

SDR implementation of the receiver of adaptive communication system

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The paper presents description of software implementation of the receiver of adaptive communication system. The system is foreseen to be used to communicate with a satellite placed in low Earth orbit (LEO), in order to increase amount of data transmitted from the satellite to the ground station. Depending on signal to noise ratio (SNR) of the received signal adaptive transmission using different modulation schemes (BPSK, QPSK, 8PSK, 16APSK) and different convolutional code rate (1/2, 2/3, 3/4, 5/6, 7/8) is realized.

The receiver of the proposed adaptive communication system consists of software defined radio (SDR) module (National Instruments USRP-2920) and reception software running on Windows operating system. The structure of the receiver software is presented in Fig. 1, it is three thread application implemented in C++. The first thread supports data feed and the SDR hardware configuration. Also, necessary data conversion is realized in this block. The input data can be read from SDR module or read from the text or binary file. The second thread is designed to do reception signal processing, like frequency correction, symbol timing and decimation, and channel equalization. As an output, this thread returns clear data symbols with stable constellation. The third thread provides soft demapping of symbols, channel code depuncturing and Viterbi decoding. In order to increase the speed of signal processing the software uses SIMD instructions supported by x86 processor architecture.

Proper operation of the developed software receiver has been verified during measurement tests. The described work is part of the project “SACC – Satellite Adaptive Communication Channel”, funded by European Space Agency.

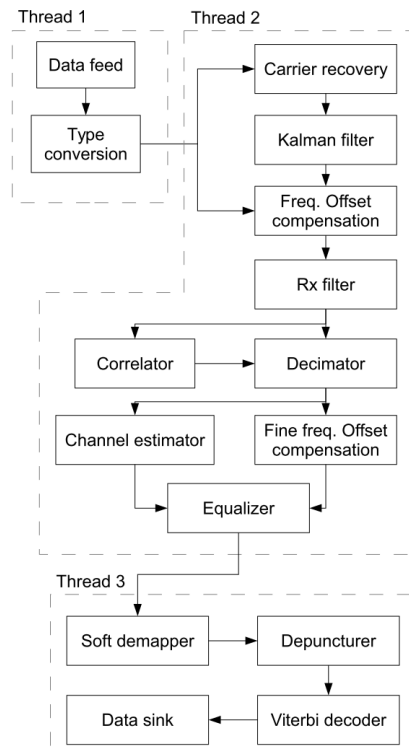


Fig. 1 Structure of the program of the system receiver