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ELECTRONIC HEALTH REGISTER BASED ON THE COMPUTER MODEL OF ORGANISM

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Content

- 1. The problems of the electronic medical registration creation
- 2. The Structure of electronic health passport
- 3. The problem of technical realization
- 4. The linguo-combinatorial simulation of complex systems
- 5. The adaptation maximum phenomena
- 6. The analytical model of organism
- 7. Conclusion

??? PROBLEMS ???

Indicated by the offered models authors:

- The huge cost of expenses
- Training of medical staff
- Increase of load for the staff

??? DEEP PROBLEMS ???

- a problem of qualities of the presented information
- conflicts of medical conclusions
- how to help doctor to make medical decisions
- accumulating amount of information make the analysis difficult

??? BASIC PROBLEM ???

CORRECTNESS and TIMELINESS
of MEDICAL DECISIONS

↓

ANALYSIS

↓

SYNTHESIS

Transition quantitative – that is huge number of the medical data - in qualitative, that is acceptances of the best medical decision, it is possible only at use of the *computer* as the founder of individual model of each patient on the basis of the established uniform *model* of a human body

!!! BASIC MOTTO !!!

«to treat the person,
instead of the diagnosis»

The principals of Health Passport establishment

1. General (base) parameters

(entered by the patient, health professionals, family practice (or private) doctors)

2. Special parameters

(entered by doctors-specialist)

All data is consolidated by
«Computer model of a human body» (CMHB)

Parameters	Actions CMHB
1.Patient`s Identification Data (Passport data) Dermatoglyphics markers (finger-print)	-Verification with the passport office -Data on risk of disease in the given age and sexual group -Environmental risks in the given region - Statistics on disease in the given region - «a circle of risk »

Parameters	Actions CMHB
2. Anthropometrics (physical examination): height, weight, volume of breast, etc.) Using the digital picture or phone photo camera	-Recording of proportions -Rating (comparison with standards) -Estimation of Harmony and Constitution

Parameters	Actions CMHB
3. Pre-natal and post-natal history cases	The Estimation of risks

Parameters	Actions CMHB
4. Obligatory genetic (screening markers) the most wide-spread socially significant diseases: - Metabolic factors of development of an ischemical heart disease -Family/hereditary history -- System genes of detoxication	- Verification with the data under №1 - Evaluation of risk - The offer of standard system of preventive maintenance and supervision

Parameters	Actions CMHB
5. The formalized questionnaire of the patient (parents): The life history, habits, labor activity, harmful habit, etc	Analysis of the questionnaire Account of risks (ball systems)

Parameters	Actions CMHB
6. The data for the emergency help Blood type, Rhesus factor the factor Allergic reactions	System of the prevention of medical professionals Account of risks and treatment.

Parameters	Actions CMHB
7. The standard protocols of supervision over patients: - Pulse - Blood Pressure - Clinical analyses of blood, urine - X-Ray examination - electrocardiogram (ECG) - immunization	Analysis Comparison with all groups Account of risks Contraindications for doctors-specialists actions in connection with a somatic condition of the patient (for example: Operation endoprosthetics only after cardiologist investigation)

Establishment

Introduction of a "soft way", since maternity clinics
and female consultations will be optimum.

usb-flash-card is outdated

1. In any case, constant synchronization of the information with a powerful server is necessary.
2. The computer for communication of information through the Internet is necessary.

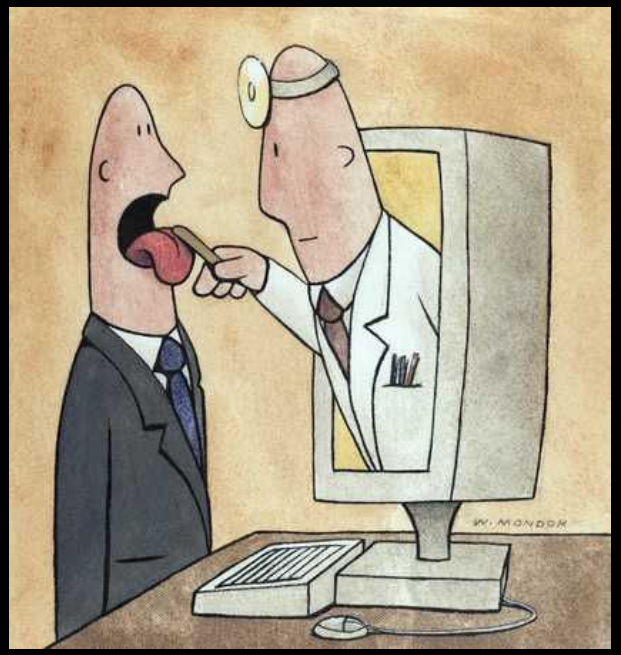
«In 21 century the cellular telephone has consolidated in itself a pager, the camera, a games hookup, the system for listening of radio and even viewing of telecasts, exit means in the Internet, an alarm clock, and the daily log»

