THE RAW MATERIAL FOR THE CEMENT INDUSTRY-DEPOSIT PERFORMANCE: COMPUTER APPLICATION OF THE DISCRETE INTERPOLATION OR FINITE DIFFERENCES METHOD

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Abstract

The formation of the discreet mathematical model as the precondition of the ore homogenization by opal breccia for the cement industry demands is based on the principle of the discretion extant, i.e. the deposit simulation as an extant phenomenon over the mini blocks system. The whole or the encircled part of the deposit by interpolation together with the working environment is devided over the prisms - mini blocks, so every prism, as a part of the whole is bearing some information about the located part of the extant.

Introduction

By means of that physical represented model, it may be described mathematically by matrix form symbols or figures whichever representing the block. In such away the extant model directly may be represented as a three dimensional matrix or indirectly by two dimensional matrix set in the horizontal or vertical sections. The model formation course of the deposit is run across the following phases: 1. The collecting and working out of the investigated information by the deposit; 2. The preparations of the investigated information's for computer working out; 3. The memory of the investigated information; 4. The safety valuation of the investigated information by means of the geo statistical methods; 5. The determination of the mini blocks dimensions; 6. The choice of the working out method - the interpolation; 7. The computer working out; 8. The printing and drawing of the output results; 9. The analysis of the obtained results.

The Application of the Discreet Interpolation

If the purpose is to form the discreet model of both deposit or ore body with the surrounding follower rocks, the deposit extant have to be derived in mini blocks. According to the obtained in formation by the investigated tests have to define mining-geology signs of every block, i.e. the useful component assay, the both assays tailings and injurious components, the digging residence etc. which will contribute for the studying of the possibility of composite material production which will be used in the cement industry. The idea of the extant discreet interpolation is based on the definition from the influence of every point bearing the investigated information from the influenced group of the investigated mini block.(Fig. 1.)

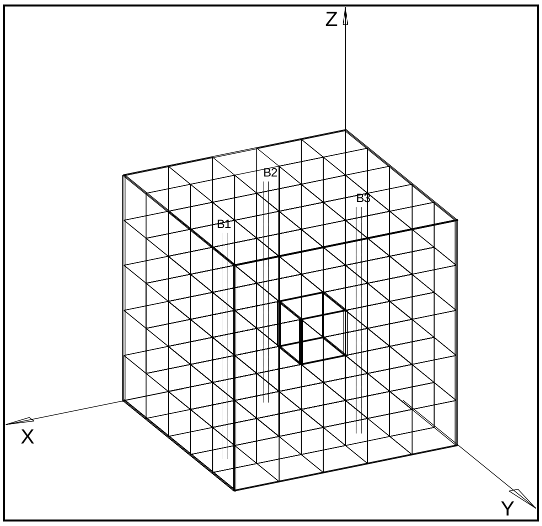

Fig. 1 - Scheme of the mini block

The influence of the all known points - holes from the influenced group, to the observed unknown point - mini block is estimated according to the equation:

$$U_n = \frac{\sum_{p=1}^{p=m} U_p \cdot L_{p,n}^{-l}}{\sum_{p=1}^{p=m} L_{p,n}^{-l}}$$

where are:

U_n - *unknown point;*

U_p - *known point;*

$L_{p,n}$ - *distance between influenced known and unknown point;*

l - *degree of influenced activity of the distance.*

From the theoretical view point, defining the characteristics of every unknown point - the mini block by means of discreet interpolation, the influenced activity has had all information points as a bearers of the mining-geology information about the unique extant whole - deposit, having:

$$U_{min} < U_n < U_{max}$$

Experimental Investigation of Discreet Interpolation

The practical experiment and reviewing of the discreet interpolation applicable for the deposit model formation, are carried out by means of experimental investigation from the opal breccia deposit “Spancevo”-Cisinovo- R. Macedonia, according to the set theoretical principles, simultaneously, using the graphic presentation with SURFER computer programe. It was encircled the deposit investigation field represented by blocks matrix with following dimension: Dx = 50 m and Dy = 50 m with carried in disposition of the investigated holes (the number of 36) with following characteristics (Table 1.):

