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APPLICATION OF INDISTINCT SETS IN FAM BORING PIPES FOR THE INTELLECTUAL THE ROBOT

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The Analysis of tendencies of development of a robotics in flexible automatically manufactures of boring pipes (FAM BP) shows that one of the most perspective directions for FAM BP, is creation of robots with artificial intellect elements. In the general view the similar robot can be described in the form of functional structure, in conformity with which a necessary element of such robot the touch system allowing on the basis of the information on an environment is, to generate the models necessary for functioning of algorithm of planning purposeful of carrying out of robot FAM BP and its reflex activity, the planned strategy of carrying out pre-appointed for the realization robot in the conditions of constant changes of parameter PF. Thus acceptance of robot decisions, according to the plan of purposeful behavior developed by it and taking into account "the reflexes" put in it, are transferred in the block of planning of program movements, transfering there in commands on executive bodies FAM BP.

The purpose of given article is planning problems purposeful behavior of the intellectual robot, and also formation and replenishments knowledge in Б3 reflex activity of the last, i.e. its self-training in the course of functioning.

Considered concentration of planning purposeful on-conducting the intellectual robot (IR) is based on FAM BP that functioning. the last is carried out in difficult dynamic process which is characterized by the big degree of uncertainty. In this pertinently to remind that else in [1] the idea has been come up with that system FAM BP leaning on rigid "well-badly" of a reasoning, appears not-adequate for "reasonable" behavior in real environments. The person, carrying out even the most unpretentious tasks, operates in always odd and potentially uncertain environment, and of its reasoning is constant observe expressions "possibly,» probably",« perhaps and like … ». The a formulation concept acceptances IR is based on necessity workings out logic формализмов based on interpretentse the above-stated uncertainty, as illegibility's, i.e. on indistinct (multiple-valued) logicians. For this purpose the indistinct logic is defined as is scarlet-gebraic system $<[0,1],\hat{Z},\hat{V},\sim>$ in which the set of values of difficulty makes the closed interval [0,1], and logic operators» And"($\hat{Z}$),"OR"($\overset{2}{V}$) and "NOT"(~) are defined as [2].

$$
\begin{aligned}
T(\tilde{A},)\overset{\wedge}{,}T(\tilde{B}) &= \begin{cases} 0, \text{ если } T(\tilde{A})+T(\tilde{B})\le 1 \\ \max\left[T(\tilde{A}),T(\tilde{B})\right], \text{если } T(\tilde{A})+T(\tilde{B})>1 \end{cases} \\
T(\tilde{A},)\overset{2}{,}VT(\tilde{B}) &= \begin{cases} 1, \text{ если } T(\tilde{A})+T(\tilde{B})\ge 1 \\ \min\left[T(\tilde{A}),T(\tilde{B})\right], \text{если } T(\tilde{A})+T(\tilde{B})<1 \end{cases} \\
\sim T(\tilde{A},) &= 1-T(\tilde{A}) \\
T(\tilde{A},),T(\tilde{B}) &\in [0,1]
\end{aligned}
\qquad (1)
$$

where T (•) is value of the validity, $\tilde{A},\tilde{B}$ is indistinct F statements. First of all, it is necessary to shine some key aspects of constructive realization of a principle allowing for planning of the purpose directed behavior of IR FAM BP. For this purpose we will enter concept p - predicate in particular, we will give the following. F - as a predicate is called defined on individual F is variables x1, …., xn proportional function of a kind Here – with $P_F(x_1,....,x_n)\in[0,1]$. Here P_F is a symbol of the F-relation with accessory function (FP) $\mu_{P_F}: U_P \to [0,1]$; IR is universal set $x_i(i=\overline{1,n})$; define district F-predicate. Thereupon it is necessary to notice $x_i(i=\overline{1,n})$ that to everyone there corresponds some linguistic variable of a kind

$\dot{x}_i = \left\{ < x_i^j, U_{x_i}, \tilde{x}_i > \right\}, x_i^j \in T_i^*(U)$ where - $T_i^*(U)$ the expanded thermo-set of a corresponding linguistic variable. $\tilde{x}_i$ - normal F - set with (FP) $\mu_{x_i}; U_{x_i} \to [0,1]$; U_{x_i} - corresponding universal sets. Thus $\forall_i = \overline{1,n} / \dot{x}_i \Leftrightarrow$ {sort=individ}. For example, numbers, subjects, the phenomena, etc. further we will enter syntax:

a) F – variable, linguistic variables, functional symbols, symbols f_1^F, f_2^F of relations P_F, Q_F, R_F.

