# WIRELESS AUDIO TRANSMITTER

R.Suresh, S.Muthulakshmi, B.Kalpana
Department of Biomedical Engineering
Dhanalakshmi Srinivasan Institute of Technology, Samayapuram, Tamil Nadu, India

## Abstract

Since from past few years it has been observed that the technology has been changed very rapidly. Most of the devices that we are using at present are operating wirelessly. So in this paper we are proposing a method to transmit the audio signals wirelessly using Bluetooth and control the signal using CC2500 trans-receiver. Here we will use an audio device as an input to the voice signal to the controller that is Arduino Nano Atmega 328. The controller is used to down sample/ up sample the data and finally a wireless device Bluetooth is used for wireless communication.
Keywords - Bluetooth, Arduino Nano ATmega 328, CC2500

## 1. Introduction

In today's world wireless communication is the fastest growing technology. As wireless communication is very interesting area of research for researchers in electronics world. Wireless communication involves transmission and receiver of data without use of cables or wires. Wireless Sensor Network (WSN) is a network which works same as that of internet. As we know that the internet is a network in which various networks are connected to a central network called as hub. Similarly in a WSN network there are number of distributed sensors which collect data from various distributed locations and transfer it to a central location through the network. In traditional WSN we mainly focused on monitoring various parameters such as temperature, humidity, gas, pressure, etc. Now-a-days WSN are gaining more response in emergency applications. As there may be many uncertain parameters that need to support Voice transmission over WSN. [1] So there has been a tremendous surge in Voice over Internet Protocol (VoIP) in various sectors. People have started experiencing the advantages of VoIP in various sectors some of which include mobile, Wi-Fi etc. The advantage of using wireless network is it has low cost and it consumes low power as compared to wired networks [2-3]. Due to various benefits of wireless communications it has grown rapidly. The wireless approach shows many advantages but also has some disadvantages with respect to cabled networks. Mobility is clearly one of the major advantages of wireless with respect to cabled devices, which require plugging [2]. Another advantage lies in the way new wireless users can dynamically join or leave the network, move among different environments, create adhoc networks for a limited time and then leave. The technological challenges involved in wireless networks are not trivial, leading to disadvantages with respect to cabled networks, such as lower reliability due to interference, higher power consumption, data security threats due to the inherent broadcast properties of the radio medium, worries about user safety due to continued

exposition to radio frequency, and lower data rates[3]. With better wireless network, transmission of real time media in everyday life is now possible.

## 2. Literature Survey

From the past few years, technology has been growing at a very high speed. As now human beings are becoming much more dependent on electronic gadgets and their applications for their comfort. Thus, Bluetooth and IEEE 802.11 (Wi-Fi) are two communication protocol standards which define a physical layer and a MAC layer for wireless communications within a short range (from a few meters up to 100 meters) with low power consumption (from less than 1 mW up to 100 mW). Bluetooth is oriented to connecting close devices, serving as a substitute for cables, while WiFi is oriented towards computer-to-computer connections, as an extension of or substitution for cabled LANs. In this paper there is an overview of these popular wireless communication standards, comparing their main features and behaviours in terms of various metrics, including capacity, network topology, security, quality of service support, and power consumption. It conveys more information about communication modules like RF, Bluetooth and Zigbee in industrial applications. In this paper, an overall comparison of these modules on the basis of their industrial applications and characteristics such as standard, bandwidth, battery life, data rate, and maximum transmission range etc. Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor [3]. The most common wireless technologies use radio. The different types of wireless communication mainly include IR wireless communication, satellite communication, broadcast radio, Microwave radio, Bluetooth, Zig-bee etc . We discuss the wireless communication using the HC-05 Bluetooth module, the bluetooth network topology and interfacing Bluetooth with arduino. Real-time audio-visual communication has become the need of this era [4]. Video conferencing may be one solution to saving both time and money. In fact, video conferencing may be a more effective way of communicating to clients and customers. Integrated Network Systems can install video conferencing that will allow you to share anything that is on your computer monitor and meet people face to face. In last few years, work is being done for real time transmission of audio and video. This paper presents detailed study of audio and video transmission through various channels. Most popular is using wireless LAN or Wi-Fi. Though some authors have tried audio and video transmission through visible light communication using LEDs, some have used WiMax which means broadband wireless network with high speed. Arduino ATMEGA-328 microcontroller has been programmed for various applications [5]. By using the power jack cable, arduino microcontroller has been programmed so that the execution of the program may takes place. Various kinds of arduino board are present in the market. In this paper, Arduino UNO ATMEGA-328 microcontroller is described in a detailed manner. Arduino software is installed in the computer and so that we can edit and upload the program according to the applications. Mainly these arduino software supports c and c++ programming languages. Various inputs and outputs are present in the arduino board and therefore simultaneously 8 input and output ports can be used for various applications. Some of the applications used by using arduino boards are rotating general motor,