Interested structures:

1. Patients
2. Cellular operators
3. Manufacturers of phones and the software
4. The Internet providers
5. Public health services and social services
6. Insurance companies.

<u>Potential opponents ?</u>

Doctors, BUT**...**

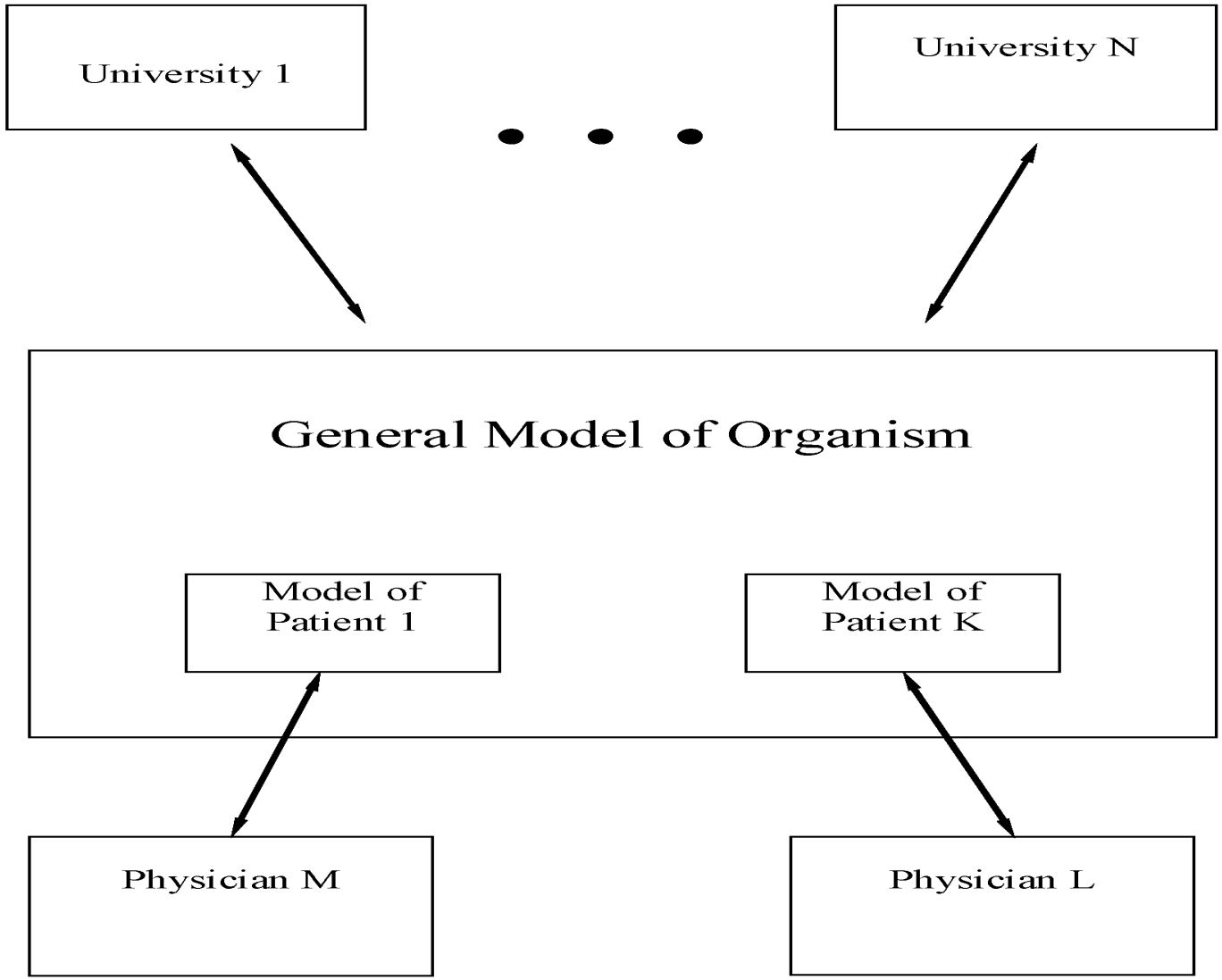


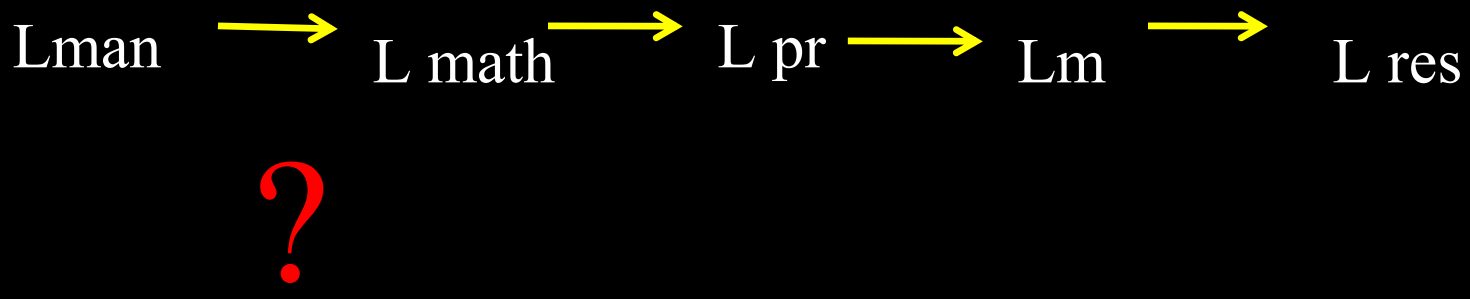
<u>Opponents</u>:

Pharmacological companies.

Prospects

At chronic patients, which constantly taken off data (for example, electrocardiograms monitoring), can send (received) information through Bluetooth channels in a cellular telephone and having synchronized with *computer model of a human body* to issue the different level of accident prevention notice for the physician and the patient


University 1
University N
General Model of Organism
Model of Patient 1
Model of Patient K
Physician M
Physician L


Lman
L math
L pr
Lm
L res
?

Frequently we use the natural language to describe systems. We propose to transfer this natural language description to mathematical equations.
For example, we have a sentence

$$WORD1 + WORD2 + WORD3 \qquad (1)$$

