Modeling resources for training based on cognitive maps

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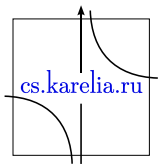
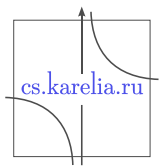


AMICT Seminar, May 19, 2009

Goals

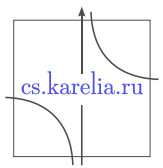
- Application of Cognitive Maps (**CM**) for the problem of planning the Training Resource content
- Application of Genetic Algorithms (GA) for solving the problem of optimizing the content of the Training Resource on the importance, given the constraints of time



Description of problem

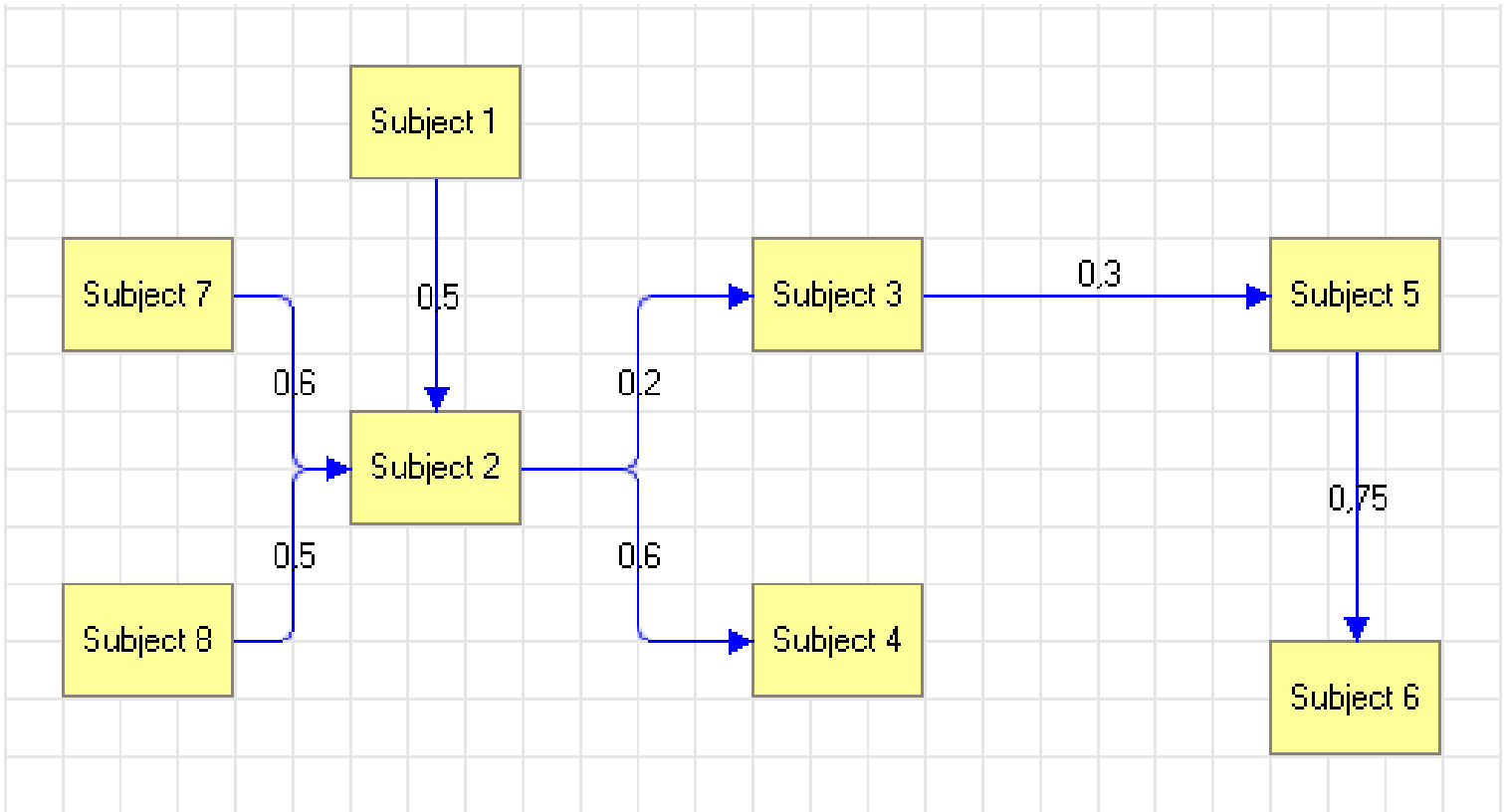
The task of planning the Training Resource content is to select from all the available volume of the original subjects (usually greater than the volume of the curriculum) the most important (for certain user groups) and place them on any time intervals (eg, semester) optimally , in the sense of the certain criterion of optimality.

