from phase “sprouting” to phase “beginning of flowering” measured at intervals of fifteen days, cm

Фиг. 5. Фуражен грах сорт „Богатир” отгледан по проект „Опазване на околната среда чрез технологични решения за биологично земеделие в Ямболска област”. Фаза цъфтеж

Fig. 5. Forage pea variety "Bogatyr" grown on the project "Conservation of the environment through technological solutions for organic farming in the Yambol region". Phase flowering

Заключение

Фенологичните наблюдения върху пролетен фуражен грах сорт „Богатир” отглеждан за зелено торене при екологични условия и по принципите на биологичното земеделие в Ямболски

Conclusion

Phenological observations on the spring forage peas variety "Bogatyr" grown for green manuring in ecological conditions and principles of organic

агрорегион отчитат следното:

1. Фуражният грах сорт „Богатир" се развива нормално и има много добра адаптивност към почвено-климатичните условия на Ямболски агрорегион.

2. Отглеждан по принципите на биологичното земеделие той пониква масово и дружно до 12-ия ден след сеитбата.

3. Продължителността на вегетационния му период, от поникване до фаза начало на цъфтеж е 65 дни. За този период грахът нараства с 69.5 cm.

4. Продължителността на междуфазните периоди варира от 7 до 22 дни. Най-бързо преминава междуфазния период първа двойка листа ► същинска двойка листа, а най-продължителен е междуфазния период начало на разклоняване на стеблото ► начало на бутонизация – 22 дни.

5. За краткият вегетационен период грахът развива богата вегетативна маса, в която влизат множество странични разклонения към главното стебло и прилежащи към тях същински сложни листа. Стеблата и разклоненията са устойчиви като цялата вегетативна маса стои стабилно изправена. Посевът е изравнен с приблизително еднаква височина, като не се наблюдават по-ниски или по-високи участъци.

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farming in Yambol region reported the following:

1. The forage peas variety "Bogatyr" is developing normally and has very good adaptability to soil and climatic conditions of Yambol region.

2. Grown in principles of organic farming the peas sprout en masse and simultaneously till the 12th day after sowing.

3. The duration of the vegetation period from sprouting to phase "beginning of flowering" was 65 days. During this period the peas is increased with 69.5 cm

4. The duration of the periods between phases varies from 7 to 22 days. The shortest is the period between phases "first couple of leaves"► "real couple leaves", and the most prolonged is the period between phases "beginning of branching" ► "beginning of budding"- 22 days.

5. For the short growing season peas develop rich vegetative mass, which includes many side branches to the main stem and adjoining real compound leaves. Stems and branches are stable as a whole vegetative mass stands firmly upright. The crop is aligned with approximately the same height as not observed lower or higher areas.

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ТЕХНИЧЕСКИ НАУКИ / TECHNICAL SCIENCES

ПРИЛОЖЕНИЯ НА СТРУКТУРАТА ОТ ДАННИ СТЕК

Галя Шивачева

Резюме: В доклада са представени начини за организиране на стек в статичен и динамичен вид и примери за тяхното приложение. Представената структура допълва известните от литературата източници като подобрява нагледността на материала и улеснява прилагането му за целите на обучението. Препоръчаният начин на работа с тази структура от данни води до повишаване на неговата ефективност при използване за обучение. Описаният начин за организация на динамичен стек и статичен такъв с използване на масив, дава възможност да се изследват основните операции с двата типа структури от данни и да се избегнат затрудненията при тяхното овладяване от обучаемите.

Ключови думи: Структура от данни, Стек, Масив

1. Увод

Във Факултет „Техника и технологии“ – Ямбол студентите специалност „Автоматика и компютърни системи“ изучават дисциплината „Алгоритми и структури от данни“. Учебната програма освен алгоритми включва и структурите от данни: масив, линеен едносвързан списък, двусвързан списък, стек, опашка, дек, дърво и граф. Структурата от данни стек намира множество приложения, което налага търсенето на нови, усъвършенствани начини за нейното усвояване от студентите [2,4,5].

Целта на доклада е да се представят

APPLICATIONS OF THE DATA STRUCTURE STACK

Galya Shivacheva

Abstract: The article presents ways to organize stacks in static and dynamic form and examples of their application. The presented structure complements the sources known from the literature by improving the visibility of the material and facilitating its application for training purposes. The recommended way of working with this data structure is to increase its performance in training. The described method of organization of dynamic and static stack using such an array, gives the opportunity to explore the basic operations with two types of data structures and to avoid difficulties in their assimilation from the students.

Keywords: Data structure, Stack, Array

1. Introduction

At the Faculty of Engineering and Technology - Yambol, students specializing in Automation and Computer Systems study the subject Algorithms and Data Structures.

In addition to algorithms, the curriculum also includes data structures: array, linear unrelated list, double-linked list, stack, queue, deck, tree, and graph.

The Data Structure stack finds multiple applications, requiring new, advanced ways to learn from students [2,4,5].

The aim of the report is to present the ways to organize a stack of data

начините за организиране на структура от данни стек като се предложат примери улесняващи усвояването й от обучаемите.

2. Статична реализация на стек с масив

Дефинира се един индекс, който сочи към върха на стека. При добавяне на нов елемент индексът се увеличава с единица и елементът се записва на върха на стека.

При премахване на елемент – проверява се дали стека не е празен и след това стойността на елемента се извлича и индексът се намалява с единица.

При добавяне на елемент трябва да се прави проверка за препълване на масива, което е основен **недостатък** на статичната реализация.

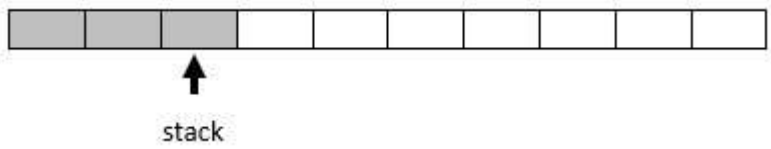
structure by offering examples facilitating its assimilation from learners.

2. Static realization of stack by array

The static realization of stack by array defines an index that points to the top of the stack. When adding a new item, the index is incremented by one, and the item is recorded at the top of the stack.

When removing an item, check if the stack is empty and then the value of the item is retrieved and the index is reduced by one.

When an element is added, an overflow check of the array must be performed, which is a major **drawback** of the static conversion.



Фиг.1. Статична реализация на стек с масив

Fig.1. Static realization of stack with array

3. Динамична реализация на стек

Дефинира се структура с две полета: стойност на елемент и указател към следващ елемент и функции, които реализират основните операции със структурата стек: добавяне на нов елемент, премахване на елемент, извличане стойността на елемент, проверка за празен стек и др. След това във функцията main се използват тези функции за реализиране на стек.

За всяка функция се илюстрира със схема как се променя структурата на стека за всеки от операторите.

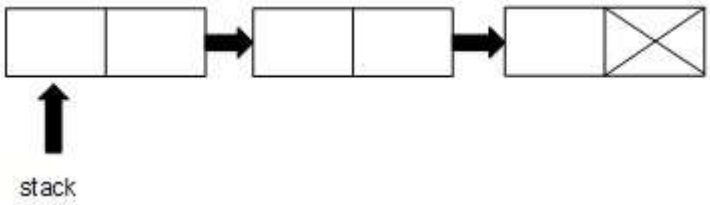
Например за добавяне на нов елемент в стек първо схематично се представя стек с три елемента (фигура 2).

3. Dynamical realization of stack

A two-array structure is defined: an element and a pointer value to the next element and functions that perform the basic stack operations: adding a new element, removing an element, extracting an element value, checking for an empty stack, and more. Then, in the main function, these functions are used to implement a stack.

For each function is illustrated in the diagram how to change the structure of the stack for each of the operators.

For example, to add a new element to a stack, a stack of three elements is schematically represented (Figure 2).