Table 1. The disposition of the investigated holes, SiO_2 and Al_2O_3 assays

Hole Nº	*Sample Nº*	*Type of material*	*Chemical analysis results*	
			SiO_2	Al_2O_3
1	1/1	Opal breccia	74.06	12.81
2	2/1	Opal breccia	79.92	7.54
3	3/1	Opal breccia	87.50	2.15
4	4/1	Opal breccia	85.49	2.92
5	5/1	Opal breccia	80.70	10.06
6	6/1	Opal breccia with andenzite inclusion	53.46	20.13
7	7/1	Opal breccia	79.92	7.54
8	8/1	Opal breccia	84.50	5.15
9	9/1	Opal and tuf breccia	74.95	12.60
10	10/1	Andenzite, vulcanic tuf	51.80	4.50
11	11/1	Opal breccia with andenzite inclusion	52.70	16.05
12	12/1	Opal breccia with andenzite inclusion	57.10	22.32
13	13/1	Opal breccia	70.36	14.80
14	14/1	Opal breccia	81.70	9.06
15	15/1	Opal breccia	78.92	6.50
16	16/1	Opal breccia	88.40	2.25
17	17/1	Opal breccia	83.17	4.52
18	18/1	Opal breccia	80.94	6.03
19	19/1	Opal breccia with andenzite inclusion	56.40	15.73
20	20/1	Opal breccia	87.30	2.82
21	21/1	Opal and tuf breccia	78.40	6.35
22	22/1	Opal and tuf breccia	73.95	1.60
23	23/1	Opal and tuf breccia	79.70	9.06
24	24/1	Opal breccia	89.40	1.92
25	25/1	Opal breccia	80.93	8.90
26	26/1	Opal and tuf breccia	68.60	10.00
27	27/1	Opal and tuf breccia	69.50	9.10
28	28/1	Opal breccia	86.40	2.25
29	29/1	Opal and tuf breccia	69.60	2.92
30	30/1	Opal breccia	78.82	7.50
31	31/1	Opal and tuf breccia	74.40	6.40
32	32/1	Opal and tuf breccia	73.95	2.65
33	33/1	Opal and tuf breccia	74.82	5.77
34	34/1	Opal breccia	76.60	4.00
35	35/1	Opal and tuf breccia	71.36	13.80
36	36/1	Opal and tuf breccia	78.30	7.25

MODEL OF SPANCEVO DEPOSIT ACROSS SiO_2 obtained by discreet interpolation

```
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99999ZZZZZZZZ###$###ZZZ9ZZ9X88URKEAPYPHLALVAA1E33
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          54.00 < P <= 55.00   55.00 < H <= 56.00   56.00 < L <= 57.00
          57.00 < V <= 58.00   58.00 < A <= 59.00   59.00 < 1 <= 60.00
          60.00 < C <= 61.00   61.00 < 2 <= 62.00   62.00 < E <= 63.00
          63.00 < 3 <= 64.00   64.00 < G <= 65.00   65.00 < 4 <= 66.00
          66.00 < K <= 67.00   67.00 < 5 <= 68.00   68.00 < N <= 69.00
          69.00 < 6 <= 70.00   70.00 < R <= 71.00   71.00 < 7 <= 72.00
          72.00 < U <= 73.00   73.00 < 8 <= 74.00   74.00 < X <= 75.00
          75.00 < 9 <= 76.00   76.00 < Z <= 77.00   77.00 < # <= 78.00
          78.00 < $ <= 79.00   79.00 < B <= 80.00   80.00 < I <= 81.00
          81.00 < D <= 82.00   82.00 < J <= 83.00   83.00 < O <= 84.00
          84.00 < S <= 85.00   85.00 < Q <= 86.00   86.00 < F <= 87.00
          87.00 < M <= 88.00   88.00 < @ <= 89.00   89.00 < & <= 90.00
```