stepper motor, control valve open, etc.,

## 3. Theory of Techniques

### 3.1 Arduino Nano ATmega 328

The Arduino Nano is a small and user-friendly board based on the ATmega328 (Arduino Nano 3.0). It lacks only a DC power jack and works with a Mini-B USB cable instead of a standard one. The Nano was designed by Gravitech. The Arduino Nano can communicate with a computer or with other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels has serial communication over USB. The FTDI drivers provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent. The Receiver and Transmitter LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer.
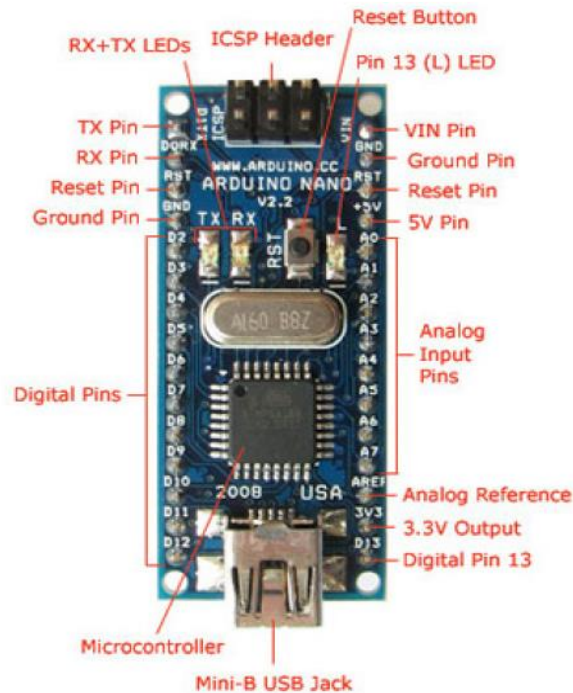


Fig 1: Arduino Nano ATmega 328

### 3.1.1 Power supply in Arduino Nano ATmega 328

There is an additional power supply source present in Arduino microcontroller. Power supply port is present at the corner of the arduino microcontroller. Either we can use this power supply port by connecting with external power supply (i.e, ac power supply), or by connecting a dc power supply through input pins. These power supplies produce an active form to the arduino microcontroller. These arduino microcontrollers can accept a range of power supply. When the power supply voltage range exceeds, the microcontroller gets damaged.

### 3.1.2 Working Principle of ATmega 328

The working of arduino microcontroller is where the proper connection is made. The output of the pins can be connected with the external devices according to their applications. The program to be executed for the applications can be done by using arduino software. From this arduino software, we can edit according to the applications. This software can works on c and c++ programming language. It is fully a high level language. By using the conditions of working, we can create a program to proceed for the applications. Then after, these programs can be uploaded through the arduino microcontroller by using the power jack cable. The program can be uploaded to the microcontroller and ready for further process. ATMEGA328 microcontroller can saves a program and these IC can acts as a processor to do the process without any error [6].

After by giving an analog or digital input to the system, we can do the process according to the applications. We can control the process of the application by editing the program in the arduino software and again can be uploaded to the arduino microcontroller via power jack cable. There is an option of reset button. The purpose of reset button is to reset the program which means the previous programs are deleted and we can use the arduino for the other application purposes. Likewise, these arduino ATMEGA328 microcontrollers can be used for n number of applications.

