Real Time Embedded Cognitive Radio Network for ISM Band

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Abstract: ***Cognitive radio is an intelligent radio that can be programmed and configured dynamically. The radio automatically detects available channel in wireless spectrum and changes its transmission or reception according to it, Which allows more concurrent wireless communication. The wireless router knows the details of its environment, internal state and the transmitter parameters. The signal strength, bandwidth allocation of the wireless router during the transmission and receiving process is calculated using the sigview software. Tarang module is configured using TMFT software.***

Keywords: Cognitive radio network, Stellaris board, TMFT, Sigview, ARM Cortex-M4.

1. Introduction

[1] The coexistence technique used in IEEE 802 reduces the interference between different networks. In MATLAB a prototype is used for designing and testing the cognitive radio. It checks the reliability and effectiveness of the system. To obtain better performance USRP2 and RF front end is used. Bluetooth and adaptive frequency hopping mechanism for coexistence between wireless technologies sharing RF spectrum. [2] Cognitive radio is the extension of the software radio with radio domain model. It provides the flexibility of services through language. The language represents the knowledge of software module, networks and user need software radio is used as the ideal platform for the cognitive radio networks. Software radio provides an ideal platform for realization of cognitive radio. The radio hardware consists of the antenna, radio frequency conversion module. Software radio provides a vast, untapped potential to personalize services, but the contemporary process of modifying radio etiquette is extremely labor-intensive.the limits of flexibility and responsiveness of the radio to the network and user. Software defined radio provides an ideal platform for realization of cognitive radio. [3] Cognitive radio is an alternative wireless communication used for managing and executing in real-time without human. The spectrum is shared for industry and academic purpose. Spectrum is of two models owned and common. [4] The coexistence between Bluetooth and Wi-Fi provider issues. The simulator is developed with modifies the behaviour of PHY& MAC of the Wi-Fi and Bluetooth networks. The performance of both collocated Bluetooth & Wi-Fi systems is increased. [5] It identifier the spectrum which is being used by the primary user and identifier the empty uses when they are empty only then the spectrum is being used. [6] The IEEE 802 LAN/MAN is used for developing the IEEE 802.22 standards for cognitive wireless regional area network which allows for sharing the unused spectrum over the geographical area which area allocated for the television broadband services. [7]Cognitive radio is intelligent wireless communication, which is aware of its environment. The objective are it has high reliable for communication and provides the efficient utilization of the radio spectrum. [8] European Telecommunication standard institute uses the reconfigurable radio systems techniques. ETSI RRS are concentrated on cognitive function & architecture for managing and controlling of reconfigurable radio systems, dynamic spectrum management and for public safety. It achieves the efficiency and improves the overall performance of the system.

2. Block Diagram

The RF transponder is designed by using tarangF4module with antenna. The antenna receives the signal from the environment. This signal passes through the sigview software. This software is easy to analyse the signal strength and frequency and easy to calculate the different signal strength during transmission and receiving Process. stellaris board(ARMcortex-M4) is use in hardware phase. The stellaris ADC mainly use for convert the analog to digital value from received signal

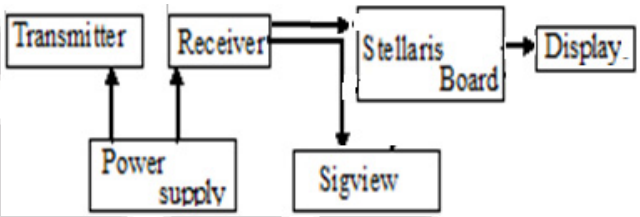

Figure 1: Block Diagram

3. Hardware Description

Tarang modules are designed with low to medium transmit power and for high reliability wireless networks. The modules require minimal power and provide reliable delivery of data between devices. The modules operate within the ISM and 2.4-2.4835GHZ frequency band with IEEE802.15.4 baseband. Stellaris LM4F120 Launchpad evaluation Board is a low cost evaluation platform for ARM cortex–M4F-based microcontrollers. The stellaris LM4F series of ARM cortex-M4 microcontrollers provides high performance, low cost platform, reduce pin count, low power consumption.32-bit

ARM cortex architecture optimized for embedded applications. An analog-to-digital converter is a peripheral converts a continuous analog voltage to a discrete digital number. The stellaris ADC module features 12-bit conversion and resolution and support 12 input channels. Each ADC module provides eight digital comparators. The trigger source for ADC0 and ADC1 may be independent or the two ADC modules may operate from the same trigger source and operate on same or different inputs. The features are on-chip internal temperature sensors,12-bit precision ADC, maximum sample rate of one million samples/second, Flexible trigger control, Hardware averaging of upto 64 samples.

Figure 2: Tarang Module

4. Software Description

Sigview is a real-time and offline signal analysis software package with wide range of powerful signal analysis tools, Statistics function and comprehensive visualization systems with its unique user interface and philosophy, sigview gives you the absolute freedom to combine different signal analysis methods in any possible way there are almost no artificial rules and limitations. Once you get the basics, everything else in sigview follows the same logical pattern. Real time data display, signal analysis and control. Optimized FFT algorithm with fine parameter tuning and various pre and post processing option. Spectrogram and time FFT functions with powerful graphical display solution. TMFT Software: Tarang Multi-Function Tool, this software is used to configure Tarang module using AT commands. USB breakout board are handy to use &no external power adapter is require. just plug in the Tarang module into the socket and connect the USB cable to one of the USB ports of pc. While plugging in the module on to the USB breakout board take care to insert the way.pin1 is power (3.3V dc) pin 10 is ground. Tarang modules can be configured using AT commands. After typing AT, the category should be mentioned the categories are G-General category, N-Networking categories.

5. Simulation

This FFT output using easy to calculate the signal strength and bandwidth allocation of the wireless router using sigview software, which monitors the signal strength and band allocation of the wireless router during transmission and receiving process.

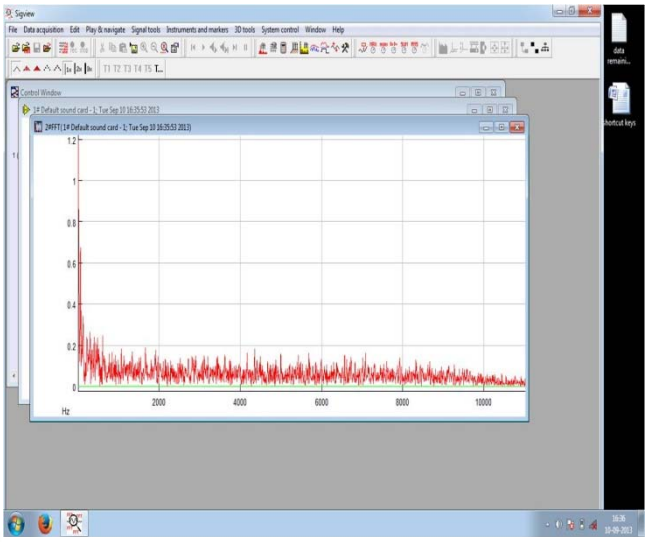

Figure 3: FFT Output

Figure 4: TMFT Program

This simulation output is represents Tarang module configuring using AT commands with in terminal of TMFT program.

6. Conclusion

This project was simulated by using sigview software. The AT commends are used to configure tarang modules. The RF transponders are designed by using tarangF4module with antenna. The antenna receives the signal from the environment. This signal passes through the sigview software. This software is easy to analyse the signal strength and band allocation and easy to calculate the different signal strength during transmission and receiving Process. This goal give successful method of improving the signal performance.

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