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HUMAN MENTAL ACTIVITY MODELING

Thinking is an essential feature of the human brain. It is the object of study of numerous organizations in the world, and the creation of certain model that can simulate human cognitive activity has been the goal of many scientists for a long time.

The research object of this work is the process of human thinking. The research subject is the software that will allow modeling human thinking process.

The goal of this work is development of software that will allow modeling the human thinking system based on p-adic trees.

P-adic metric, constructed described by Kurt Hensel, is a sequence of numbers, which describes the distance between the ideas, which are processed by the brain, and defines associative thinking. It has been used before [1]. According to this model, the brain is divided into the areas of the consciousness and subconsciousness, which are controlled by the corresponding centers (CCC and CCS).

The information J0, which is received from the external environment by the human analyzers, can be presented as a p-adic number. This information passes through CCC to the set of processors of thinking π located in the CCS, after which it is transformed into an idea-attractor J.

Ideas that have become too interesting or too forbidden throughout existence of the individual and gaining experience by them are stored in the long-term memory (LM) in the database of the interesting ideas (Di) and in the database of the forbidden ideas (Df) respectively.

Therefore, the obtained solution J is sent to the working memory (WM), specifically to the comparator (COMc), where the distance to Di and Df is measured by formula (1) [1]:

$$\rho_m(x, y) = \frac{1}{m^k}, \quad (1)$$

where x, y – sequences of numbers with a base $m > 1$, k – position, which x and y have different numbers on.

Further, the measures of interest I(J), countermeasure F(J), coherence T(J), and the strength of the idea S(J) are calculated according to formulas (2) - (5):

$$I(J) = \frac{1}{1 + \rho(J, D_i)} \quad (2)$$

$$F(J) = \frac{1}{1 + \rho(J, D_f)} \quad (3)$$

$$T(J) = a * I(J) - b * F(J) \quad (4)$$

$$S(J) = c * I(J) + d * F(J), \quad (5)$$

where $a, b, c, d > 0$ – are parameters of the thinking system [1].

Calculated parameters are compared to the appropriate thresholds, which are individual for each person and can be calculated with the passing certain psychological tests, and afterwards added to the model.

The idea is either deleted or included in the area of doubts (Od) or to the accumulator of ideas awaiting implementation (Q) in accordance with the result of the calculations. In addition, it can be included in the LM (Di or Df respectively), where, in turn, can be deleted under the influence of time (formulas (6) – (8)):

$$I(t, J) = l_{mem} (t - t_0) * I(J) < I_{mem} \quad (6)$$

$$F(t, J) = l_{mem} (t - t_0) * F(J) < F_{mem}, \quad (7)$$

$$S(t, J) = l_{mem} (t - t_0) * S(J) < S_{mem}, \quad (8)$$

where $I_{mem}, F_{mem}, S_{mem}$ – thresholds of deleting from LM, $l_{mem}(0) = 1$ and l_{mem} decrease with the increase of t .

The developed software should reflect the work of the described model of thinking, allow a user to set individual parameters with the user interface and explore reactions and choices based on the individual characteristics of subjects.

REFERENCES

1. Khrennikov, A.Y. Modelling of psychological behavior on the basis of ultrametric mental space: Encoding of categories by balls. P-Adic Num Ultramet Anal Appl 2, 1–20 (2010): [Электрон. ресурс]. – Режим доступа: <https://doi.org/10.1134/S2070046610010012>