

## Форма 502. КРАТКИЙ НАУЧНЫЙ ОТЧЕТ НА АНГЛИЙСКОМ ЯЗЫКЕ

### 2.1. Номер проекта

08-07-00078

### 2.2. Руководитель проекта

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### 2.3. Название проекта

Development of multithreshold decoders for digital systems of data transmission, processing and storage and storage for work near channel capacity

### 2.4. Год представления отчета

2009

### 2.5. Вид отчета

этап 2008 года

### 2.6. Аннотация

The main attention in the first year of the project has been given the optimization of codes and decoding parameters. It allows to receive the performance closer to the capacity. Essentially new technique for selection of structure of self-orthogonal codes applied in the multithreshold decoders has been offered. The technique performs optimization of information and checking branches weight of codes. It allows to construct codes with essentially smaller the errors propagation effect and to provide their near optimal decoding at higher noise level. The given technique has been implemented in software during 2008 year. The software will be used in 2009 year for searching of codes with best performance.

For additional increasing efficiency of decoder at high noise level a modified algorithm of the multithreshold decoding has been offered. The threshold element of the offered algorithm uses tentative estimation of inaccuracy of checks.

The big attention has been given to increasing efficiency of the non-binary multithreshold decoder (QMTD) which is used for decoding of symbolical data. The given decoder can be applied to formation, maintenance and restoration of files for superbig audio- and video- databases. In particular an algorithm for the non-binary threshold element differing from known for essentially smaller complexity has been offered. It allows to accelerate work of QMTD in several times.

Also concatenated schemes of coding/decoding consisting of QMTD and non-binary parity-check codes or non-binary modified Hamming codes have been developed. These schemes were unknown before. Use of the given codes together with QMTD, as well as in a binary case, allows to reduce in several times the symbol error rate after decoding in the field of effective work of QMTD in comparison with base QMTD at insignificant growing of implementation complexity. In the course of analysis of the offered schemes of coding/decoding analytical estimations of their efficiency have been done.

On the basis of last achievements in the field of non-binary multithreshold decoders a technique for protection of files against distortions has began developed. The given technique will allow to increase in tens times speed of coding and restoration of information in comparison with existing analogues. Now the technique is realized in software for protection of files against distortions in typical conditions of decoders using.

For the last year set of software for research of efficiency of modern methods for error correction continued to develop. Software for simulation of the LDPC codes recommended by DVB-S2 standard and the turbo codes recommended by DVB-S standard was developed.

During all period of the project specialized web site [www.mtdbest.iki.rssi.ru](http://www.mtdbest.iki.rssi.ru) is developed. The basic results of workings out of MTD algorithms are presented in it.

Two surveys on coding theory and its applications were published in main magazines on communications.

### 2.7. Полное название организации, где выполняется проект

Space Research Institute of the RAS

*Подпись руководителя проекта*