GNU Radio based Real Time Data Transmission and Reception

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Abstract – *Today the world is using the most advanced technologies everywhere. From electronic devices used for household to artificial intelligence there is a need for communication. Two devices may involve in a communication where one has to transmit data while the other needs to receive for the operation. The problem becomes evident if the systems are at a very larger distances. So we need to go for wireless communication.*

A software defined radio is a reconfigurable radio whose physical layer functions are mainly or fully defined by software instead of hardware. Because of their exibility and cost efficiency, SDRs allow the implementation of radio communication systems that are interoperable among different standards, protocols, frequency bands, user requirements and functionalities.

In this paper, real time data transmission and reception using different digital modulation techniques like GMSK, GFSK and DPSK are implemented using GNU Waveguru and GNU Octave tool.

Keywords-software defined radio, GMSK, GFSK, DPSK, GNU Octave.

I.   INTRODUCTION

SDR(Software Defined Radio) is a radio communication system where components that have been typically implemented in hardware are instead implemented by means of software on a personal computer or an embedded system. SDR are used for its simplicity and exibility. With the right software, a single SDR chip could perform the functions such as recording FM radio and digital television signals, read RFID chips, track ship locations, or do radio astronomy which makes SDR versatile.

What is GNU radio? GNU Radio is a free and open-source software development tool kit that provides signal processing blocks to implement software radios. It can be used with readily-available low-cost external RF hardware to create software defined radios, or without hardware in a simulation like environment. It is widely used in hobbyist, academic and commercial environments to support both wireless communications research and real-world radio systems.

II.   LITERATURE REVIEW

Many techniques were developed in recent years. The main approaches of the techniques was to transmit and receive data without much hardware needed using GNU radio. In this section, a brief literature review is given.

In paper [1], the authors discuss about the emerging trends of SDR for the applications in modern communication systems.

In paper [2], the authors focus on SDR from a discrete-time sampling perspective and discuss the efforts that are currently being pursued in order to further bridge the gap between these discrete-time samples. Highlighting the advantages and current issues with SDR technology, this paper also presents several examples using a recently released, commercially available SDR platform.

In paper [3], the authors portray the exibility and reusability of SDR. SDR designers have turned to FPGAs to provide a exible and reconfigurable hardware that can support computationally intensive and complex algorithms which can be used in a multitude of voice, data, and multimedia applications.

In paper [4], the authors specify that the Gaussian Frequency Shift Keying modulation and demodulation is the most widely used modulation scheme for wireless communication as this scheme uses a brand new architecture based on reconfigurable CORDIC is involved which saves about 640Kbits memory units.

III.   SYSTEM OVERVIEW

GNU Radio is a framework that enables users to design, simulate, and deploy highly capable real-world radio systems. This signal processing blocks can be linked together for building and creating the baseband part of the dedicated radio. The most basic structure of the constructed radio is as shown in Fig.1.