where we assign words and only imply meaning of words, the meaning (sense) is ordinary implied but not designated.
We propose to assign meaning in the following form

$$(WORD1).(SENSE1) + (WORD2).(SENSE2) + (WORD3).(SENSE3) = 0 \qquad (2)$$

This equation (2) can be represented in the following form

$$A1.E1 + A2.E2 + A3.E3 = 0 \qquad (3)$$

where Ai, i = 1, 2, 3, will denote words from English Appearance and Ei will denote senses from English Essence. The equations (2) and (3) are the model of the sentence (1). When we have a mathematical equation in the form F(x1, x2, x3) = 0, we can turn such a form by means of differentiation where the partial derivatives are the appearances and the derivatives with respect to time are the essences. This model is an algebraic ring and we can resolve this equation with respect to the appearances Ai or the essences Ei

$$A1 = U1.E2 + U2.E3$$
$$A2 = - U1.E1 + U3.E3 \qquad (4)$$
$$A3 = - U2.E1 – U3.E2$$

or

$$E1 = U1.A2 + U2.A3$$
$$E2 = - U1.A1 + U3.A3 \qquad (5)$$
$$E3 = - U2.A1 – U3.A2$$

where U1, U2, U3 are arbitrary coefficients, can be used for solution of different tasks on the initial manifold (2) or (3).