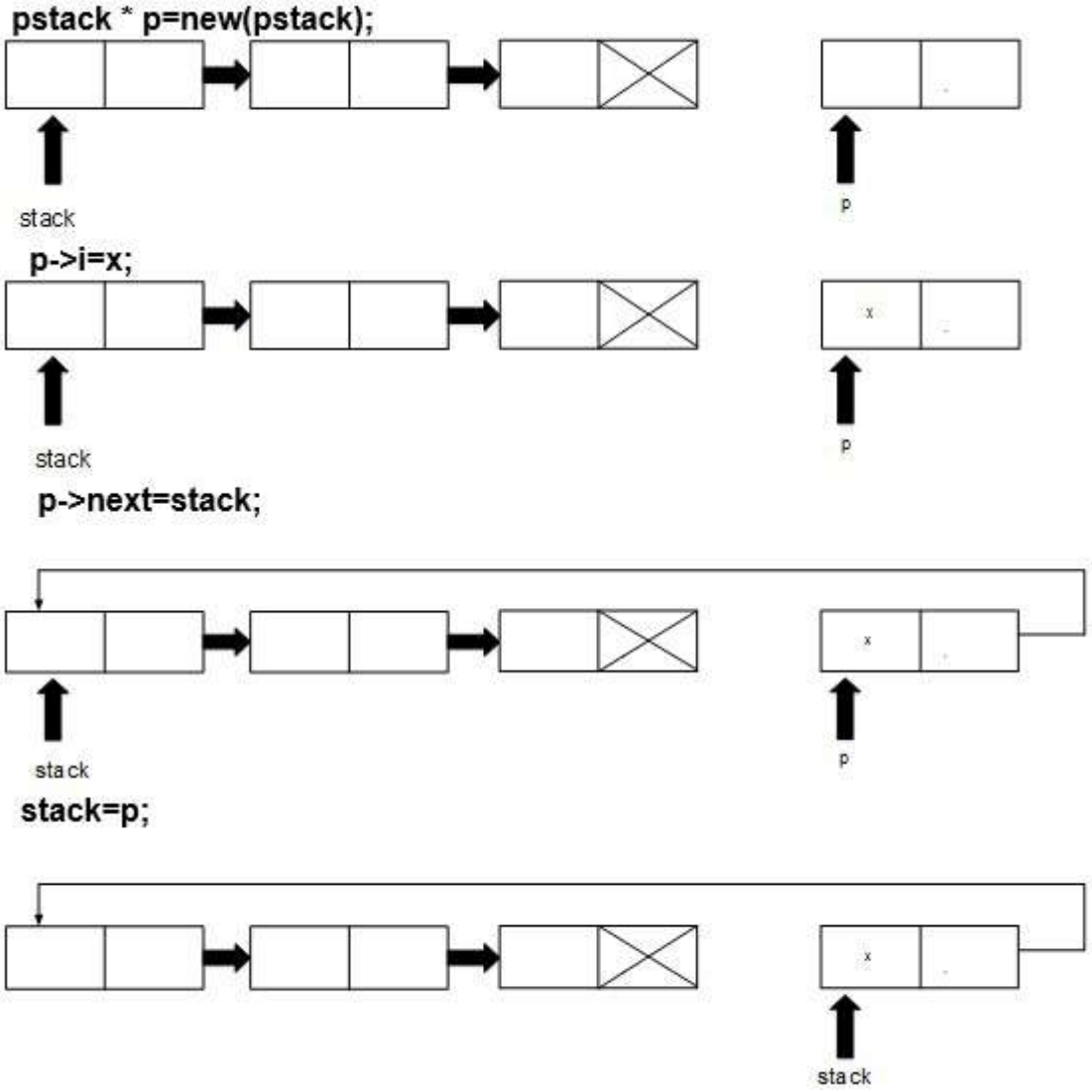


Фиг.2. Динамична реализация на стек

Fig.2. Dynamic realization of stack

След това се илюстрира програмния код оператор по оператор (фигура 3).

Then, the operator code is then illustrated operator per operator (Figure 3).



Фиг.3. Стъпки на изпълнението на програма, реализирана с алгоритъм за стек

Fig.3. Stages of execution of the program realizing algorithm for stack

4. Стандартна библиотека STL (Standart Template Library)

Библиотеката съдържа пет основни видове компоненти:

- алгоритми (algorithm): определят изчислителни процедури (sort, unique,

4. Standard library STL (Standart Template Library)

The library contains five main types of components:

- Algorithm: Define computational procedures (sort, unique, count,

count, reverse, next_permutation, lower_bound, upper_bound и др.).
- контейнери (container): управляват набор от обекти в паметта.
- итератори (iterator): осигуряват на алгоритмите средства за достъп до съдържанието на контейнерите.
- функционални обекти (function object): капсулират функции в обектите за използване на други компоненти.
- адаптери (adaptor): адаптират компонентите за осигуряване на различен интерфейс.

Стекът е представител на контейнерите - намира се в заглавния файла **<stack>**, който се включва в програма на C++ чрез **#include <stack>** (фигура 4).

reverse, next_permutation, lower_bound, upper_bound, etc.);
- Containers: manage a set of objects in memory;
- Iterators: provide algorithms with means of accessing the contents of the containers;
- Function objects: Encapsulate functions in objects to use other components;
- Adapters: Adapt the components to provide a different interface.

The stack is a representative of the containers - located in the <stack> header file, which is included in the C++ program by **#include <stack>** (Figure 4).

stack<int> s;	// дефинира стек с елементи от тип *int* //definition of stack with elements of type *int*
void push(X);	// добавя елемент в стека //adding element in the stack
void pop();	// премахва елемент от върха на стека // removes an element from the top of the stack
T top();	// връща елемента на върха на стека //return element to the top of the stack
bool empty();	// проверява дали стека е празен // checks whether the stack is empty

5. Приложения

Симулация на рекурсия чрез програмен стек. В почти всички езици за програмиране, неявно за програмиста част от паметта се използва за програмен стек. Когато се изпълняват рекурсивни извиквания, локалните данни за всяко поредно извикване се разполагат в паметта на принципа на стека (на ниво компилатор/операционна система реализацията на този процес е точно такава: съществува част от паметта, наречена програмен стек, и регистър-указател към върха на стека) [3].

Проверка за съответствие на броя на отварящите и затварящите скоби

Да се напише програма, която прочита

5. Applications

Recursion simulation through program stack. In almost all programming languages, implicitly for the programmer, a portion of the memory is used for a program stack. When recursive calls are executed, the local data for each consecutive call is stored in stack memory (at compiler/operating system level, the implementation of this process is exactly the same: there is a piece of memory called a program stack and a directory register at the top On the stack) [3].

Check the number of opening and closing brackets to match. Write a program that reads the source code

изходния код на програма на Си и проверява дали двойките (и); { и }; [и]; /* и */ участват симетрично в него.

Изчисляването на изрази се извършва лесно чрез стек [3].

Представяне на аритметичен израз в обратен полски запис. Аритметичният израз се състои от едноцифрени числа, аритметични операции, зададени със съответен знак (+) за събиране, (-) за изваждане, (*) за умножение и (/) за деление.

Алгоритъмът се състои от следните стъпки:

1. Ако поредният символ е отваряща скоба - включва се в стека.

2. Ако поредният символ е цифра - записва се директно в изходния низ.

3. Ако поредният символ е знак за операция - включва се в стека при условие, че е празен или на върха му се намира знак за операция с по-нисък приоритет.

4. Ако на върха на стека се намира операция с по-висок приоритет, тя се изключва от стека и се добавя към изходния низ, а на нейно място се включва текущата операция.

5. При затваряща скоба се изключва всичко до отварящата скоба и се добавя в изходния низ без нея.

6. Когато входният низ се изпразни, цялото съдържание на стека се добавя към изходния низ.

Пример: входен низ: **((2+4)*3-4*(5-2))/2**

изходен низ (в обратен полски запис):

2 4 + 3 * 4 5 2 - * - 2 /

Пресмята се аритметичен израз, записан в обратен полски запис. Тези изчисления се извършват в следния ред:

- Ако поредният символ е цифра – включва се в стека;
- Ако поредният символ е знак за операция изключваме 2 елемента от стека и прилагаме върху тях операцията, съответна на знака като резултата се

of a C program and checks whether the pairs (и); {и}; [и]; /*и*/ participate in it symmetrically. Calculation of expressions is easy by stack [3].

Presentation of arithmetic expression in reverse Polish notation. The arithmetic expression consists of one-digit numbers, arithmetic operations assigned with a corresponding sign (+) for addition, (-) for subtraction, (*) for multiplication and (/) for division.

The algorithm consists of the following steps:

1. If the next character is an opening bracket – It's included in the stack.

2. If the next character is a digit - it is written directly to the output string.

3. If the next character is a sign of an operation, it is included in the stack provided it is empty or a lower priority operation sign is at the top of the stack.

4. If a higher priority operation is at the top of the stack, it is excluded from the stack and added to the output string, and the current operation is included in its place.

5. With a clamping bracket, everything is off to the opening bracket and added to the output string without it.

6. When the input string is empty, the entire contents of the stack are added to the output string.

Example: input string:

((2+4)*3-4*(5-2))/2

Output string (in Reverse Polish notation): **2 4 + 3 * 4 5 2 - * - 2 /**

An arithmetic expression written in a reverse Polish notation is calculated. These calculations are made in the following order:

- If the next character is a digit - it is included in the stack;
- If the next character is a sign of an operation, we exclude 2 elements

включва в стека;
- След обработка на целия низ в стека се намира крайния резултат от пресмятанията.

Изходен резултат за примерния низ: **3**

Пресмята се аритметичен израз с числа – използват се два стека – един за операциите и един за числата.

Разглежда се всеки символ от аритметичния израз:
- Ако поредният символ е отваряща скоба – включва се в стека с операциите;
- Ако поредният символ е знак за операция (Докато стека не е празен и приоритета на операцията е по-малък или равен на операцията на върха в стека с операциите, пресмятаме с операцията от стека). Включва се знака за операцията в стека;
- Ако поредният символ е цифра – включва се цялото число, започващо с тази цифра в стека с числата;
- Ако поредният символ е затваряща скоба (Докато операцията в стека е различна от отваряща скоба пресмятаме операциите като за всяка операция изключваме две числа от стека с числата и върху техните стойности прилагаме операцията.