MODEL OF SPANCEVO DEPOSIT ACROSS Al_2O_3 obtained with descreet interpolation

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LEGENDA:   1.00 < W <=  1.50    1.50 < T <=  2.00    2.00 < Y <=  2.50
           2.50 < P <=  3.00    3.00 < H <=  3.50    3.50 < L <=  4.00
           4.00 < V <=  4.50    4.50 < A <=  5.00    5.00 < 1 <=  5.50
           5.00 < C <=  5.50    5.50 < 2 <=  6.00    6.50 < E <=  7.00
           7.00 < 3 <=  7.50    7.50 < G <=  8.00    8.00 < 4 <=  8.50
           8.50 < K <=  9.00    9.00 < 5 <=  9.50    9.50 < N <= 10.00
          10.00 < 6 <= 10.50   10.50 < R <= 11.00   11.00 < 7 <= 11.50
          11.50 < U <= 12.00   12.00 < 8 <= 12.50   12.50 < X <= 13.00
          13.00 < 9 <= 13.50   13.50 < Z <= 14.00   14.00 < # <= 14.50
          14.50 < $ <= 15.00   15.00 < B <= 15.50   15.50 < I <= 16.00
          16.00 < D <= 16.50   16.50 < J <= 17.00   17.00 < O <= 17.50
          17.50 < S <= 18.00   18.00 < Q <= 19.00   19.00 < F <= 20.00
          20.00 < M <= 21.00   21.00 < @ <= 22.00   22.00 < & <= 23.00
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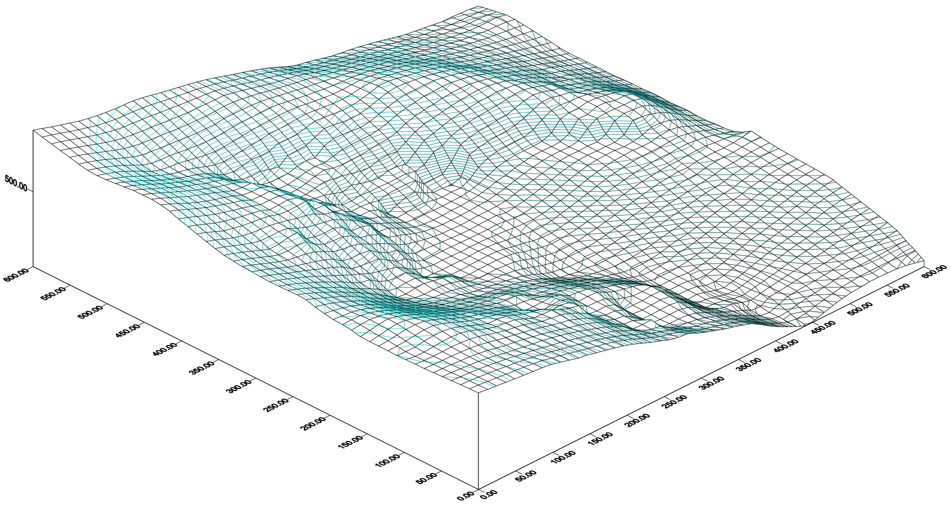

Fig 2. Situation of the opal breccia open pit - SPANCEVO Mine

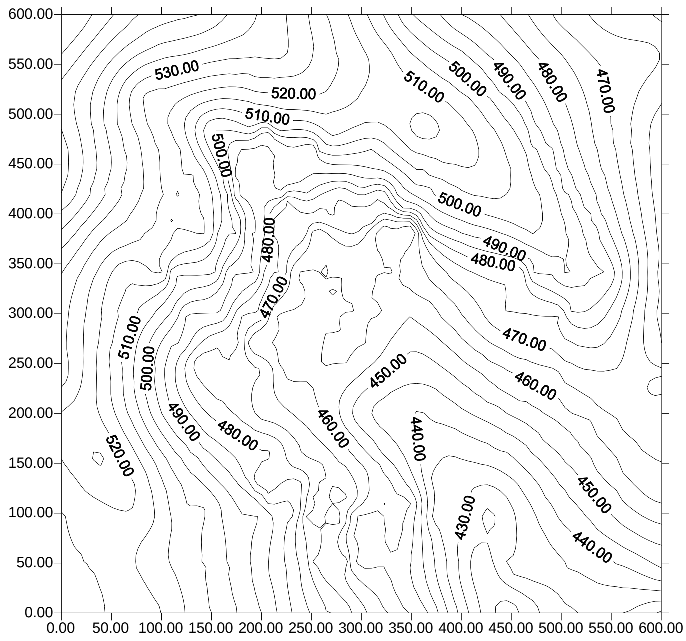

Fig 3. Situation of the opal breccia open pit - SPANCEVO Mine

Conclusion

On the basis of the obtained results and other reference data related to the application of descreet interpolation in modelling of deposits may be seen the fact that this method is fairly useful which is first of all seen in its simplicity, flexibility and accurancy. The method isn’t appropriate in deposits which posses an abrupt change in the modelled trait, for example deposits with explicit effect of native occurance, the stockwork deposits etc.

The only issue that remains unsolved is the defining of the zone of influence. The selection of its shape and size is made experimentally or by intuition which may cause mistakes. Therefore, a scientific objective procedure for the defining of the zone of influence has not been developed. The degree of influental action of the distance is essential important component in the model which exerts a dumping action. The importance of this one becomes greater if the zone of influence has been defined with less accurancy. Concerning our experience a satisfactory results can be achieved for both: l=2 or l=3.

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