### 3.2 OVC 3860 Bluetooth Module

Bluetooth is a wireless communication technology used for exchange of data over short distances. It is found in many devices ranging from mobile phones and computers. Bluetooth has a combination of both technologies that is of hardware and software. It is intended to create a personal area networks (PAN) over a short range. It operates in the unlicensed industrial, scientific and medical band at 2.4 GHz. User can use the UART serial port to communicate with OVC3860. It will implement Bluetooth headset and stereo headset functions through sending AT command. The UART serial port use-slow signal wires: Transmitter and Receiver, supporting 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400, 460800 and 921600bps baud rate. The default baud rate is 115200bps.
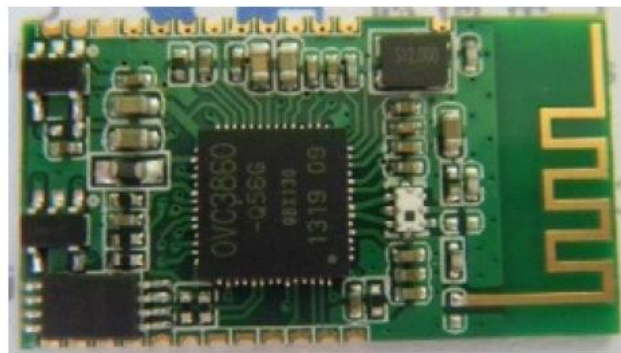


Fig 2: OVC3860 Bluetooth module

**3.2.1 Pairing & Connections of OVR 3860 Bluetooth Module:**

1) Enter Pairing Mode #CA

AT#CA: This command puts the module in the pairing mode. By response of information indication of command success or failure will be seen. Entering in pairing mode indication or failure indication will be sent to the host.

2) Cancel Pairing Mode #CB

AT#CB: When the module is in pairing mode, this command causes the module to exit the pairing mode. This command makes the module in idle state. By response of information indication of command success or failure will be seen.

3) Connect HFP to Handset #CC

AT#CC: This command is used to connect the module to a paired handset. By response of information indication of command success or failure will be seen. Connect Indication will be sent to the host after the connection will be established. Or disconnect Indication will be sent to the host.

4) Disconnect HFP from Handset #CD

AT#CD: This command is used to disconnect the module from the connected handset. By response of information indication of command success or failure will be seen. Disconnect Indication will be sent to the host after the connection is drop.

**3.3 CC2500 Trans-receiver**

CC2500 RF Modem is a transceiver module. It provides easy to use RF communication at 2.4 GHz. CC2500 is used to transmit and receive data at multiple baud rates. These data can be transmit and receive from any standard CMOS/TTL source. It works in Half Duplex mode which provides communication in both directions, but only one direction at a time. This switching from receiver side to transmitter side is done automatically.



Fig 3: CC2500 trans-receiver

### 3.3.1 Features:

- It supports Multiple Baud rates.

- Works on ISM band (2.4 GHz) which is reserved internationally.

- Supports multiple frequencies within the same band rate thus avoiding data collision.

- No complex wireless connection software required.

- Designed to be as easy to use as cables.

- No external Antenna required.

- Works on 5-9v DC supply.

### 3.4 CP2102 USB to serial Convertor

The CP2102 is a highly-integrated USB-to-UART Bridge Controller. CP2102 is used because it provides a simple solution for updating RS-232 designs to USB. It uses minimum components and PCB space for updating. The CP2102 includes a USB 2.0 full-speed function controller. It also has USB transceiver, oscillator, EEPROM, and asynchronous serial data bus (UART) with full modem control signals. No other external USB components are required.



Fig 4: CP2102 USB to serial Convertor

Wireless Audio Transmission System. As shown in figure it consists of a Bluetooth device i.e. Laptop, USB to serial converter and Trans-receiver.
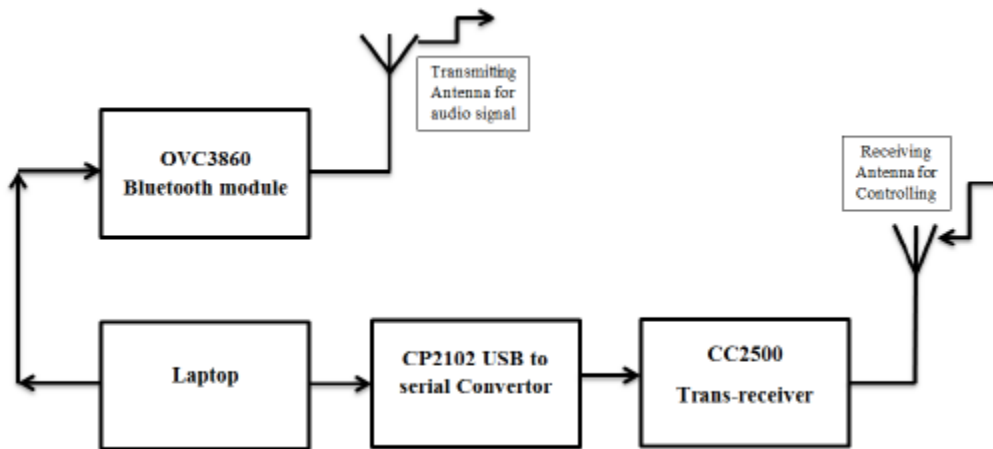
Fig 7: Transmitter section of Wireless Audio Transmission System