Резултатът от операцията се записва в стека с числата). Изключваме нова операция от стека и така, докато има знак за операция в стека извършваме пресмятания.

6. Организация на учебния материал в DSLearning

Учебният материал по всяка от темите е организиран на модулен принцип. Задачите са разпределени в следните три основни модула:
- Емпиричен модул;
- Теоретичен модул;
- Практикоприложен модул.

Задачите в емпиричния модул са насочени към формиране у обучаемите на

from the stack and apply the operation corresponding to the character on the stack and the result is included in the stack;
- After processing the entire string in the stack, the final result of the calculations is found.

Output for the sample string: **3**

An arithmetic expression with numbers is calculated - two stacks are used - one for operations and one for numbers.

Any symbol of the arithmetic expression is considered:
- If the next character is an opening bracket, it is included in the stack of operations;
- If the next character is a sign of an operation (While the stack is not empty and the priority of the operation is less than or equal to the operation at the top of the stack with the operations, we calculate the operation from the stack). Include the sign for the operation in the stack;
- If the next character is a digit - include the integer starting with that number in the stack with the numbers;
- If the next character is a closing clamp (While the operation in the stack is different from an opening clamp, we calculate the operations as for each operation we exclude two numbers from the stack with the numbers and their values we apply the operation.

The result of the operation is recorded in the stack with the numbers). We exclude a new operation from the stack, so we perform calculations while there is a sign for an operation in the stack.

6. Organization of the training material in DSLearning

The training material on each

умения и способности за опериране с обекти от логическия обем на понятието и с дефиницията на понятието, както и за разпознаване и прилагане на характеристичните му свойства, съотнесени към признаците за съществуване на понятието.

Теоретичният модул е насочен към формиране у обучаемите на умения за откриване на определящи признаци, коректно използване на фактическата структура на понятията, интерпретиране на моделите на поведение на обектите и съпоставка на тези модели чрез сравнителни анализи.

Формирането у обучаемите на умения за моделиране на обекти и свойствата им, разширение на функционалността на понятията, генериране на нови понятия са основна задача при практико-приложния модул [1].

7. Заключение

В доклада са представени начини за организиране на стек в статичен и динамичен вид и примери за тяхното приложение. Представената структура допълва известните от литературата източници като подобрява нагледността на материала и улеснява прилагането му за целите на обучението.

Описаният начин за организация на динамичен стек и статичен такъв с използване на масив, дава възможност да се изследват основните операции с двата типа структури от данни и да се избегнат затрудненията при тяхното овладяване от обучаемите.

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subject is organized on a modular basis. The tasks are divided into the following three basic modules:

- Empirical module;
- Theoretical module;
- Practical application module.

The tasks in the empirical module are aimed at forming the students the skills and abilities to operate with objects from the logical volume of the concept and the definition of the concept as well as to recognize and apply its characteristic properties related to the features of the existence of the concept.

The theoretical module is aimed at forming learners' skills to identify identifying features, to use the factual structure of concepts correctly, to interpret the patterns of behavior of objects and to compare these models with comparative analyzes.

Forming learners of skills to model objects and their properties, expanding the functionality of concepts, generating new concepts is a major task in the practical application module [1].

7. Conclusion

The article presents ways to organize stacks in static and dynamic form and examples of their application.

The presented structure complements the sources known from the literature by improving the visibility of the material and facilitating its application for training purposes.

The described method of organization of dynamic and static stack using an array, gives the opportunity to explore the basic operations with two types of data structures and to avoid difficulties in their assimilation from the students.

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ДИЗАЙН / DESIGN

BULGARIAN NATIONAL FOLK ELEMENTS FOR THE CONTEMPORARY FASHION

Elsayed Elnashar, Zlatin Zlatev, Özlenen İşmal, Geeta Mahale

Abstract: The article explores Internet sites featuring authentic non-commercial folk costumes and those offering modern stylized folk costumes for commercial purposes. A survey of consumer opinion was made in the selection of elements of folk costumes. Through simulation software are proposed variants of modern garments that use selected from consumer items. It has been found that consumers prefer elements with low solidity and high value of coefficient of the form. The results of the research can be applied in the training of future specialists in the study of shaping, coloring and design of clothing.

Keywords: Bulgarian national folk costume, Embroidery, Internet sites, Image analysis

1. Introduction

The advanced design looks for the ideal link between small queries and moderately low creation costs. In order to ensure the achievement of the clothing market, the designer can create and apply techniques with a variety of innovative methodologies. As a matter of the look of clothes, fabrics are tools through which they are ultimately attractive to customers. The weaving elements of the Bulgarian national clothing, their shapes, nuances and sizes between them are the reasons for the production of clothes [19,28].

The development of innovation in the material business has achieved the woven fabrication pattern of machine weaving. Given the ultimate goal of making quality outlines the shapes to be weighed, they should be divided into locales that characterize different parts.

The varied forms of Bulgarian folk clothing and its dignity are an inexhaustible source of ideas for diversifying and embellishing modern clothing.

The aim of the report is to study the presentation and supply of Bulgarian folk costumes and to analyze the consumer opinion when choosing elements for modern fashion by proposing the application of the chosen motifs in modern clothes.

The article is structured in the following **order**: We studied Internet sites presenting authentic folk costumes Non-Commercial and those offering modern stylized costumes for commercial purposes; A survey of consumer opinion was made in the selection of elements of folk costumes; Through simulation software are proposed variants of modern garments that use selected from consumer items.

2. Presentation and use of Bulgarian folk costumes and their elements

The websites that represent Bulgarian folk costumes can be divided into two main groups – non-commercial and commercial. The first type on the site is mainly traditional folk costumes in their authentic appearance. A description and pictures of such costumes are provided. The commercial websites present modern stylized variants of folk costumes,

which are intended for folklore compositions, public appearances, theater performances and more.

On figure 1 are presented original authentic Bulgarian national folk costumes. By its nature, the folk costume is the everyday work wear, which, through artistic decoration, acquires a festive appearance. It is distinguished by its outstanding practicality in labor, traditional rituals and celebrations. The folk costume is male and female, festive and every day, as in each of the Bulgarian ethnographic regions they are distinguished by their specificity and uniqueness [1].

			
Ritual maid costume of a lazarka, village of Byala, Sliven [23]	Folk costume of Kariotska ethnic group [11]	Folk Costume from Kazanlak [1,4]	Female Costume – village of Stresimirovtsi, Pazardjik [23]

Fig.1. Examples of Bulgarian national folk costumes

On figure 2 are presented stylized Bulgarian national folk costumes. The folk costumes offered are copies of the traditional ones, using modern textile fabrics, sewing and embroidery machines.

			
Bulgarian Northern Lady Costume [22]	Thracian women's costume [24]	Varna ladies suit [15]	Bulgarian Northern Lady Costume [25]

Fig.2. Examples of stylized Bulgarian national folk costumes

On figure 3 are presented Examples of modern fashion with Bulgarian folklore motifs. The Eastern European traditional costumes are unique with their colors, motifs and embroidery. This is the reason many designers to use these motifs in their clothes.

The Italian fashion designer Valentino often interprets the motifs of traditional clothing and other nations in the lines he presents, and the clothes inspired by the Bulgarian costume are really impressive. The models look different and stylish at the same time. They present the authentic spirit, tradition and identity of East Europeans.

The designer Pierre Cardin worships our folklore and represents it in his clothes because Bulgarian costumes are a fashion masterpiece that he could not create.

On the Bulgarian market also appeared dressings and accessories inspired by folklore.

			
Lady's dress with symbol 'Elbetitza' [16]	Lady's costume of Valentino [9]	Embroidery on dark blue tunic from Isabel Marant [12]	Lady's blouse with embroidery [13]

Fig.3. Examples of modern fashion with Bulgarian folklore motifs

3. Analysis of websites that present Bulgarian nation folk costumes

The analysis of the resulting data set of indexing of the websites is realized with the methods ABC and VED, well described in detail in [3], the results of which are combined.

- The ABC analysis is to control raw material components and work-in-progress inventories in the normal course of business. Here this method is used for measuring the change of number of publications and for analysis of the indexing of websites;
- The VED analysis is to determine the stocking levels of spare parts. It is used for analysis of the indexing of the web pages related to change of the indexing of websites;
- An ABC-VED grouping was used, where groups A-V and A-E rank high-indexed websites on Google and Yandex [5].

Table 1 presents the results of the survey of 12 websites presenting Bulgarian folk costumes. The sites are non-commercial in nature and are mainly of museums and enthusiasts who support Bulgarian traditions by presenting them in languages other than Bulgarian.

Table 1.

