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WIRELESS MULTIPLEXING AGILE ANTENNA-BASED CONTROL SYSTEM FOR SPACE APPLICATION

Abstract

The concept of multiplexing arose as a mechanism for allowing multiple users to efficiently utilize a limited, shared communication medium. Multiplexing refers to a method where by several signals at the transmitting side of a communication system are combined into one signal for transmission. At the receiving end, each user is able to extract their desired data reliably from the multiplexed signal. In communication systems, antennas are responsible for transmission and reception of signals. The steady growth and increment in communication services has led to the increase in number of antennas used to cover the different frequency communication link/bandwidth as these antennas mostly operate at a fixed frequency. A feasible solution to this is to employ frequency reconfigurable or frequency agile antennas. This approach has advantages from both multiple antenna and multiband/wideband antenna designs. In this paper, a hardware implementation of a proposed biasing and control circuit/system for wireless multiplexing that utilizes a frequency reconfigurable or frequency agile antenna is reported. The device comprises a microcontroller, DAC, CMOS oscillator, power module and a USB interface for communication with a custom-built software installed on a PC. The device has functions for control, digital signal processing and de-multiplexing. The device is fed with an input multiplexed signal, and the de-multiplexed output signals are extracted and displayed on the graphical user interface of the software. Due to the re-configurability and programmability of the device, it presents a flexible, cost effective solution for a variety of real-world applications. A hardware implementation of a wireless multiplexing agile antenna-based control system has been developed and tested. This was demonstrated as an input multiplexed signal was de-multiplexed into its constituent signals and displayed on the software interface. As the device is programmable and a variety of voltage bias levels can be configured, the device can provide a cost effective and flexible solution for a variety of real-world applications Future planned extension of this work is to incorporate the RF front end and carry out performance testing as well as detailed analysis on power consumption, effect of frequency/bias switching on system performance and comparison of performance with separate circuitry for different frequencies. This will be reported in a later publication.