- The importance of Training Resource subjects is defined by experts
- Most of subjects depend on each other, including implicitly dependence (One subject may depend on another in a few intermediate)



Desciption of Cognitive Maps

CM - are the variety of mathematical models for the formalization of complex systems as a set of concepts, which reflects its systemic factors and identifyes causal relationships between them



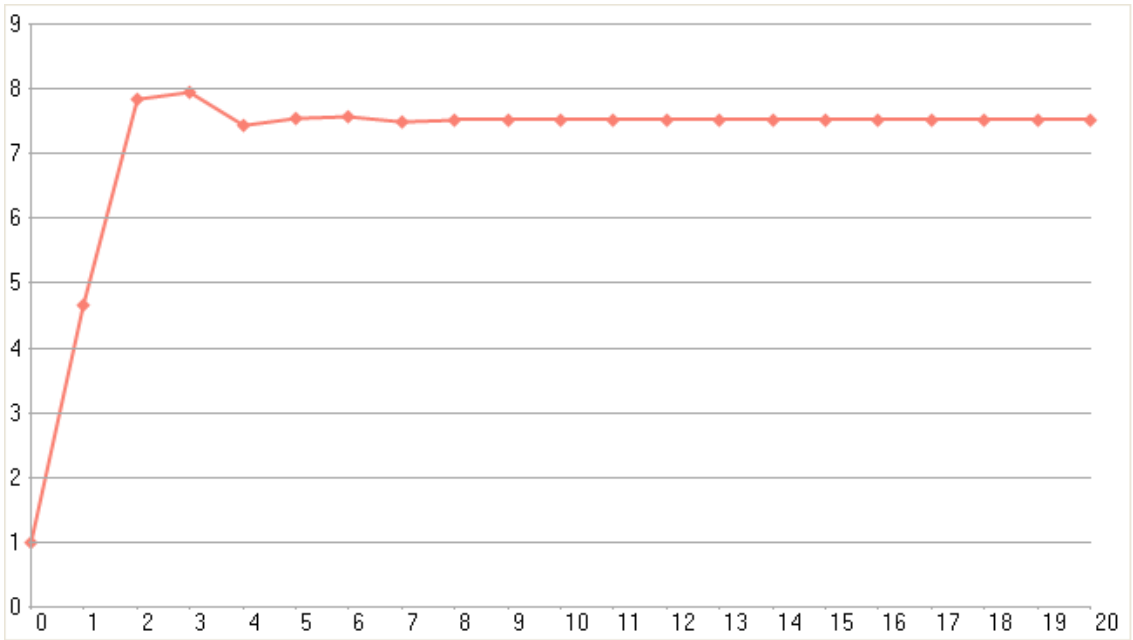
Analysis of Cognitive Maps

- The main objective: finding indirect influence of one concept to another

	Concept 1	...	Subject N
Concept 1	...	...	...
...	...	...	...
Concept N	...	...	...

	Sys. Impacts	Consonance	Dissonance	**Impact on Sys.**	Consonance	Dissonance
Concept 1	...	...	...	...	...	...
...	...	...	...	...	...	...
Concept N	...	...	...	...	...	...

