

Computer algebra system as a pedagogical task

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Teaching of algorithmic mathematics within a course of discrete mathematics include acquaintance of students with algorithms on long numbers and polynomials and their application for solution of various applied tasks, for example in cryptography.

Within a course of mathematics there is no opportunity to discuss and especially to realize all such algorithms.

Within three years The Mathematics Department of SPbETU "LETI" makes the experiment on creation of computer mathematics systems consisting from more than 40 interacting modules by students teams. Every year about 200 students who are divided into teams of 6-20 members participate in the project.

The project has two main goals:

1. to connect knowledges of programming with knowledges on algorithmic mathematics
2. to learn to work in teams, to optimise distributing of works among themselves and to make decisions on architecture of system.

As a rule, the team consists of one academic group, but it is allowed both to unite with other groups and to separate into small groups. Management of work of each team is provided by two persons: architect of system of computer algebra and responsible for quality management.

The architect of each team receives the description of structure of system: names and functions of all modules and description of links between them. After that he/she chooses structure of data, programming language, system of versions support (for example, GitHub), specifies interfaces for interaction of modules and defines a type of user interface, and also the requirement to readability of separate modules and technology of testing.

Responsible for quality management organises contact of students with the architect so that each student of group benefited from the project; after project terminates responsible for quality management creates an anonymous questionnaire to which all members of team respond and which gives the answer to whether they succeeded in distribution of works between students - whether well they understood sense of the common work. Also students which are responsible for quality

management from all the teams, in unison define metrics for estimation of software quality.

3-4 weeks are allocated for all works. The most inspiring stage of the project - presentation them to other teams and discussion. Complete projects are placing in common access for preliminary acquaintance with them members of other teams. The projects must be presented by incidentally chosen students from each team (in total about 15 teams) which are given 10 minutes for demonstration and 5 minutes for answers of architects and other students from all the teams. Students very much worry about quality of the projects and in spite of the fact that they are not considered formally in progress, try to finalise them and optimize.

Results of questioning of students show that in average each student works about 1-3 hours and that more time is needed for linking of modules and correction of mistakes, than on their coding. Most of students (about 80%) consider this work as the useful and interesting.

In other questionnaires next year students often mark experience on creation of systems of computer algebra as the example which they remember and consider as interesting and useful form of studying.

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