In general if we have n variables in our system and m manifolds, restrictions, then the number of arbitrary coefficients S will be defined as the number of combinations from n to m+1, as shown in Table 1

$$S = C_{n}^{m+1}, \quad n > m \qquad (7)$$

n /m	1	2	3	4	5	6	7	8
2	1							
3	3	1						
4	6	4	1					
5	10	10	5	1				
6	15	20	15	6	1			
7	21	35	35	21	7	1		
8	28	56	70	56	28	8	1	
9	36	84	126	126	84	36	9	1

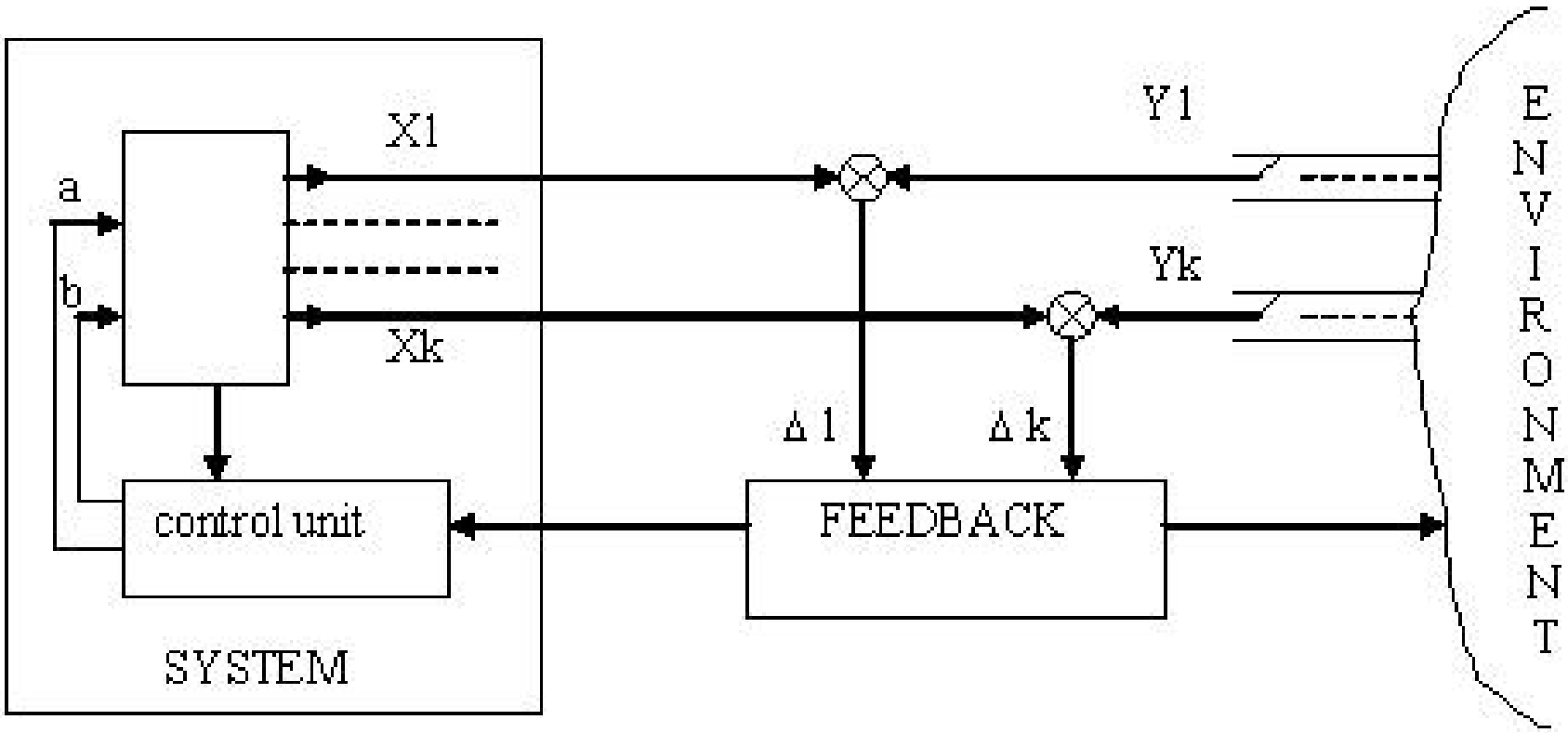


FIGURE 1. Model of "System - Environment"