- The calculation of integral indicators of the influence: Consonance and Dissonance
- Impulse Simulation: prediction of behavior of some concepts of cognitive maps duaring time



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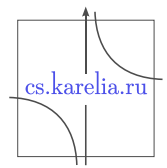
Modeling based on CM

A graph of Training Resource IS Cognitive Map.

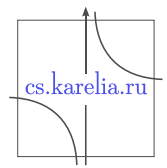
- Every concept has an expert estimation of importance (importance of this subject)
- This graph is oriented and weighted. Weights of links are expert estimations
- Model pre-follow-up of subjects

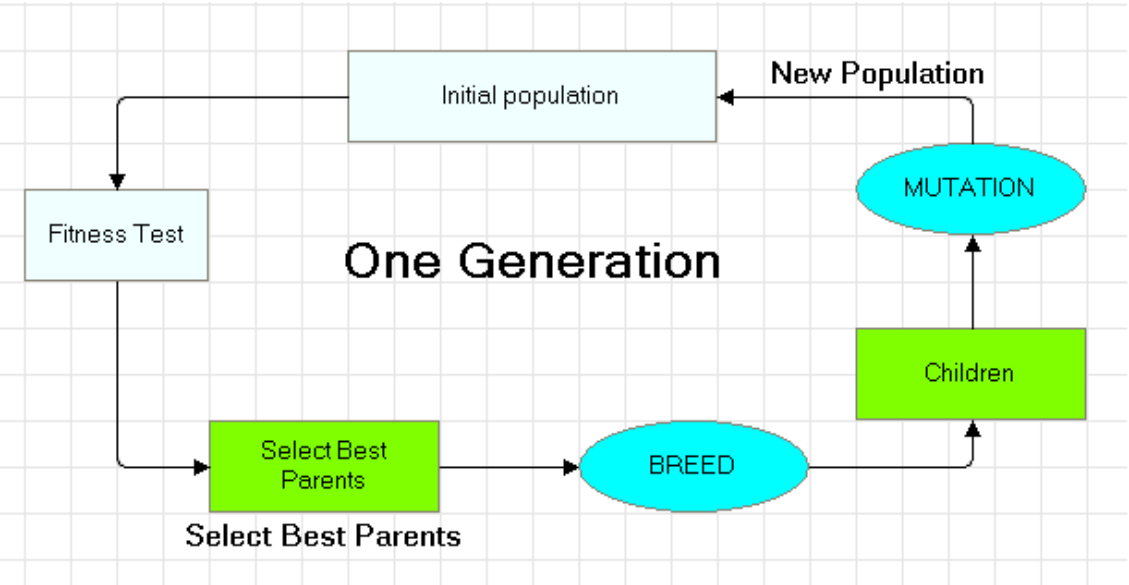


Description of problem

The task of optimization Training Resource content is to construct a model of the course content to maximize the total importance of including in its concepts and length(duaring) of course study doesn't exceed a given value.

The Goal is to get such set of concepts, which will more important, willn't exceeed time limitation and will follow pre-follow-up model