A comparative analysis of non-commercial Websites that presents Bulgarian national folk costumes

Name of the manufacturer	General Web address	№	Structure of the Website	Language except Bulgarian	Search in site options	Presentation of the sfolk costume	Information about the sfolk costume	Free to download pictures	Yandex indexing	Google indexing
ITCOMEL	http://www.spge-bg.com	P1	M	N	N	Y	Y	Y	500	613
Dechica	http://dechica.com/Article/Details/1689	P2	H	N	N	Y	Y	N	10000	33900
Hora BG	http://www.bghora.com	P3	H	Y	N	N	Y	Y	30	2200
Bulgarian folclore	http://www.bulgarian-folklore.com	P4	M	Y	Y	Y	Y	Y	10	218000
Folklore BG	http://www.folklore-bg.com	P5	M	N	Y	N	Y	Y	30	4810
Ot izvora	http://www.otizvora.com/2010/03/1012	P6	M	N	N	Y	Y	Y	800	15200
Ziezi	http://ziezi.net/	P7	M	N	N	Y	N	Y	6000	534
Site Bulgari zaedno	http://www.sitebulgarizaedno.com	P8	M	N	Y	Y	Y	Y	200	2400
Beu	http://www.beu.bg	P9	M	N	Y	Y	Y	Y	800	162000
Bulgaria travel	http://bulgariatravel.org	P10	H	Y	Y	Y	Y	Y	20000	39900
Bulger duhovnost	http://bulger-duhovnost.free.bg	P11	M	N	N	Y	Y	Y	10	15
Horo	http://horo.bg	P12	M	Y	Y	Y	N	Y	700	40400
H-very well structured; M-acceptable structure; L-poorly structured. Y-yes; N-no										

The ABC-VED analysis takes into consideration the Internet sites within the A-V, A-E, A-C, B-V, B-E groups. The results, presented in Table 2 show that 7 of the 12 sites fall into the indicated groups according to their indexing. In group A-V has neither a website as there is no one that is dominant in indexing the rest. It can be seen from the table that sites that have a good structure are also the highest indexes - P2, P6, P10. Also, on the mentioned websites there is information about the national costumes in English and other languages.

Table 2.

ABC-VED analysis of the indexing of websites in Yandex and Google

	V	E	D
A	-	P10, P2, P6	P7
B	P9	P12, P8	P1, P3
C	P4	P5	P11

Table 3 presents the results of a survey of commercial Internet sites featuring stylized folk costumes. These sites offer folk costumes for folklore, theater, public appearances and more. The folk costumes offered are copies of the traditional ones, using modern textile fabrics, sewing and embroidery machines.

Table 3.

A comparative analysis of Websites with manufacturers of stylized Bulgarian folk costumes

Name of the manufacturer	General Web address	№	Structure of the Website	Language except Bulgarian	Search in site options	Presentation of the sfolk costume	Information about the sfolk costume	Free to download pictures	Yandex indexing	Google indexing
Mely-M	https://nosii.com/category/1/narodni-nosii.html	S1	H	Y	Y	Y	N	Y	300	505
Pen silhouette	http://www.pensiluet.com/narodni-nosii	S2	M	Y	Y	N	N	Y	90	35
Balkanfolk	http://www.balkanfolk.eu/narodni-nosii.php	S3	H	N	N	Y	N	Y	100	114
Leila	http://www.leila.bg/nosii-v-nalichnost/	S4	M	N	Y	Y	N	Y	10	23

Bozov style	http://www.bozovstil.com/	S5	M	Y	Y	N	Y	Y	10	700
Mia moda	https://miamoda.alle.bg	S6	M	N	N	Y	N	Y	7	31
Shevitsa	http://www.shevitsa.com/en/index.php	S7	M	Y	N	Y	N	Y	80	58
Bebeshki dreshki	http://bebeshkidreshki.com	S8	H	Y	Y	Y	N	Y	100	492
Galatea Varna	http://galateabg.net/	S9	M	Y	Y	Y	N	Y	100	196
Perlita	https://perlitabg.eu/	S10	H	N	Y	Y	Y	Y	30	360
Lili style	http://www.narodninosii.com/	S11	H	N	Y	Y	Y	Y	40	100
Etnorai	http://www.etnorai.com/	S12	M	Y	N	Y	N	N	40	9
Slancho	http://www.slancho.net/bg/products/narodni-nosii/	S13	M	N	Y	Y	N	Y	100	414
BG family	http://bgfamily.bg	S14	M	Y	Y	Y	N	Y	200	688
H-very well structured; M-acceptable structure; L-poorly structured. Y-yes; N-no										

The results of the ABC-VED analysis, presented in Table 4 show that there are four indexing sites that fall into group A-V. These are S1, S8, S13, S14. They have a good content structure, information in English and other languages, except Bulgarian, advanced page search capabilities.

Table 4.

ABC-VED analysis of the indexing of websites in Yandex and Google

	V	E	D
A	S1, S14, S8, S13	S9, S3	-
B		-	S2, S7, S11, S12
C	S5	-	S4, S6

The review of Internet sites presenting traditional costumes and stylized items offered for commercial purposes shows that folk costumes with their elements, shapes and colors remain relevant and sought a modern stage. They are also used in the design of fashionable clothing [8,14,20,27].

The form of clothing in folk costumes is made up of different elements. When the consumer perceives the appearance of the clothing, he or she unintentionally, on an emotional basis or consciously, on a rational-valuation path, compares the individual elements by size, area, volume, size of color spots, invoice, rhythm and other characteristics [2,7,17,18].

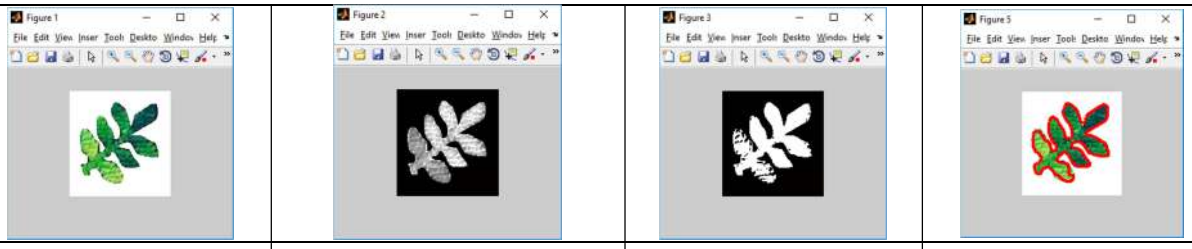
What is said here is a prerequisite to a survey on customer reviews when selecting items for contemporary clothing using their geometric descriptions.

4. Analysis of the geometric properties of motifs from Bulgarian national folk costumes

Embroidery is a beautiful thread work on a Bulgarian folk costume which makes it more attractive and appear gorgeous. The Bulgarian embroidery is beautiful, interesting, colorful, varied and brings a positive charge. In addition, they return to times when traditional clothes were hand-decorated, and women have given their freedom of creativity and showed true craftsmanship of craftsmanship.

The current research in the use of digitized forms of Bulgarian embroidered elements is related to their use with CAD systems, for the generation of programs for embroidery machines, digital collections [10,19,28]. Similar research has been done for embroidered elements of other nationalities - for Egyptian elements [10], where digitized elements are used to create a digital collection. Indian embroidered elements and their digitized forms were used to study consumer opinion, the results of which are presented in [19]. The author presents original and digitized Indian embroidered elements. As a criterion for evaluation of consumer opinion is used chi-square criterion.

Obtaining a digital version of the Bulgarian embroidered items is implemented with software tools presented in [10]. The algorithm for extracting an element in an image is used. Experimentally is found that for obtaining the contour of the image is appropriate to use S color component of the HSV color model. Then, according to the algorithm, the image is converted to binary and the contour and object parameters (the embroidered element) are obtained. Figure 4 presents stages of processing of floral element.



a) Original image	b) Representation by S(HSV) color component	c) Binary image	d) Contour of the object and it's parameters

Fig.4. Stages of processing of element from Bulgarian national folk costume

The proportions of the elements are important in the design of clothing and instrument through which the product becomes attractive to the consumer. Apart from proportions, other important elements and principles are form, texture, color, dominance and balance.

Geometric descriptions of the elements are obtained with the "regionprops" function of the Matlab programming system. The function "regionprops" is very useful for measuring the properties of objects in a binary image. There is documentation examples and product examples showing how to do this. Type of measurement, specified as a character vector, comma-separated list of character vectors, cell array of character vectors, or "all". Property names are case-insensitive and can be abbreviated [21]. The coefficient of form kf is defined as the relationship between the square of the perimeter and the area of the object. The function is described in detail in [10,28]. Table 5 presents elements from Bulgarian national folk costumes and their geometrical descriptions.

Table 5.

