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RF CHAT

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Abstract - *Chat applications are made in order to make our life easier by allowing us to connect with our friends in a split second. Our idea is simple, to create an application in android that can communicate using radio frequency signals. Android devices cannot communicate to each other directly through radio frequency, so here we make a small radio frequency antenna which can be carried easily. Android devices will make use of bluetooth to connect to this antenna and the antenna would transmit the messages in the form of radio frequency. This way an effective communication can be established between a sender and the receiver without using any internet or mobile network data by using this application user can exchange in communication without a centralized mobile network. By using this application, user can exchange in communication without a centralized mobile network. Our Idea is simple, why don't we create an application in android that can communicate using Radio Frequency signals. Android devices can't communicate to each other directly thru Radio Frequency. So we plan to make a small RF antenna which can be carried easily. And the antenna would transmit the messages in the form of Radio Frequency Signals. This can be implemented cheaply and effectively just by using a simple Arduino Board and an Android device.*

Key Words: RF - Radio Frequency, Wi-Fi - Wireless Fidelity, IP - Internet Protocol, MAC - Medium Access Control, IR - Infrared, ISM - Industrial and Scientific and Medical, LCD - Liquid Crystal Display.

1. INTRODUCTION

We have a wide range of chat application available in the internet. These applications have made our life easier by allowing us to connect with our friends and relatives in a split- second. So, it would be quite oblivious question that Now, why should we need a chat that uses RF signals. The answer is quite simple: Most of the chat application make use of internet which requires the user to connect to a Wi-Fi network which has data or the use rmust make use of data in his/her device, which is not economical. Of course, there are chats in android which work effectively in a Bluetooth/Wi-Fi network. But these technologies give a little range. i.e. The sender and the receiver must not be away more than 10 meters. This problem makes it quite impractical to use them.

Our idea is simple, why don't we create an application in android that can communicate using Radio Frequency signals. Android devices can't communicate to each other directly through Radio Frequency. So we plan to make a small RF antenna (about the size of a pen) which can be carried easily. Android devices will make use of Bluetooth to connect to this antenna. And the antenna would transmit the messages in the form of Radio Frequency Signals. This way an effective communication can be established between a sender and the receiver without using any internet or mobile network data. By using this application, user can exchange in communication without a centralized mobile network. This can be implemented cheaply and effectively just by using a simple Arduino Board and an Android Device.

2. LITERATURE SURVEY

In Paper [1], we have Wi-Fi Direct, which is a new technology defined by the Wi-Fi Alliance aimed at enhancing device to device communications in Wi-Fi. Thus, given the wide base Wi-Fi capabilities of the devices, and the fact that it can be entirely implemented in a software over traditional Wi- Fi radio's, and this technology is expected to have a significant impact. Our results produce certain delays. These delays are to be expected in practice when Wi-Fi Direct devices discover each other and establish a connection.

Paper [2], tells how to provide mobile users with cost-effective wireless information services is becoming a hot topic for wireless vendors. This paper reports recent research and development efforts in constructing Mobile Jabber IM a wireless-based text chatting system,. It tells about the system architecture, system design, and technologies. The paper demonstrates the system application examples and shares the development and implementation experiences.

In Paper [3], we have MultiNet, that facilitates simultaneous connections to multiple networks by virtualizing a single wireless card.There are many scenarios where it is desirable to have a wireless device which can be used to connect to multiple networks simultaneously.

Currently, this is possible only by using multiple wireless network cards. By using multiple wireless cards causes consequent reduction of lifetime and excessive energy drain in battery operated devices. In this paper, we propose a software based approach, that facilitates simultaneous connections to multiple networks by using a single wireless card. The wireless card is virtualized by introducing an intermediate layer below the IP, which is used to continuously switch the card across multiple networks. The aim of the switching algorithm is to be transparent to the user who sees her machine to be connected to multiple networks. We mainly present the design, implementation, and performance of the MultiNet system. We can evaluate and analyze buffering and switching algorithms in terms of delays and energy consumption. Our system works well over popular IEEE 802.11 wireless LAN cards.

Paper [4] is based on efficient utilization of communication links between RF Modems, which facilitate vehicle monitoring, vehicle authentication and automated toll collection on the highways over wireless channels. The system is implemented to register automatically the vehicles getting on or off a motorway or highway, cutting the amount of time for paying toll in large queues. Detailed monthly bill is sent to the customer at the end of the month. The customer could register and get a transmitter module and thereafter would not need to stop at the toll booth whenever they get on or off the motorway. The implementation is divided into two modules- the Vehicle Module (Active Tag) and the Base Module. The two modules communicate with each other through the RF modem connected to each module. These RF modules can communicate over the ISM Frequency Range of 902 – 928 MHz. The Vehicle module revolves around Atmel 8051 microcontroller. This module contains an LCD panel , keypad and an RF modem is interfaced to the microcontroller through a Max-232 chip. Microcontroller contains user-specific data associated with vehicle, such as the Engine Number, Registration Number, and owners information, along with the billing address. The base module is used with a user interface that allows the administrator to monitor the current activities in the range, which include the vehicle in the range, their status, and the detailed information about any registered vehicle. Moreover both the base and vehicle module can communicate with each other through chat session.

