Abstract

Software Defined Radio is an all new technology being developed in the 21st century. Over a past couple of decades many Mobile communication standards have evolved and even today researches are going to develop new standards. Different standards of Mobile communication use different type of hardware circuitry. The existing mobile communication standards are primarily regional and not global. So efforts are going on to develop systems which can support multiple mobile communication standards using same hardware but swapping the software.

The main aim of this paper is to develop a model of a Software defined Radio using SIMULINK tool to implement the IEEE 802.11 standard and the Bluetooth standard. The main aim of this paper is to build various protocols for WLAN and the Bluetooth standards and
to demonstrate their functionality. This includes implementation of IEEE 802.11a standard for the WLAN and basic core protocols for the Bluetooth. According to the IEEE 802.11a standard out of the various transmission modes the basic transmission mode (BPSK with 6Mbps transmission speed) was implemented. For forward error correction half convolution codes are used. The communication channel is assumed to be flat fading channel where the transmitted sub carrier undergoes flat fading. The ideal channel model for this type of channel is chosen as Nakagami channel. Regarding the Bluetooth technology all the core protocols of Bluetooth are implemented and the type of modulation is Gaussian phase shift keying and frequency hopping spread spectrum.

Objectives and goals of our paper are stated as follows: • To develop a model of a Software Defined Radio which supports the IEEE 802.11a standard and Bluetooth standard using the SIMULINK tool? • To implement all the main protocol stacks for WLAN and Bluetooth Protocols and verify their functionality. • To transmit the data as frames using the format specified for the standard, to compress the binary data using source coding algorithm and also encode the data for Forward Error Correction (FEC). • To modulate the binary stream of data using the BPSK modulation for WLAN mode which supports the basic transfer mode with 6 Mbps speed. • For the Bluetooth standard the basic modulation scheme used is GPSK and Frequency hopping spread spectrum is used. • To implement WEP algorithm for WLAN security and also CRC-16 for protecting the integrity of the data. • To implement point to point communication and data transfer for the Bluetooth standard. • To implement CSMA/CA technique and also implement different basic functions such as packet routing, Authentication, Request to transmit etc. for the WLAN standard. • To develop a suitable channel model to include signal fading and Additive White Gaussian Noise. • To develop necessary equations for calculation of BER curves for the type of modulation and coding schemes used.

Reference

- Published paper in Computer “Communications” titled “Software Radio Reconfiguration Management”. By Klaus Moessner, Didier Bourse, Dieter Greifendorf and Joerg Stammen dated 26th February 2002.
- Technical Brief on “Planning a Wireless Network” by ProCurve networking – Hp-innovative.
- “Bluetooth protocol Architecture” by Riku Mettala.
- Theses published on “Performance analysis of the IEEE 802.11a WLAN standard optimum and sub optimum receiver in frequency selective, slowly fading Nakagami channels
with AWGN and pulsed noise jamming” by Christos Kalogrias.
- “Programmable SDR” CBIS 2007, by Chris Wasser.

Index Terms

| Electronics | Communication Systems |

Key words

| Radio Implementation | Hardware circuitry |
| BPSK |