Here we are using a Laptop that contains Bluetooth used as an input device to the circuit. The Bluetooth device can directly be paired with OVC3860 Bluetooth module for transmission of data. From the fig, we can see that we are using CP2102 USB to serial converter which is highly integrated and use minimum PCB space. The CC2500 trans-receiver is used for controlling the device by using MatLab programming. Here we are using MatLab programming for controlling the signal. The controlling of a signal is done by using switches and they are transmitted and received by trans-receiver. This is shown in fig. 8. Switch contains five pins they are playing, next, stop previous and folder. The signal for controlling is transmitted from the receiver side to the transmitter side by using CC2500. If at transmitter side CC2500 trans-receiver get the signals of "PLAY" then device starts transmitting the audio signal using Bluetooth to the receiver side. If "STOP" is received transmitter stop the signal for transmission. If the "NEXT" signal is received the next song is played. If the "PREVIOUS" signal is received the previous song is being played. If the "FOLDER" signal is received then the next folder song is played. In this way, the control of signal is done.

Fig. 8 shows the block diagram of the receiver section. Here the transmitted signal is transmitted by using Bluetooth is received by the receiver and this signal is then applied serially to the micro-controller unit through UART for processing. Externally battery is connected with the Arduino microcontroller for the power supply. After processing the signal is to be applied to the OVR3860 Bluetooth module to get output using headphones. From the fig. 8 we can see that the switches are connected to the microcontroller which is used for controlling the device using CC2500 trans-receiver.
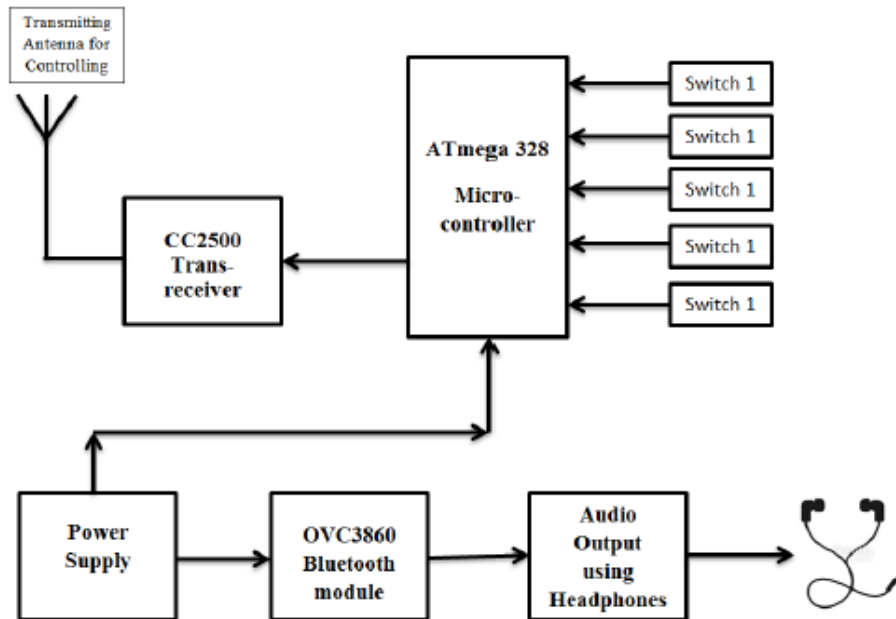
Figure 8:  Receiver Section

## 4. Software Used

4.1 Matlab

MATLAB is a fourth-generation high-level programming language. Matlab has an interactive environment for visualization, numerical computation, and programming. It allows matrix manipulations, plotting of functions and data, creation of user interfaces, interfacing with programs. A program in MatLab is written in other languages which include C, C++, Java, and FORTRAN and creates different applications. It has numerous commands and math functions that help in mathematical calculations and generating plots. MATLAB allows writing two kinds of program files: <pScripts - Script files are program files with ".m extension". <pIn these files, you write a series of commands, which you want to execute. Scripts do not accept inputs and do not return any outputs. They operate on data in the workspace. Functions - Functions files are also program files with ".m extension". Functions can accept inputs and return outputs. Internal variables are local to the function. You can use the MATLAB editor or any other text editor to create your ".m" files. So in this section, we will discuss the script files. <pA script file contains multiple sequential lines of MATLAB commands and function calls. Here you can run a script by typing its name at the command line.