b) Symbols of logic operators $\left\{ \overset{\wedge}{2}, \overset{2}{\vee}, \neg, \vec{2}, \vec{\exists}, \exists \forall \right\}$ where $\overset{\wedge}{2}, \overset{2}{\vee}, \neg, \vec{2},$ it is defined as in (1),

+thus

$$x \leftrightarrow y = \begin{cases} 1, \text{ if } x=y \text{ if} \\ \wedge \left\{ \left[(1-x) \wedge y \right] \left[(1-y) \wedge x \right] \right\} \text{ if } x \neq y \\ 0, \text{ if } x=0,\ y \neq 0 \text{ or on the contrary} \end{cases} \quad (2)$$

where $x \wedge y = \min(x, y); \exists x = \inf_{x \in U} \mu_x(U), \forall_x = \sup_{x \in U} \mu_x(U)$

v) everyone F – a variable or the individual is a term. A term is also expression $f_i^F(t_1,...t_n)$, $\varphi^F(t_1,...t_n)$, where $(t_1,...t_n)$ - terms. F – the predicate $P_F(t_1,...t_n)$ is the atomic formula, if $(t_1,...t_n)$ a term.

q) Any atomic formula $P_F(t_1,...t_n)$ is F – the formula.

d) If A_F both B_F - F - formulas and x - F – a variable each of expression

$$\neg A_F \left(A_F \overset{2}{\vee} B_F \right), \left(A_F \overset{\wedge}{2} B_F \right), \left(A_F \xrightarrow[2]{} B_F \right), (\forall \times A_F), (\exists \times A_F)$$

are F – the formula.

e) $\neg \forall \times P_F(x) = \exists \times (\neg P_F(x))$,
$\neg \exists \times P_F(x) = \forall \times (\neg P_F(x))$

For descriptive reasons we will give an example F – a predicate, for what observe space of conditions (functioning) of IR FAM BP, as F - metrical n - measured S_F, i.e. with the metrics $\forall \tilde{A}, \tilde{B} \in S_F$.

$$f_{AB}(x_1,...x_n) = \sum_{i=1}^{n} |\mu_A(x_I) - \mu_B(x_i)|$$

Then F – a predicate, for example, «FAM BP W is near to a point In» can look like:

$$\tilde{A}T(W,b) = 1 - \frac{\sum_{i=1}^{n} \forall_{x},...,\forall_{x_n} |\mu_W(x_i) - \mu_B(x_i)|}{n} = \quad (3)$$

$$= 1 - \frac{\sum_{i=1}^{n} \sup_{x_1},...,\sup_{x_n} |\mu_W(x_i) - \mu_B(x_i)|}{n} =$$

It is necessary to notice that work on of realization of procedure of planning purposeful conducted by IR FAM BP now is executed. In a basis of the given scheduler system "STRIPS" [3] is put known planing, ideas which are added by the theoretical results shown above. Its difference consists, first of all, that here planning is carried out in space F – conditions.