If we have the key words –
Population, Passionarity, Territory, Production,
Ecology and Safety,
Finance and External Relation for simulation of city,
then the equivalent equation of our model will be

$$E1 = U1.A2 + U2.A3 + U3.A4 + U4.A5 + U5.A6 + U6.A7$$
$$E2 = -U1.A1 + U7.A3 + U8.A4 + U9.A5 + U10.A6 + U11.A7$$
$$E3 = -U2.A1 - U7.A2 + U12.A4 + U13.A5 + U14.A6 + U15.A7$$
$$E4 = -U3.A1 - U8.A2 - U12.A3 + U16.A5 + U17.A6 + U18.A7 \qquad (17)$$
$$E5 = -U4.A1 - U9.A2 - U13.A3 - U16.A4 + U19.A6 + U20.A7$$
$$E6 = -U5.A1 - U10.A2 - U14.A3 - U17.A4 - U19.A5 + U21.A7$$
$$E7 = -U6.A1 - U11.A2 - U15.A3 - U18.A4 - U20.A5 - U21.A6$$

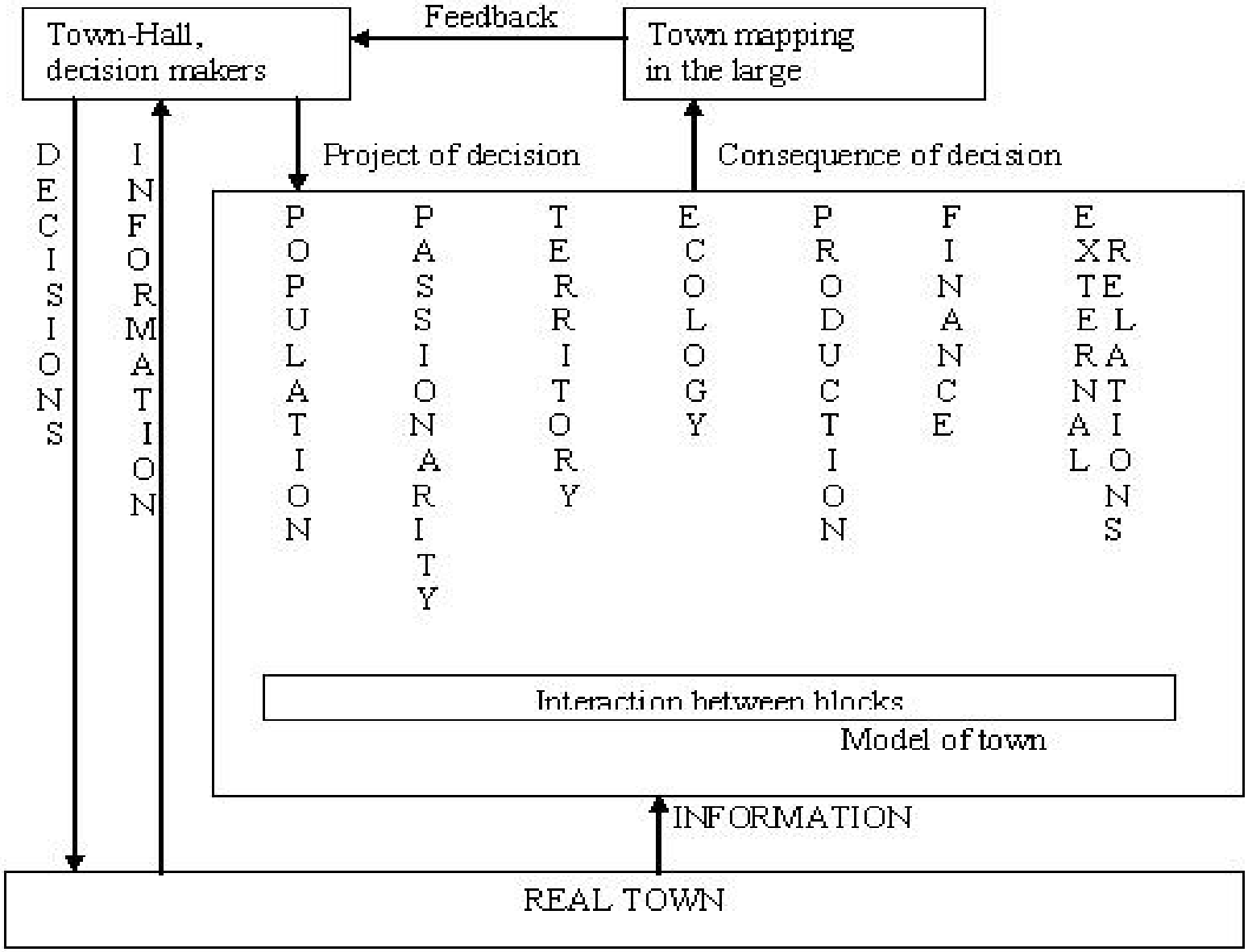

Town-Hall, decision makers
Feedback
Town mapping in the large
DECISIONS
INFORMATION
Project of decision
Consequence of decision
POPULATION
PASSIONARITY
TERRITORY
ECOLOGY
PRODUCTION
FINANCE
EXTERNAL RELATIONS
Interaction between blocks
Model of town
INFORMATION
REAL TOWN

TABLE 2. The mortality depending on the age as a result of the census in Russia in different times

Years/ages	1896-1897	1958-1959	1969-1970	1978-1980	1982-1983	1984-1985
0 – 4	133,0	11,9	6,9	8,1	7,9	7,7
5 – 9	12,9	1,1	0,7	0,7	0,6	0,6
10 – 14	5,4	0,8	0,6	0,5	0,5	0,5
15 – 19	5,8	1,3	1,0	1,0	1,0	0,9
20 – 24	7,6	1,8	1,6	1,7	1,6	1,5
25 – 29	8,2	2,2	2,2	2,3	2,2	2,0
30 – 34	8,7	2,6	2,8	2,9	2,9	2,8