Descriptive statistics of coefficients for all motifs

															
B1		B2		B3		B4		B5		B6		B7		B8	
kf	75,42	kf	27,05	kf	55,98	kf	51,88	kf	32,88	kf	59,43	kf	37,16	kf	19,67
ex	0,86	ex	0,71	ex	0,78	ex	0,69	ex	0,56	ex	0,48	ex	0,81	ex	0,73
or	-88,01	or	76,76	or	-85,71	or	27,92	or	-0,36	or	-59,48	or	2,60	or	87,43
so	0,70	so	0,77	so	0,48	so	0,61	so	0,80	so	0,79	so	0,80	so	0,88
ex	0,59	ex	0,49	ex	0,46	ex	0,52	ex	0,56	ex	0,68	ex	0,63	ex	0,73
															
B9		B10		B11		B12		B13		B14		B15		B16	
kf	124,7	kf	52,09	kf	288,10	kf	43,44	kf	73,20	kf	104,89	kf	107,00	kf	37,09

	8														
ex	0,96	ex	0,58	ex	0,75	ex	0,46	ex	0,38	ex	0,60	ex	0,82	ex	0,35
or	64,62	or	78,26	or	0,95	or	62,38	or	-48,67	or	53,94	or	46,45	or	-7,70
so	0,50	so	0,80	so	0,48	so	0,60	so	0,67	so	0,62	so	0,53	so	0,79
ex	0,27	ex	0,57	ex	0,38	ex	0,53	ex	0,49	ex	0,49	ex	0,37	ex	0,58
															
B17		B18		B19		B20		B21		B22		B23		B24	
kf	67,01	kf	65,40	kf	60,20	kf	28,09	kf	60,63	kf	48,48	kf	39,07	kf	100,62
ex	0,60	ex	0,71	ex	0,82	ex	0,59	ex	0,66	ex	0,70	ex	0,68	ex	0,70
or	81,03	or	3,87	or	9,19	or	-37,47	or	-67,26	or	-86,40	or	2,39	or	41,21
so	0,52	so	0,84	so	0,71	so	0,83	so	0,73	so	0,74	so	0,85	so	0,66
ex	0,44	ex	0,69	ex	0,50	ex	0,72	ex	0,51	ex	0,58	ex	0,68	ex	0,52
															
B25		B26		B27		B28		B29		B30		B31		B32	
kf	60,46	kf	20,83	kf	61,99	kf	22,62	kf	56,55	kf	30,26	kf	104,42	kf	40,99
ex	0,68	ex	0,59	ex	0,92	ex	0,44	ex	0,83	ex	0,93	ex	0,82	ex	0,57
or	24,62	or	2,43	or	73,86	or	-73,98	or	-80,97	or	-8,33	or	46,66	or	-81,19
so	0,72	so	0,89	so	0,71	so	0,86	so	0,70	so	0,77	so	0,53	so	0,77
ex	0,53	ex	0,73	ex	0,52	ex	0,73	ex	0,50	ex	0,54	ex	0,37	ex	0,56
kf-coefficient of form; ex-eccentricity; or-orientation; so-solidity; ex-extent															

A survey was conducted on consumer opinion when choosing items of folk costumes. It is limited only within the Faculty of "Technics and Technologies, Yambol, of Thrakia University – Stara Zagora, Bulgaria. The lecturers involved in this study were randomly selected, regardless of gender, average success, and so on. The interviews were anonymous 79 of them (44 women and 35 men) from all technical fields. All lecturers participated voluntarily in the survey. They were informed of the purpose and use of the survey data collected.

Survey data were collected in May 2017. Table 6 presents the results of the survey.

Table 6.

Results from survey

Coefficient / Diapason of change	Coefficient of form	Eccentricity	Orientation	Solidity	Extent
0-20%	11	12	20	16	17
20-40%	19	21	14	28	22
40-60%	23	21	17	22	17
60-80%	19	21	27	17	21
80-100%	28	25	22	17	23

The results of the correspondence analysis [26] are presented in figure 5. It can be seen from the figure that these symbols with a small value of solidity and higher coefficient of form are chosen. Elements are selected with intermediate values of the eccentricity,

orientation, extent coefficients. Selection of elements with high coefficient of form values is observed.

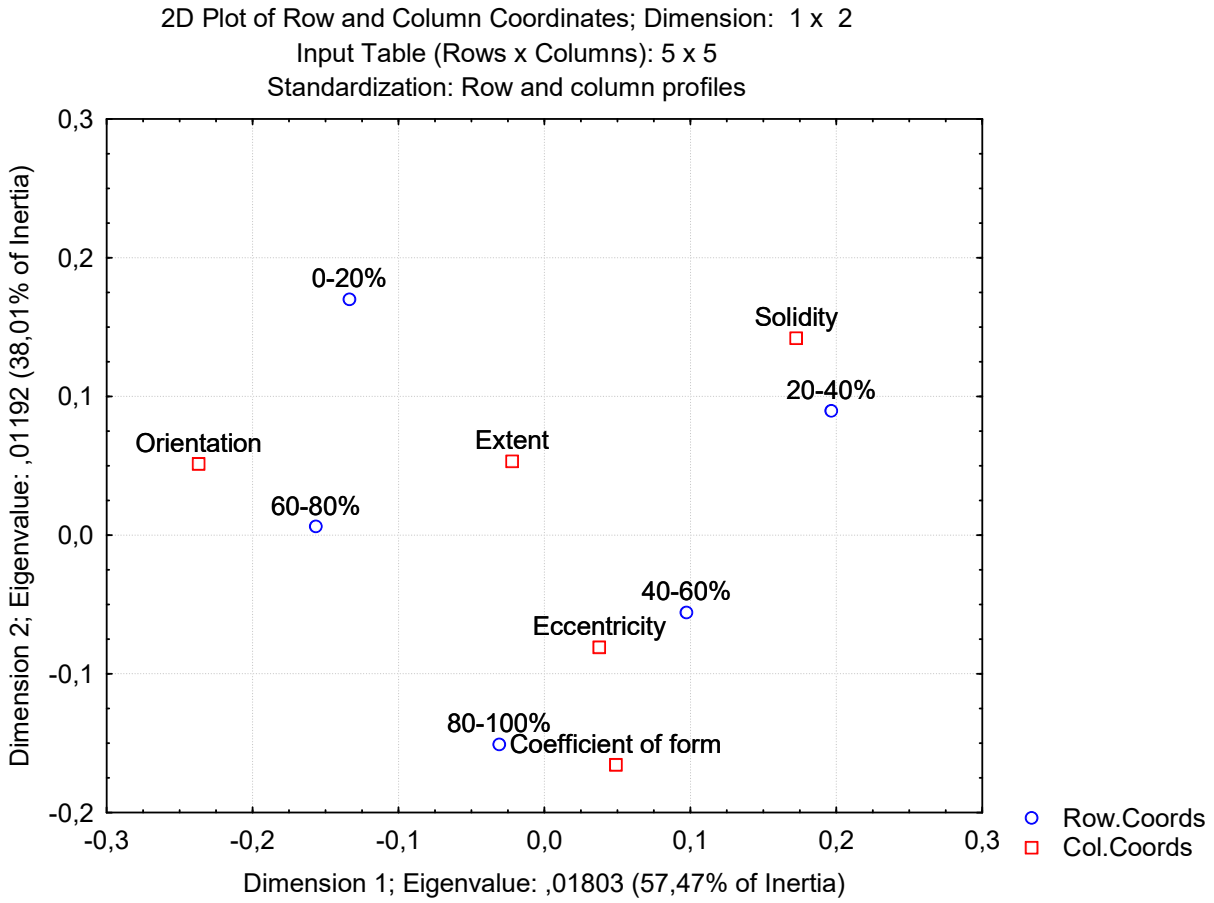


Fig.5. Results from correspondence analysis for coefficients of the symbols

An ABC analysis of the data obtained after a correspondence analysis was performed. In this case, a graphical representation of the results obtained is selected (Figure 6). Taken into consideration are the symbols within the group A. These are B1, B7, B11, B12.

