### Optimization for partial differential systems

**Program**

### 1. Transformation inverse problems to optimization problems

Consider heat transfer phenomenon. The mathematical model of the system is the heat equation with boundary conditions. It is necessary to transform it to the optimization one.

### 2. Function minimization

It necessary to determine the stationary condition for the given function and specify its properties.

### 3. Functional minimization. Differentiation

Calculation of Gateaux derivatives of the given functions of two variables and integral functionals.

### 4. Functional minimization. Gradient method

Determining gradient method for the given functions of two variables and integral functionals.

### 5. Abstract inverse problems. Adjoint operators

Find the adjoint operator for the given operator on the space of the smooth functions with zero values on the boundary of the given interval [0,1]. It is necessary to use the definition of adjoint operators. The scalar product here the integral of product of the considered functions.

### 6. Inverse problems for ordinary differential equations

Using the gradient method for the system, described by differential equations.

### 7. Inverse problems for ordinary differential equations

Using the gradient method for the system, described by differential equations with pointwise measuring.

### 8. Inverse problems for the boundary problems for second ordinary differential equations

Using the gradient method for the system, described by second order differential equations with boundary conditions.

### 9. Inverse problems for the heat equation with distributed unknown parameter

Using the gradient method for the system, described by the heat equations with distributed unknown parameter.

### 10. Inverse problems for the heat equation with initial unknown parameter

Using the gradient method for the system, described by the heat equations with initial unknown parameter.

### 11. Inverse problems for the heat equation with boundary unknown parameter

Using the gradient method for the system, described by the heat equations with boundary unknown parameter.

### 12. Inverse problems for the wave equation with distributed unknown parameter

Using the gradient method for the system, described by the wave equations with distributed unknown parameter.

### 13. Inverse problems for the wave equation with initial unknown parameter

Using the gradient method for the system, described by the heat equations with initial unknown parameter.

### 14. Inverse problems for the wave equation with boundary unknown parameter

Using the gradient method for the system, described by the heat equations with boundary unknown parameter.

### 15. Inverse problems for Poisson equation with boundary unknown parameter

Using the gradient method for the system, described by the Poisson equations with boundary unknown parameter.

### 16. Inverse problems for Poisson equation with distributed unknown parameter

Using the gradient method for the system, described by the Poisson equations with distributed unknown parameter.