

# **Problems of development of expert system SPI (Seismic Processing, Interpretation)**

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The article is devoted to methodological aspects of constructions of expert system to geophysical data processing. Expert system will provide a researcher-geophysicist with the powerful software tools that increase efficiency of his work while solving, prediction, analysis and interpretation of geophysical objects according to the number of features.

In the article there are discussed: aims of development, development and functioning conditions, technical assignments, general principles, functional levels, stages of the development, the users of the expert system, tests of the expert system and special conditions.

## **1. Aims of development**

The main aims of development and realization of SPI expert system are:

**1.1.** To give a researcher-geophysicist the powerful software tools for increasing efficiency of his work when solving prediction, analysis and interpretation of geophysical objects according to the number of features.

**1.2.** Creation of general-system program and technical base:

- to develop processing algorithms, analysis, interpretation;
- to create and enlarge the knowledge base on the regional model of a predicted phenomenon, on the value of prediction in selecting the region points, on the dependence between the prediction value and geology-geophysical features.

**1.3.** Carrying out scientific investigations on fundamental Earth's resources prediction in the Siberian region.

## **2. Development and functioning conditions**

**2.1.** Design and realization of SPI expert system must be fulfilled with the orientation to the powerful hardware (workstations on the basis of Sparc-technologies), basic software of these workstations (OS Unix System V, high capacity language compiler C, C++, X Windows etc.).

**2.2.** System and application software in high-level modern languages must be developed in the course of realization of the expert system.

**2.3.** Design and realization of the expert system must be fulfilled under assumption that the industrial system operation will be realized, if there are documentation and instructive materials on installation and maintenance.

### **3. Technical assignments**

#### **3.1. General principles**

**3.1.1.** SPI expert system must be a powerful software tool when solving the Earth's resources prediction.

**3.1.2.** The expert system must be a base for the development and industrial operation of the applied software, which is oriented towards processing, analysis, interpretation of the seismic information, when predicting the Earth's resources according to the number of features.

**3.1.3.** SPI expert system must have a "shell" of the applied part of the system, providing "friendly" interface to the researcher-geophysicist with the applied system in the course of work at every functional level. Every "shell" must have its own special task statement.

**3.1.4.** The following functional levels must be defined and realized in the expert system:

- specialized geology-geophysical data processing aimed at presenting in the necessary form for the knowledge base and with visualization of the seismic fields;
- inputting vectors features into the data base (as a part of the knowledge base);
- constructing the medium model (composing prediction maps);
- prediction function analysis, prediction maps analysis and inputting information in the form of the expert estimates on the prediction value in choosing the region point;
- interpretation of the prediction maps using the expert's competence and also accumulation of the knowledge on the prediction points and on the character of connection between prediction and features. This knowledge should be presented in the form of the frames in the knowledge base;
- new knowledge obtained in the course of interpretation must be input into the knowledge base in the form of the models of the region of prediction maps for using in the further interpretation (see above).

**3.1.5.** Design and realization of the functional levels (see 3.1.4) must be fulfilled on the basis of special tasks statement of the functional levels of processing analysis, modeling and interpretation.

**3.1.6.** Design and realization of the expert system must be fulfilled with the orientation towards its adaptation to the prediction of natural resources.

**3.1.7.** Design and realization of SPI expert system must be fulfilled with the orientation towards generation resources of the system depending on the necessity of enumeration (complete or incomplete) of functional levels.

**3.2. The users of the expert system**

**3.2.1.** Geophysicists must be the main users of the expert system to process, analyze, interpret the seismic information when predicting the natural resources.

**3.2.2.** The users of SPI expert system can be the specialists of computational methods in geophysics, to develop the methods and software to secure, process, analyze and interpret geophysical information.

**3.3. Stages of the development**

**3.3.1.** Basic version of the expert system is planned to be implemented during one year, according to the task statement (see 3.4.3).

**3.3.2.** The final version of SPI expert system will require additional one year, according to the task statement.

**3.4. Basic version of the expert system**

**3.4.1.** Basic version must secure a practical validation of the main conceptual, architectural, general system, applied software and technological decisions.

**3.4.2.** Basic version of the expert system must satisfy requirements of the task statement.

**3.4.3.** Architecture, structure of software and hardware of the expert system basic version, documentation for tests are determined on the stages of technical and working design of the system and are regulated by the corresponding special statement task approved by the supervisor of the Project.

**3.4.4.** Design and realization of the expert system basic version must be fulfilled with the orientation towards the practical exploitation under conditions of the author's accompaniment and requirements (see 2.3).

**3.4.5.** Design and realization of the expert system basic version must be fulfilled with the orientation towards possibility of its development at the cost of:

- new specialized processing algorithms, analysis, modeling, interpretation;
- new estimating data for the knowledge base;
- additional services for the users.

**4. Tests of the expert system basic version**

**4.1.** Tests of the basic version of the structure provided in 3.4.3 are fulfilled component-wise and in the large.

**4.2.** Applied software realizing processing, analysis, modeling and interpretation algorithms being developed according to the task statement provided in 3.4 and also system software realizing the shell of the expert system must be presented for the component-wise test.

**4.3.** Tests of SPI expert system basic version are fulfilled on special tasks according to the test program approved by the supervisor of the Project.

## 5. Special conditions

**5.1.** Special tasks statements provided by 3.1.3, 3.1.5 and 3.3.1 are the essential part of the general task statement.

**5.2.** The general task statement can be corrected by designers of the expert system with confirmation by the supervisor of the Project.

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