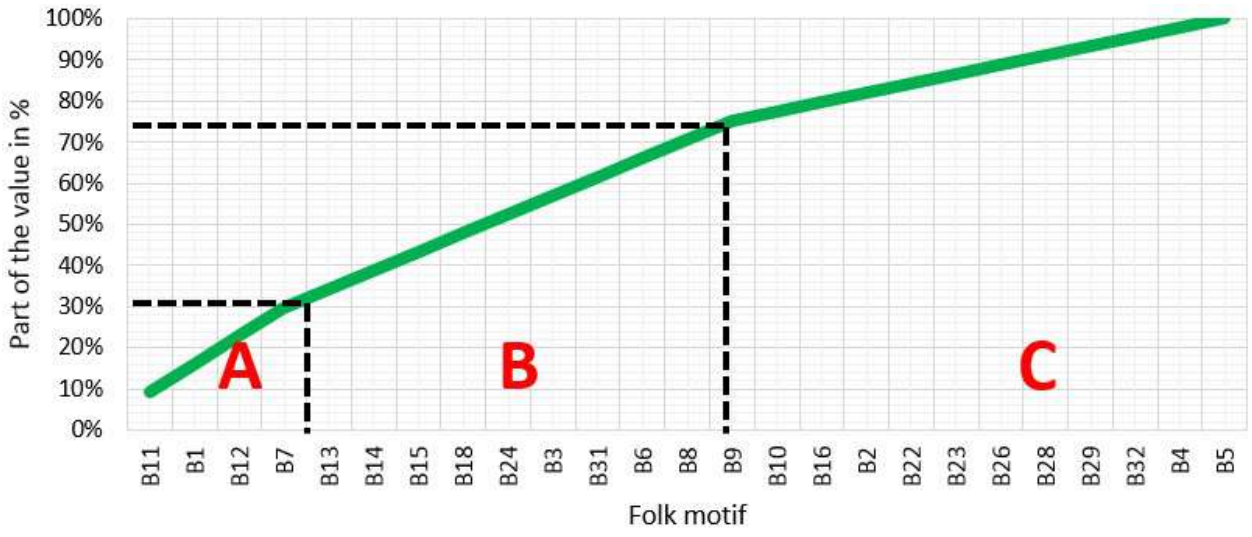


Fig.6. Results from ABC analysis

A modern clothing simulation was made using the online application Digital Fabrics [6], which can be used for textile and interior design. Figure 7 shows scarf and baby clothes as elements of modern fashion accessories and clothing.

a) scarf with element B11

b) baby clothes with element B11

Fig.7. Example of application of the developed motifs in the textile design

The design of modern clothing and accessories affects the relationship between clothing of different ages and styles, their cultural ties. Particular attention is paid to designing modern women's and children's clothing inspired by historical epochs and styles in fashion. There is a new and interesting look at how to dress well. Developed contemporary clothing and accessories deserve attention with a starting point today and a non-profit tomorrow.

5. Conclusion

Folk embroidery is still very much of a living tradition in the rural areas of Gujarat. It inherited a rich culture of aesthetic sensibility and discipline of folklore. It is a colorful medium of sensitive and individual expression.

From the study can be concluded that the floral, geometrical, animal traditional motifs can be created in contemporary form.

Thus, the process of automation of conventional Bulgarian national embroidery motifs using Computer Aided Textile software developed in Matlab environment was quick, faster and user-friendly compared to manual designing that was laborious, time consuming and less flexible to edit, modify and/or replicate the design.

An investigation of Internet sites presenting and offering Bulgarian folk costumes showed that the favorites are those that have good structure and provide information to Bulgarian, English and other languages. The information provided by these sites is useful for modern designers who can apply elements of Bulgarian folk costumes to modern clothes.

In the survey of consumer opinion on the selection of elements of folk costumes it

was found that consumers prefer low-solidity elements and high value of the coefficient of the form.

Designing of clothes can be subject to the application of the results of the survey. They can be applied in the training of future specialists in the study of the silhouettes.

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BIONIKA CONCEPT FOR DESIGN OF FURNITURE

Katerina Despot, Vaska Sandeva

Abstract: The design represents the outward appearance of a product or subject. The design is what makes the products attractive, beautiful and desirable, and has a significant impact on sales of the product and enhancing its commercial and artistic value.

The main conditions that a design must meet to individuality and uniqueness, as well as its features to not only have technical function, but also have artistic value.

Bionics is a tool for expression in the design of furniture, or a way to explore the similarities in animate and inanimate nature for further use of the established principles of construction and operation of biological systems and their elements to improve the existing technical systems, creating new functional forms-furniture.

Keywords | ***Key phrases***

Design, bionics, aesthetics, furniture, architecture, urbanism

INTRODUCTION

Designers and innovators are constantly looking for inspiration to create new designs. One source of inspiration is nature. Examples from nature and inspiration from natural forms that surround us daily were solutions to create a lot of designs, both in the past and today. Designers have used natural forms, compile, and mechanisms applied in many designs. In the world of industrial design natural forms were not visible in the past, but today there are serious attempts to use nature as inspiration for design - bionics, innovation inspired by nature.

That is the subject of the environment which man makes as imitation of forms from nature, and any creation of such a product of nature is characterized by striking suitability, reliability, durability, efficiency in various shapes and designs.

In 1995, the American scientist Jackie Style introduces the word "bionics" to express the symbiosis between nature and technology. This is an original interpretation of bionics, which stems from the terms "organic" and "technology". But Jackie Steele believes in the principle of "learning from nature", so bionics are defined as learning from nature.

This principle is commonly used by various specialized sciences such as mathematics, engineering and architecture. It basically determines the way of investigating living systems with analytical criteria in order to find better solutions to human needs.

Bionics is not science, but a method in which man should implement their imagination with an understanding of how and why things work in nature.

Bionics explains all shapes representing the imitation of forms from nature. One of the main reasons why bionics is more popular today is that man finally has the tools and skills to analyses the nature and learn from her many processes.

Bionics in furniture design

In recent year's bionics gained popularity, so that more and more seen as a model

and touchstone. Millions of years of evolution in nature and mechanisms produce compositions that are very effective, avoid waste and sustainable in almost closed system.

Bionics can be defined as the study of the shape, structure and function of biological materials and manufactured articles, and biological mechanisms and processes, in order to create products which are nature imitation. The field of bionics is interdisciplinary and covers the study of biological functions, structures and laws of nature, which are studied by biologists, chemists and other scientists.

By studying successful solutions in nature, to solve many human problems in the field of design and construction products. This way of designing and thinking can be defined as an innovation inspired by nature. The possible extinction of many animal and plant species and knowledge of the environment in humans began to develop abstract thinking and it allows them to create forms based on their application and possibilities of materials for their realization.

Shaping the facilities it is largely determined by the technological characteristics of its creation, the organization that defines the outer shape of rhythm or repetition. It rhythmic organization of form created by man makes an external manifestation of the internal structure, obtained by specific technological research. So rhythmic organization of form created by man, makes an external manifestation of the internal structure derived from certain technological research.

The inspiration for the development of new technologies is at the core of the approach of bionics. Great diversity of biological forms allows certain attributes to be used as inspiration for innovative design solutions. Insects, plants and animals daily engineers and teachers with a lot of knowledge. They are a whole system that works and is all around us.

Nature is a big secret for the man, and each of his understanding of the system is a big step. The specific stage of development of forms of wildlife that not only formal aspects of wildlife and established connections between the laws of nature and development of the design concept.

Figure 1. Bionics

The more man comes close to nature, the chance of survival is bigger. The inspiration of the designers did not just wake up the forms in nature, but also the processes and survival of living organisms. Today, more and more people seek to

understand the nature and seize all its graces and transforming its forms and processes in its designs that facilitate human life.

Bionics place slowly finds in the design, in terms of shape and materials of design decisions. While the methodology for complex imitation of nature in respect to the structure, processes and functions in the future more and more will be developed.

The furniture industry has many examples that are created on the principle of bionics. Furniture, lighting fittings, decorations and other items that are natural forms such as bird nests, leaves, spider webs, flowers. At this stage designers do not use external forms of wildlife, but only those properties and characteristics of forms that reflect the function of a particular organism. That is the function to form within the laws - this is the main way of bionics design.

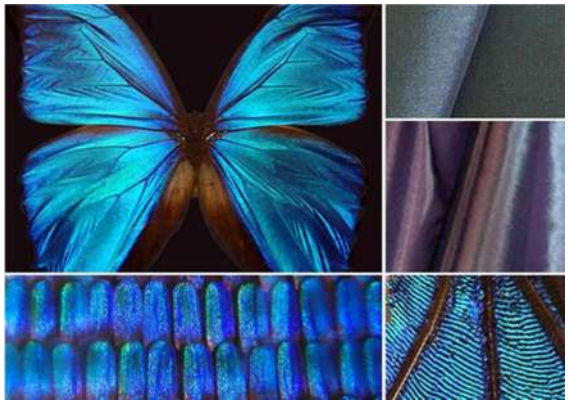
New Bionic inspired aesthetics of lighting in interior design is not achieved only by imitating natural forms, but by imitating the natural process of bioluminescence, a natural chemical phenomenon by which organisms living deep in the seas, and certain types of fungi, bacteria, insects and worms, produce light to survive in the hostile and dark environment.

The most important phase of the work of the designer is the study of the wildlife.

The main method is functional bio design - analogous comparative principles and means for shaping the design and wildlife.

Bionic research on the properties of the materials is particularly important for the design. According to the principle called "lotus effect" characteristic of the lotus leaf, thanks to the discovery that microscopic lumps covered with a layer of wax reject water droplets and also removes dirt out, designed a fabric and "Lotus" coloured properties of refusing water and self-cleaning. These materials have high potential for use in interior design. I.e. analysis of natural form designer tries

In the arrangement of the internal spaces and interesting bionics inspired discoveries of several materials, such as anti-microbial material that mimics the structure of the skin of Galapagos sharks; fabric "Morforex" made by imitating the morphology of the wings of butterflies, a mixture of nylon and polyester whose shining colors and cannot fade; bio-plastic derived from the shells of crabs and CO2 technology that mimics the metabolism of plants; strong adhesives and adhesive materials "Geckskin" that can hold objects weighing up to 317 kilograms attached to oily wall, inspired by the lizard legs.