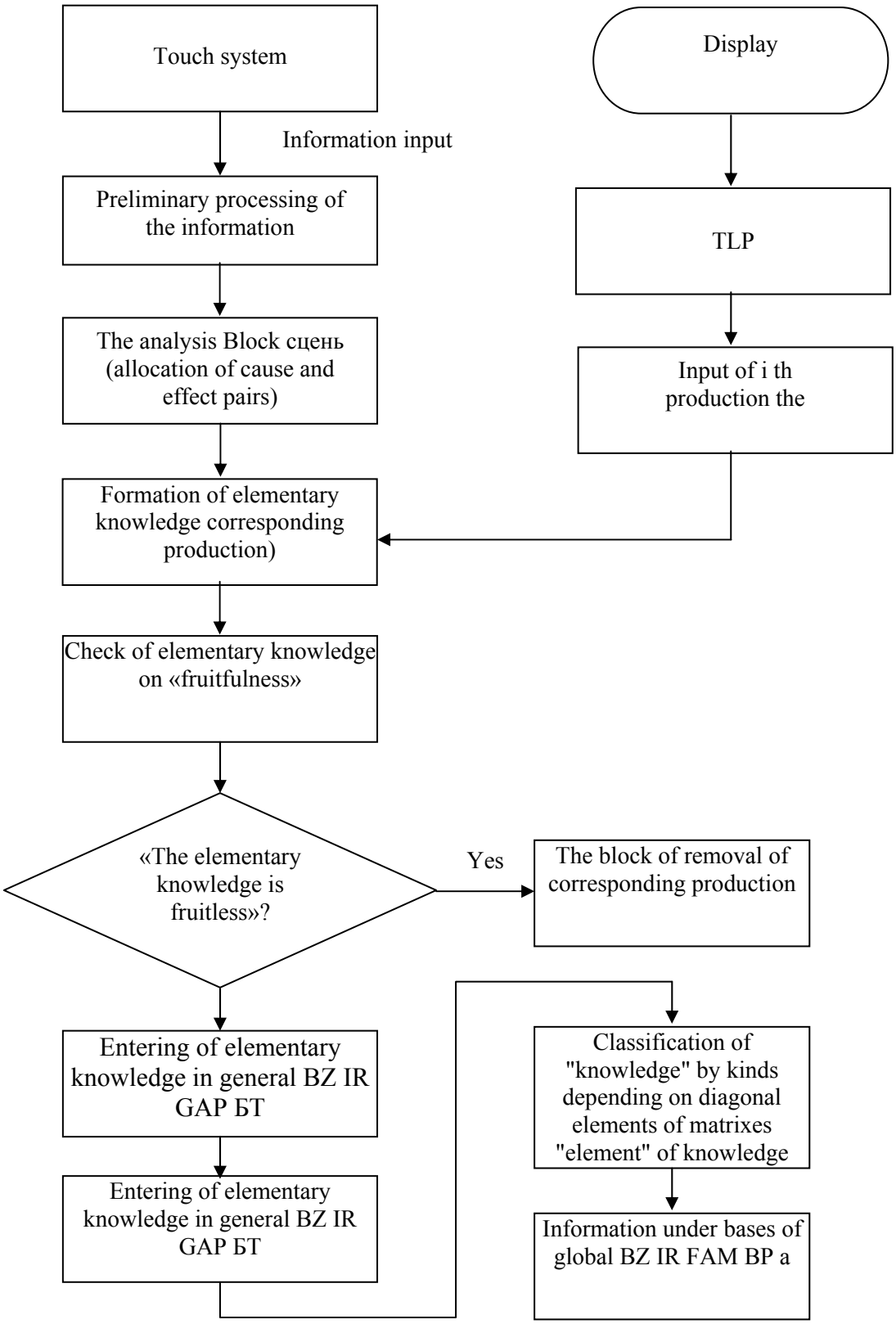

Fig. 1. Formation of knowledge of reflex activity of IR FAM BP

– F – the condition $\mu_i(i \in J)$,received after application of various operators, is F – the formula.

– F - the purpose $\tilde{C}$ also is F the formula; approachability F – the purposes and F subaim is defined in the event that corresponding F - models $\tilde{\mu}_i$ and F - the purposes $\tilde{C}$, F – rezolvent, i.e. $R[\tilde{C},\tilde{\mu}_i]$as F – the formula not is mentioned, i.e. $T(R[\tilde{C},\tilde{\mu}_i]) < 0{,}5$

– to any F - to a condition $\tilde{\mu}_i$ can be applied various F – the operators translating to IR GAP БТ in various new F – conditions $\tilde{\mu}_{i+1}$ (j number F – operators, i – condition number);

– Everyone F – the operator is characterized by that the result to its tonic cannot unequivocally be interpreted, i.e. transition in new consisting IR FAM BP should be carried out with possibility degree (trust of an illegibility etc.) Everyone F – the operator is characterized;

a) condition of applicability in the form of F – a predicate or a set of those;

b) lists of deletions and additions, which in this case substitution of new values F – the variables received in resultant of application j the F – the operator in previous F – model $\tilde{\mu}_{i-1}$;

– all conditions of applicability are interpreted in the beginning as F - under-purpose, i.e. in the form of F – predicates $\tilde{\ell}_j(j \neq 0)$.

In the conclusion it is necessary to discuss the questions connected with, whether in literature that in, the devoted given problematic, is mentioned that in a how, BKN intellectual system the demand «tolerance to contradictions» is made. In our case performance of the similar requirement can be shown, finally, to splitting logic-semantic contradiction OZ on LSN-BLOCKS with the various scales defined, measures, frequency of occurrence indistinct product, characterizing this or that tendency in cause and effect pairs (i.e. Values a diagonal of elements of a matrix $R(\cdot)$, and for this purpose it is possible to use kind functions

$$J_{R_i} = T_r(R_i) - T_r(R_i'),$$

$$\mathrm{Sign}J_{R_i} = \begin{cases} +1, T_r(R_i) - T_r(R_i') > 0 \\ -1, T_r(R_i) - T_r(R_i') < 0, \ i = \overline{1,N} \end{cases} \quad (4)$$

On fig. 1 it is represented possible structural formations of knowledge of reflex activity of IR FAM BP by means of entering from the display of the table of linguistic rules and their updating through touch system of the robot. Here it is necessary to add that importance difficulty of realization of offers of structure is realization of procedures of the analysis of the scenes demanding special research.

Literature

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