## 5. Results and Conclusion

Thus, we have implemented Bluetooth technology for the transmission of the audio signals. Bluetooth remains a very promising technology, with sound quality and connectivity of the device. Along with quality, the range of the device is also improved. The controlling part of the device can be done very efficiently by using switches. Hence, we conclude that the device works efficiently as an audio transmitter.

## References

[1] Erina Ferro, Francesco Potortì, "Bluetooth and Wi- Fi wireless protocols: a survey and a comparison", IEEE Wireless Communication's magazine, June 2004.

[2] V.Abinayaa, Anagha Jayan, "Case study on comparison of wireless technologies in industrial applications", International Journal of Scientific and Research Publications, Volume 4, Issue 2, February 2014.

[3] Anisha Cotta, Miss. Naik Trupti Devidas, "Wireless communication using HC-05 Bluetooth module interfaced with arduino", International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 4, April 2016.

[4] Nalini Bagal, Prof. Shivani Pandita, "A Review: Real-Time Wireless Audio-Video Transmission", International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008) Certified Journal, Volume 5, Issue 4, April 2015.

[5] Rajeeb Lochan Dash, Mrs. A. Ruhan Bevi," Realtime Transmission of Voice over 802.11 Wireless Networks Using Raspberry Pi", Volume 2, Issue 1, International Journal of Engineering Development and Research,p.793-800,2014.

[6] http://in.mathswork.com/product/Matlab

[7] Matlab: http://www.tutorialspoint.com

[8] Yingjie He, Liwei Ding, Yuxian Gong, Yongjin Wang," Real-time Audio & Video Transmission System Based on Visible Light Communication", Optics and Photonics Journal, 153-157, 2013.

[9] Bhushan R Jichkar., "Proposed System for Placing Free Call over Wi-Fi Network Using VoIP and SIP", Int. Journal of Engineering Research and Applications, ISSN:2248-9622, Vol.4, Issue 1( Version 3), pp.132-135, January 2014.

[10] G.Sai Prasanna, S.Karunakar, "Implementation of VOIP Communication on Embedded Systems", International Journal of Research in Computer and Communication technology, IJRCCT, ISSN 2278-5841,Vol 2, Issue 1, January 2013.

[11] Akshay Iyer, Akshay Badgujar, Maheshkumar Eaga, Rohit Iyer," Voice and Video over Wireless LAN", International Journal of Scientific and Research Publications, Volume 3, Issue 9, September 2013.

[12] Daniel Jakubisin,Marshall Davis,Casey Roberts,Dr. Ivan Howitt, "Real-Time Audio Transceiver Utilizing 802.11b Wireless Technology", IEEE,2007.

[13] Dapeng Wu, Yiwei Thomas Hou, Wenwu Zhu, Ya-Qin Zhang, Jon M. Peha, "Streaming Video over the Internet: Approaches and Directions", IEEE 2001.

[14] Kostas Maraslis, Periklis Chatzimisios, Anthony Boucouvalas," IEEE 802.11aa: Improvements on video transmission over Wireless LANs", Ad-hoc and Sensor Networking Symposium, IEEE ICC 2012. A. Panayides,

[15] Eleftheriou, M. Pantziaris, "Open-Source Telemedicine Platform for Wireless Medical Video Communication", International Journal of Telemedicine and Applications, Article ID 457491, Jan 2013.

[16] Misun Yu, Woosuk Cha, Jun-Keun Song, Ji-Young Kwak, Seon-Tae Kim," Design and Implementation of an Audio/Video Group Chat Application for Wireless Mesh

[17] Irfanullah, Amjad Ali, Abdul Qadir Khan, Rehanullah Khan, Akhtar Khalil" WiMAX Based Audio/Video Transmission", IJCSI International Journal of Computer Science Issues, Vol. 10, Issue 1, No 3, January 2013.