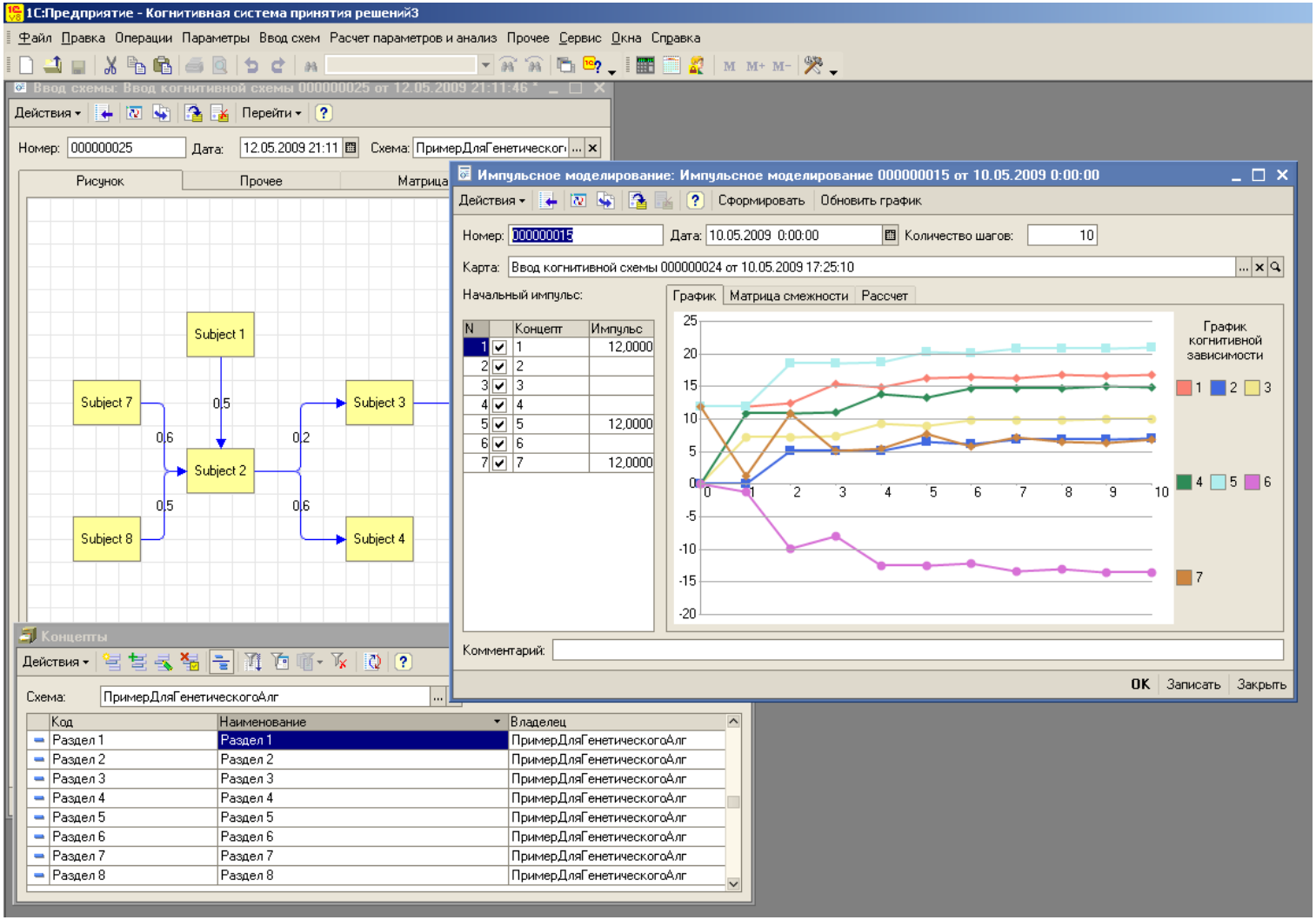


The Fitness Fuction:

$$FF = \sum_i \alpha C_{i \in N} + \beta D_{i \in N} - \gamma E_{i \in M \setminus N}$$

- Total influence of population concepts on the system
- Total expert estimation of population concepts
- Total influence of all concepts are not included in the population on each population concept

Computer System "Cognitive Making Decisions System"is developed for the analysis and modeling of different cognitive maps



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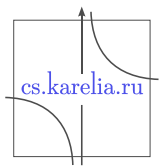
Main Functionality

- Creating, storing and editing of Cognitive Maps (CM) of various types
- Calculation of different parameters of cognitive maps - the mutual influence, consonance, dissonance, etc.
- Pulse simulation for prediction the behavior of CM in the duaring the time
- Optimizing cognitive maps using genetic algorithms

Results

- Application of modeling Training Resource content based on Cognitive Maps
- **General:** application of modeling different systems based on Cognitive Maps
- Application of Genetic Algorithms to optimize content of Training Resource on the importance, given the constraints of time
- **General:** Application of Genetic Algorithms to solve different optimization tasks in Cognitive Maps
- Computer System "Cognitive Making Decisions System"is developing



Thank you for your attention!