Paper [5] is based on wireless communication using radio signals. Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. Different types of wireless communication include, IR wireless communication, satellite communication, broadcast radio, Zig-bee ,Microwave radio, Bluetooth, etc .In this paper we discuss the wireless communication using the bluetooth network topology, the HC-05 Bluetooth module and interfacing Bluetooth with arduino

In Paper [6], we have Zig-bee, which is an IEEE 802.15.4 standard for data communications. It is used to deal with business and consumer devices. It is designed for low power consumption enabling batteries to last forever. The ZigBee standard provides security, network and application support services which operates on top of the IEEE 802.15.4 MAC and Physical Layer wireless standard. It employs a group of technologies to enable self-organizing, scalable, self-healing networks that can manage various data traffic patterns. ZigBee is a low-cost, low-power, wireless mesh networking standard. The low cost of the device allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries. ZigBee has been developed to meet the growing demands between numerous low power devices for various wireless networking capabilities. In industry ZigBee is being used for automated manufacturing in next generation with small transmitters, allowing communication between devices and central computers. This new level of communication permits finely tuned remote manipulation and monitoring.

Paper [7], is based on bluetooth chatting. Bluetooth chatting is an innovative approach to the mobile world. Bluetooth provides a low power and a low cost connection. It is basically an open standard used for implementing short range wireless communication devices. This application allows two android devices to carry out two way text chat over Bluetooth.. The paper contains design and implementation of Bluetooth Communication by using the APIs of Android platform. The APIs wirelessly connect applications to various other Bluetooth devices, enabling point-to-point and multipoint wireless features.

3. DESIGN

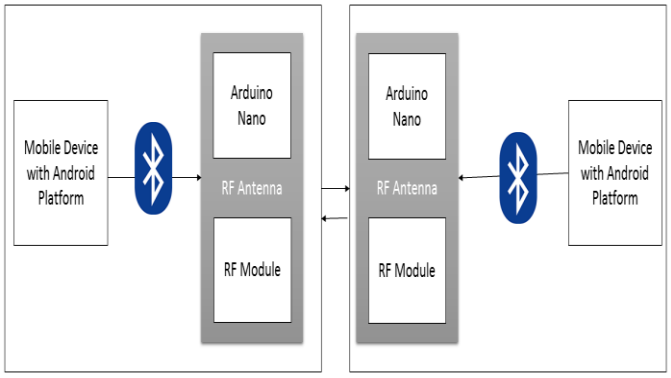

Fig -1: Architecture Diagram

The architecture of our system is shown in figure 1. The architecture diagram consist of two android devices. Each of the android device is connected to the bluetooth and the bluetooth is connected to an antenna. The antenna consist of an aurduino nano and an RF module. It's not possible for android devices to directly connect with other android devices by making use of the radio frequency signals. The first part actually makes use of Bluetooth technology to communicate with an antenna which will then transmit the data in the form of Radio Signals. The first antenna which is associated to the android device of the sender will convert the message into RF signals. These RF signals will be sent to the antenna associated with the receiver's android device. The next step is to convert the RF signals to Bluetooth signals and send it to the android device.

4. TECHNOLOGIES & TOOLS

4.1 Arduino

Arduino is an open-source project that created microcontroller-based kits for making interactive objects and digital devices that can control and sense physical devices.

Microcontroller board designs are the main part of this project. These systems provide sets of digital and analog input/output (I/O) pins that can interface to other circuits and various expansion boards (termed shields) . The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. Integrated development environment (IDE) of this android project based on a programming language named Processing, this project supports the languages C++ and C. The first Arduino was introduced in 2005, focusing to provide a low expensive, easy way for professionals and average users to create devices that interact with their environment using actuators and sensors. Common examples of such devices intended for beginner hobbyists include simple robots, motion detectors and thermostats. This Arduino boards are commercially available in preassembled form. The hardware design specifications are openly available, allowing the Arduino boards to be produced by anyone.

4.2 Android Platform

Android is considered as the most successful and popular mobile operating system used widely by almost 80% of original equipment manufacturers (OEM) across the globe. Android is mobile operating system based on Linux kernel, it is designed primarily for touchscreen mobile devices. It has user interface based on direct manipulation. And most important it is developed by Google developers. It most commonly comes installed on a variety of smartphones and tablets from a host of manufacturers offering users an access to Google's own services like Search, YouTube, Maps, Gmail and more. Much of Android games were easily developed on

Eclipse, for which the user needs to install a special plug-in, which adds more functions for developing games and applications called as Android Development Tools (ADT).