In addition aesthetic and functional values, bionic designs have both environmental and economic value. Today, more and more attention is paid to such

properties of designs and designers strive to create environmentally friendly designs.

These few examples of designs inspired by nature, mainly used in the design of interiors, and although a bit numerous and not sophisticated enough, unlike other areas where applied bionics, however clearly show the extent to which bionics can and should serve as a basis for further development of interior design.

Given the wide scope, as well as its aesthetic, functional, environmental and economic values bionic design promises great achievements in the future of humanity and change the former understanding of technology, industry and design.

Designs inspired by nature in function of design furniture

Over millions of years of continuous evolution, nature has perfected solutions to many of the questions posed by modern engineers, architects and designers. But perhaps now, the most intriguing question is how the integration of bionic discoveries can transform into practice? The easiest way may be considered a direct imitation of nature, but this is often difficult or even impossible. Nevertheless, studies have found that it is more reasonable to understand the principles of how things work in nature, rather than running copying natural models. They make analysis of natural form and determine its tectonics and thus develop harmony with well-defined laws and principles. Perception and acceptance of harmony make structural models or images of natural form requires some transformations.

Bionic design is an innovative approach in which the nature and natural processes requires inspiration to create products, processes and facilities that it's functional design challenges are resolved by devising and applying natural strategies, methods and principles. The method of functional organic design analogies. Application of bionics in the design of the system wakes creative thinking, makes you think, look, and apply the laws of nature. Bionics is widely used in the design. Such use occurs in two ways - borrowing purely external form and machine construction, furniture created based on the laws peaking in nature.

In bionics seeks to answer more questions, for example: how nature solves the problem of insulation, nature reduces friction as nature stifling noise like nature solves the problem of moisture, such as nature collects energy, nature collects water and many other issues which man tries to find them and to make life easier. Bionic approach aims to create a design that is not only visually appealing and elegant but also functional. The design- solution can be bionic in terms of shape, material, structure, process or function.

These products meet constantly and particularly noticeable in the field of architecture. Broadest range of furniture has inspired precisely by natural forms, and as such is used in all kinds of interior and exterior. The transformation of natural forms provides an opportunity for designers to combine different shapes, colors, textures.

The shape of the shells is inspiring form, and often meets as a transformation into some sort of furniture, and even architecture. This form provides an opportunity for designers to create interesting shapes to suit multiple purposes. There are elegant line and fits into any space. Starting with sofas, shelves, chairs, armchairs, sinks and other parts of the interior, the shape of the shell is found in whole architecture. Such objects have an internal space that can be adjusted in an interesting living space, and the outer appearance is unusual and interesting.

This interesting area furniture inspired by the shell can be combined and the interior and exterior solutions. It can fit multiple styles of arrangement, and give emphasis on space.

Figure 4. Shelves inspired by the shape of the shell

Finding inspiration in the form of a shell, the designers have created interesting designs with a different purpose. In this way, through different designs, industrial products available are closer to nature, mimicking its forms, processes, materials. But except furniture, the shape of the shell was inspiring for architects who created the interesting architecture.

Figure 5. Architectural objects inspired by the shape of the shell

Beautiful, unique and irreplaceable form, the shell is one of the most perfect designs of nature. It was inspiring long ago. Primitive civilizations made drinking vessels and vases shaped shell. Later in the Greco-Roman period they were created domes, spiral staircases and decorations on the walls in the form of a shell. At the time of rococo one of the main features of this style was the decoration in the form of shell. Today inspiration of this form is seen in the design of furniture, decorative objects and architectural objects.

Conclusion

Over the years, many designers and architects seeking funds to assist in the process of creating new harmonic forms. With the development of technology, the discovery of new materials and improved conditions for new designs, new forms and interesting solutions. Today, a very important feature is the ecological value of the

products produced. Man tries more and more to adapt to nature, and to create a healthy environment. Many design solutions, architectural structures, industrial products, furniture and materials are created by transformation of natural forms and processes.

Expected inspiration from nature to contribute to the improvement of technology and its impact and be felt in all spheres of life. Some designs may seem impossible performance today, but more and more improving human understanding of nature and improve skills so that in future all designs to be realized. Design forms arising from the development of the creative process of shaping the laws of nature - it is not the forms of nature and synthesis of natural forms and means that available to a designer.

Process modelling in bio-design includes systematic study of natural forms and geometric analysis of their fundamentals. In this process, there is usually a incredible precision with which nature makes calculations of ideal geometry, although sometimes it is hidden and difficult to distinguish. However, by consciously learning, feeling great and open soul, designers can find inspiration in such research.

Living systems are very different and complex technical designs. It should be borne in mind that biological form often cannot be calculated because there is extraordinary complexity. The secret of the structure of living organisms occur in them details of the life processes, the structure and operation can be found only with modern equipment.

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ONE LINE WITH RESPECT TO THE INDUSTRIAL DESIGN AND ITS PSYCHOLOGICAL REPRESENTATION IN GREEN AREAS

Vaska Sandeva, Katerina Despot

Abstract:

"Art is always modern and truly different has never been and most importantly - cannot even be"

Art - Art is a creative human activity, the product of this creativity are works which all senses emphasize intellect. Art is the gift of human and belongs only to him, with which it differs in nature and stands out from other living beings.

Art is also a creative artistic activity or art form consciousness as a kind of reflection of reality. The origins of art even in prehistoric eras (drawings in caves).

Industrial style, we can say he is perfect in imperfection. The design theory of functionalism assumed, whereby objected primarily to serve its purpose, to comply with simple geometric shapes without decorative items made by the almost standard applied to many types of products.

It is essential for quality of life in every township is the existence of green areas. Since there is a very important application of industrial design in parks and gardens. The impact of industrial design in urban green spaces in residential areas provides dedicated aesthetic note that enriches the whole functional and aesthetic forms which are always placed at precise positions that accentuate the landscape while but do cohesion and harmony combined with large green areas and contrasts nature in industrial design.

The design is created when the artwork and a predetermined order. The artwork gets the role of usability and functional aesthetics. The design evolves with the development of industry and mass consumption.

Industrial style is a combination of different materials such as wood, metal, old bricks. Industrial parts in green areas make artwork in only one sample.

Nowadays postindustrial style often used by designers for the appearance of the buildings, but more often to create a genuine atmosphere of parks, recreation areas, restaurants and shops.

Keywords **|** ***Key phrases***

design, park, city, composition, landscape

Nowadays the concept of style is taken in a very broad sense, the general characteristic of the spiritual achievements of a human community for millennia to specific features of these or other individuals, collective or even fashion creativity.

For a design to be good, he himself besides creativity, decorative, beauty and modernity should wear and functionality.

“We do not think that the good design can make bad product better, no matter if it is a machine, building, promotive leaflet or business. However, we are sure that the good

design can significantly help the product in its realization with full potential. In short, we think that a good design is a good business." – Thomas Watson

Industrial style refers to the aesthetic design trend that highlights with sharp lines, sharper links and dynamic interaction of movement. Industrial-style exterior characterizes the interaction between form and function, all this emphasis on comfort.

With industrial style particularly relevant in recent years, architects and designers see it as a challenge and exterior game.

Figure 1. Industrial design

Figure 2. Exterior industrial design

Industrial style is economical and easy to adapt to other styles. It aims at simplicity without many details in the space. Due to the imperfection of floors and walls, typical of this style, do not require large financial corporations in finishing of these surfaces. Old objects of metal and wood, which previously were in use can often perfectly fit into the atmosphere.

Industrial design is a strong blend of art and science to improve the look, ergonomics, functionality and even the use of the product can also be used to improve the market value, even the production.

Industrial design is the outward appearance of the product in whole or in part which is determined by its features, especially the lines, contours, colors, shape, texture and materials of which the product is made of or decorated, and/or its ornamentation, under the industrial design Law.

"Dynamic composition" is frequently used expression when speaking of modern parks. The expression is often associated with the ability to move, to change mood and mutual relationship of all elements in the full expression of the park. The composition represents forms within a given expanse.

Setting up forms and elements depends on the desired effect, in the narrow sense composition can be defined as an image, or better yet image-composition of free or geometric figures that are found in any dependency on each other. The compositions depend on a number of objective factors, among which the aesthetic requirements take an important part.

As a scientific discipline the theory of composition has its own categories, those are tectonic structure and volume – spaciousness structure.

In exterior design, industrial design used for recovery in terms of industrial wasteland and analysis of the design of ecological environmental protection, recovery, functionality and landscape elements with a specific case.

Industrial design focuses on the return of an environmental standpoint. It can be shared with new communicates with the story, and to allow the past to acquire rebirth, forming a harmonious whole landscape and industrial heritage.

Figure 3. Industrial design in the park

The composition in the art of park implies combining elements and principles in building a park.

Convergent line

If one pays attention to the convergent lines such as roads, railroads, sidewalks or shadows, it is noticeable that these lines will direct one's gaze to distant parts, making the view more dynamic.