35 – 39	10,3	3,1	3,7	4,3	3,8	3,6
40 – 44	11,8	4,0	4,7	5,4	5,6	5,7
45 – 49	15,7	5,4	6,0	7,8	7,4	7,3
50 – 54	18,5	7,9	8,7	10,3	10,9	11,3

We have different levels of description of organism - organ level, cell level, molecular level, but for physician the organ level is useful and suitable. We can use the traditional system of organs :

1. **The system of motion organs (bones, muscles, fasciae)**
2. **The digestive system**
3. **The respiratory system**
4. **The urogental system**
5. **The blood vascular and limphatic systems**
6. **The central nervous system**
7. **The peripheral nervous system**
8. **The ductless glands**
9. **The skin and sensory organs.**

We can increase the number of organ systems, but for illustration of our approach we will use nine systems, which interact among themselves.

A1*E1 + A2*E2 + . . .+ A9*E9 = 0 (10)

where:

A1 - characteristic of motion organs, E1 - variation of this characteristic,

A2 - characteristic of digestive system, E2 - variation of this characteristic,

A3 - characteristic of respiratory system, E3 - variation of this characteristic,

A4 - characteristic of urogental system, E4 - variation of this characteristic,

A5 - characteristic of blood vascular and limphatic systems, E5 - variation of this characteristic,

A6 - characteristic of central nervous system, E6-variation of this characteristic,