4.3 Bluetooth Module

Bluetooth is a wireless technology exchanging data over short distance from fixed and mobile devices, building personal area networks (PANs). It connects several devices and overcoming problems of synchronization. Bluetooth is owned by the Bluetooth Special Interest Group (SIG), which has more than 25000 member companies in the areas of telecommunication, computing, networking, and consumer electronics. The IEEE standardized Bluetooth as IEEE 802.15.1, but no long maintains the standard. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks. A network of patents applies to the technology, which are licensed to individual qualifying devices.

4.4 Radio Frequency Module

Radio frequency (RF) is an electromagnetic wave frequency that lie in the range extending from around 3 kHz to 300 GHz, which include those frequencies used for communications or radar signals. RF usually refers to electrical than mechanical oscillations. However, mechanical RF systems do exist (see mechanical filter and RF MEMS). Although radio frequency is a rate of oscillation, the term radio frequencies are used as a synonym for radio. To receive radio signals an antenna must be used. However, since an antenna will pick up thousands of radio signals at a

time, a radio tuner is necessary to tune the antenna into a particular frequency (or frequency range). This is typically done via a resonator , a circuit with a capacitor and an inductor form a tuned circuit. The distance over which radio communications is useful depend on things other than wavelength, such as transmitter power, receiver quality, type, size, height of antenna, mode of transmission, noise and interfering signals. Ground waves, tropospheric scatter and sky waves can achieve greater ranges than line-of-sight propagation. The study of radio propagation allows estimates of useful range to be made.

5. IMPLEMENTATION DETAILS

5.1 Bluetooth Module

We have used an Atmel Atmega32 microcontroller for the implementation of an antenna device The Atmega32 is a high-performance low cost microchip. It has a 32bit flash memory and it is an 8-bit AVR RISC based microcontroller.

The Atmega32 as the name suggests comes with 32 general purpose working registers, a JTAG interface for boundary scan and on-chip debugging and programming, three flexible timer and counters with compare modes, internal interrupts, external interrupts, serial programmable USART, universal serial interface (USI) with start condition detector, a 8-channel 10-bit A/D converter, programmable watchdog timer with internal oscillator, SPI serial port, and five software power saving modes. The device operates between 1.8-5.5 volts.

5.2 HC-05 (The Bluetooth Module)

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module. The HC-05 Bluetooth module is actually designed for an easy wireless serial connection setup and for hassle free communications with microcontrollers. The HC-05 can work as either a master or a slave. It provides a maximum communication speed of up to 2.1 Mbps (or 160Kbps) when connected in the asynchronous mode. When in the synchronous mode, it works in the speed of up to 1Mbps.

As stated above, the android device cannot communicate directly using the radio signals we are using in our project. Hence, we are using an intermediate module the HC-05. The Android devices will actually communicate with this Bluetooth module so as to communicate with the antenna. The communication signals will be actually passed on to the Arduino board which will pass on these signals to the next module (HC – 12) which will convert these to the RF signals and then will pass on to the receiving android device.

The HC – 05 has a default baud rate of 38400 and supports 8 data bits communication pattern. The default stop bit of the HC – 05 is 1 and it has no parity in the device. This module also supports the following baud rates 9600, 19200, 38400, 57600, 115200, 230400, 460800. For this project, we've chosen a baud rate of 9600.

5.3 HC – 12 (Wireless Serial Module/ Radio Frequency Module)

The HC-12 wireless serial module plays a vital role in the implementation of this project. It makes it possible for the communication to take place within a maximum range of 1.8 kilo metre. This particular module has a working frequency range of 433.4 to 473.0MHz and it provides up to a 100 communication channels at a time. We can note here that the frequency range of the HC -12 actually comes in the ISM band. The industrial, scientific, and medical radio band is the group of radio bands which are internationally reserved for use of radio frequency (RF) energy intended for scientific, medical and industrial requirements. Hence, it is easy and costless to make use of this band. One of the main disadvantages of using this band is that, we must be setting the proper channel and also we must provide adequate amount of security for a hassle free communication.

6. CONCLUSIONS

In this application android devices will make use of Bluetooth to connect to this antenna. And the antenna would transmit the messages in the form of Radio Frequency Signals. By using this effective communication can be established between a sender and the receiver without using any internet or mobile network data. By using this application, user can exchange in communication without a centralized mobile network. This can be implemented cheaply and effectively just by using a simple Arduino Board and an Android Device. We do not use internet or any other networking technologies in this application.

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