Rhythmic elements

The rhythmically repeated elements, such as trees, benches, people - or any group that repeats, forms a resting feeling for visitors, but small variations in the composition brings out liveliness and makes it more interesting.

Elements that overlap

Overlapping of elements in the scenery, partially covering objects creates a sense of mystery. It is creating more depth by creation of space in the view.

Shaping of elements

Elements that give shape to the space such as trees, urban equipment, doorways form a framework that will focus the viewer's attention to the point of interest. This technique provides excellent results with any zoom setting. Proper composition can matter great deal in building a park. The park should not just represent a picture, but a work of art that will offer pleasant feeling and lot of content. Composition is a matter of relations in a park. Every composition has its own specific factors such as:

- Concept or idea

- Material which achieves the idea
- Form for composition
- Elements for composition

Effective expression of the artist's (photographers) idea is the main objective of any composition, and it can be expressed only in a composition that is in place and related to make a firm and clear synthesis. Synthesis means unity, and unity is what makes the creation (pictured) giving a strong impression even upon first contact with the viewer.

Given that the first and strongest impression comes from the visual elements that give the momentary and direct effect on viewer's feelings, the artist (photographer) should seek his expression to flow more through them than through thematic content. After all, the viewer does the intellectual reading of the thematic content gradually and much later.

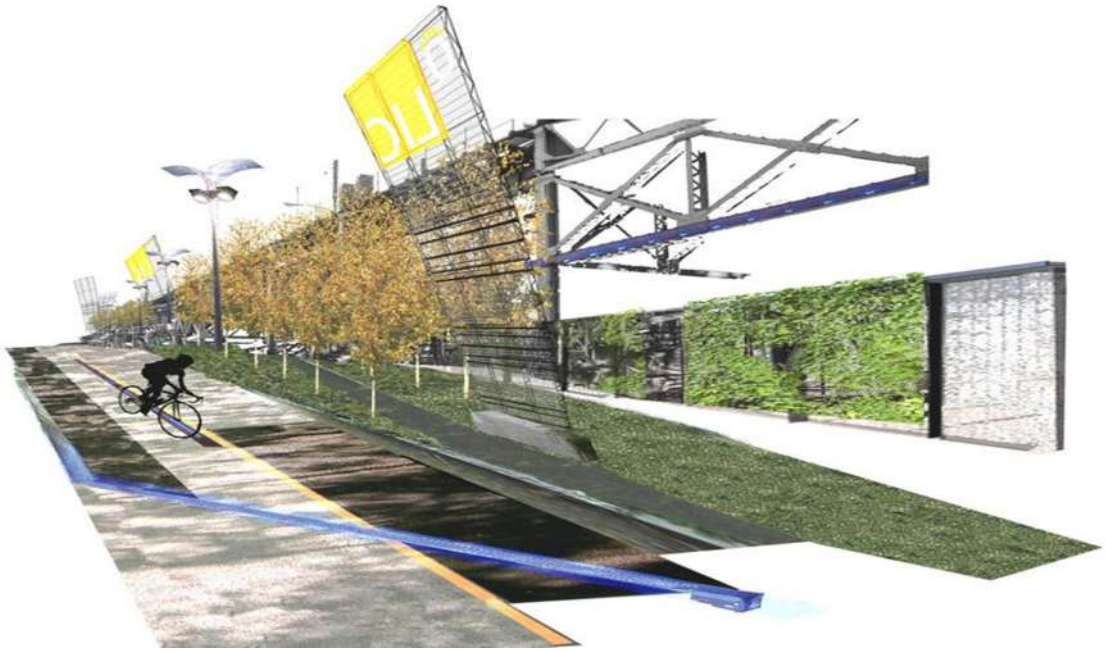

Figure 4. Industrial design in the park

Park art – Park art is a way through which a person maintains the surrounding natural environment. With the deviation of pagan beliefs before religious beliefs the park art evolved and began to express ideas and other functions. In the advanced stages of society development gardens turn into an object of visual pleasure and a way for the superiority of man over everything else to be shown. The approach of people towards nature gives vigor to think they govern it. This opinion was dominated at the time of the Italian Renaissance.

Art can be divided into three categories:

1. Spatial - arts that exist only in space - art, architecture and applied arts.
2. Temporal - which only exists in time - music, literature.
3. Spatial-temporal - exists in space and in time - dance, theater, and cinema.

Therefore park art is spatial-temporal because the spatial created work, park or garden exists in space and time at the same time.

Park art belongs to the category of spatial – temporal fine art and complex art.

Park art is a creative activity that aims to create a purposeful organic material

environment for communication between man and nature which are charged with content of modern and cool new trends of the fast and dynamic life.

Features of the park art

- Emotions - the ability to communicate specific feelings
- Cognition - with its help people enrich their knowledge,
- Nationality – it forms the love and empathy towards national tradition
- Realism - art is aligned with some purpose and characteristics (efficiency)

Industrial design is a creative activity to determine external quality of industrially manufactured items. The term industrial design can be treated as a term that denotes the area or discipline that means a finished product. Industrial design is an area that is directly derived from modern technology, where mass production and distribution of spent goods creates demand that can be satisfied with the quality products to the needs of man.

Therefore interdisciplinary and multidisciplinary treatment of the design is correct and true approach, using multiple scientific disciplines in the development of products or methodology of industrial design.

The design is a creative activity whose aim is to establish multilateral quality of facilities, processes, services and their systems in the whole life cycle. That is why design is the key, a central factor in innovative humanization of technologies and the crucial factor of cultural and economic change.

Industrial design is an industrial property that relates to a specific look or form of body, painting, drawing, contour, composition, color, texture or their combination thereof it meets the requirements of novelty and individual character to those previously known to public. Industrial design gives products a certain visual aesthetic, ergonomic, practical purpose or quality that distinguishes them from other products on the market.

Industrial design services are often provided in the context of cooperation and working relationship with other members of the development group. Typical groups include management, marketing, engineering and manufacturing specialists. The unique contribution of the industrial designer is emphasizing those aspects of a product or system that relate the most to human characteristics, needs and interests. This contribution requires an understanding of visual, tactile, safety and convenience criteria, with concern for the user. Education and experience in anticipating psychological, physiological and sociological factors that affect the user are considered as essential industrial design resources.

They work to prove that design recommendations use materials and efficient technologies, in accordance with all legal and regulatory requirements.

Industrial design has a dual application. It serves to satisfy the need of a good and useful. By its nature and by its shape, with which it presents to the public, it is located halfway between the invention and the "pure" art.

The legal protection of industrial design consists in protecting the distinctive elements that are responsible for the success on the market. The legal protection of industrial design among other things intensifies the investment in resources that nurture it, pushing design as an element of production. Protection of industrial design is determined

in different ways depending on the country. Industrial design is an applied art that enhances aesthetic and use values of the products.

The link between the park and the industrial design - the reason for setting up industrial objects is primarily adding functional segments in a park which is complemented with decorative content and shows us modern trends.

Specific features of park art and industrial design are as follows: scale, dynamics of development, availability and understandable character.

Scale - artistic principle, which defines the relationship of the dimensions of individual components and elements between them and toward the whole. The scale is also widely used in industrial and manufactured items because they are related to ergonomics.

There are two types of scales in a park:

• Relative - when surface or volumes cause optical performance for different scales in the same size of the entire area.

• Human - distinguishing the volumes and surface areas in such ratios that are associated with generally accepted medium dimensions of the human figure and the reach of his perception.

- Dynamic of Development - the basic material that is alive suffers continuous changes.

- Available and understandable character

The application of the scale in a park and related industrial scale give the complete composition of the future park.

Conclusion

The composition is a very important element in the landscape design and industrial design. It makes outer space - park much more pleasant while crossing it. Thus we can conclude that various compositions are compatible with one another and in combination fit perfectly into the design of the landscape but also have to do with the ideal blend of all elements that make up the whole.

Short definition of industrial design would say: the design represents determining and shaping of the quality and the attitude of manufactured items, cleaning, communications, systems, processes and environment satisfying conditions of production, distribution and use of interdisciplinary methodology.

When accurately determined and placed in the composition of the park they have a dual role they have strictly defined functions and their second purpose is sculptural decoration which gives parks a modern and contemporary look, their setting gives industrialized look which is the right concept for large cities. The idea is for the visitors to rest and yet, not to forget the everyday.

The style of contemporary exterior, besides the actual, quality equipment, widely understood perception, impression which should cause constant application of various types of materials. Industrial designer has double function. He serves to satisfy the need for beauty and benefit. As per his essence and his form presented in public, he is on a half way between the innovation and pure art. Because of that, there is legal protection of industrial design, which is in the middle between innovation and a copyright.

The research subject of industrial design is functionality, shape and connection between the product, user and environment.

Industrial design is a right of industrial property that refers to the specific look of the form of the body, contour, colors combination, their texture or composition that meets the conditions for novelty and distinction compared to those previously known to the public. Industrial design gives the products defined visual, aesthetic, ergonomic, practical and target quality differentiating them from other products present in the market.

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