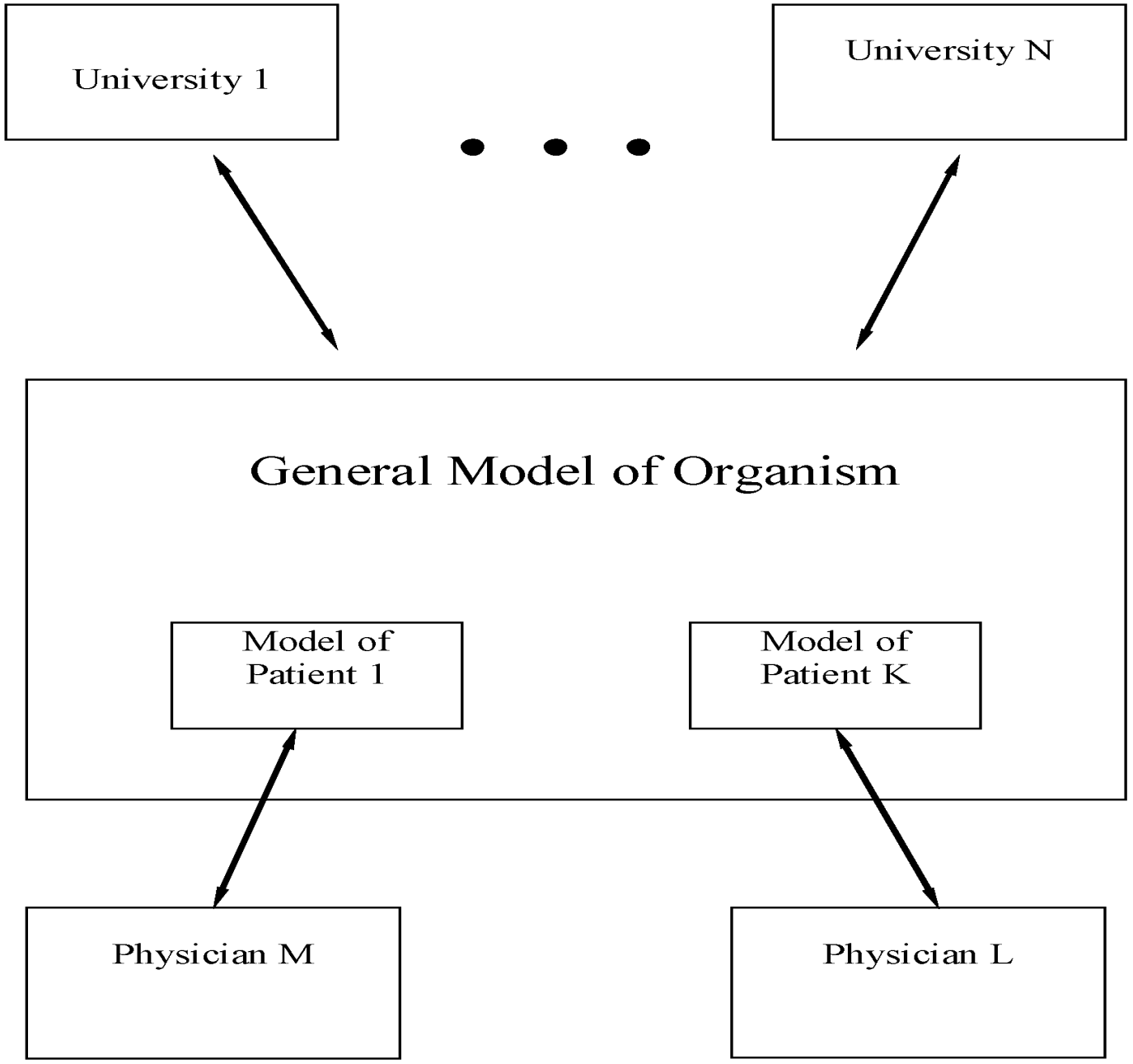
A7 - characteristic of peripheral nervous system, E7-variation of this characteristic,

A8 - characteristic of dustless glands, E8 - variation of this characteristic,

A9 - characteristic of skin and sensory organs, E9 - variation of this characteristic.

E1 = U1*A2 + U2*A3 + U3*A4 + U4*A5 + U5*A6 + U6*A7 + U7*A8 + U8*A9
E2 = -U1*A1+ U9*A3+ U10*A4+ U11*A5+ +U12*A6+ U13*A7+ U14*A8+ U15*A9
E3 = - U2*A1-U9*A2+ U16*A4+ U17*A5+ +U18*A6 +U19*A7+ U20*A8+ U21*A9
E4 = - U3*A1-U10*A2-U16*A3+ +U22*A5+ U23*A6+ U24*A7+ U25*A8+U26*A9
E5 = - U4*A1-U11*A2-U17*A3-U22*A4 +U27*A6+ U28*A7+ U29*A8+ U30*A9
E6 = - U5*A1-U12*A2-U18*A3-U23*A4-U27*A5+ U31*A7+ U32*A8+ U33*A9
E7 = - U6*A1-U13*A2-U19*A3-U24*A4-U28*A5-U31*A6+ U34*A8+ U35*A9
E8 = - U7*A1-U14*A2-U20*A3-U25*A4-U29*A5-U32*A6-U34*A7+ U36*A9
E9 = - U8*A1-U15*A2-U21*A3-U26*A4-U30*A5-U33*A6-U35*A7-U36*A8

where U1, U2, . . . ,U36 - the arbitrary coefficients, which can be used for tuning of the model. System of equations (2) is full, this system covers all combination of interaction between different organs of organism.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CONCLUSION

1. **The electronic medical register can bring positive economic benefit and reduce the number of medical mistakes**

2. **The best way for realization of our project – by means of mobile phones, which can connect patient, doctors and computer structures**

3. **You are welcome to participate in this international project**

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