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Communication Department

Design and implementation IR Communication System for Voice Transmission

A project

Submitted to the department of Communication of University of Diyala _ College of Engineering in partial Fulfillment of the Requirements for the Degree of Bachelor in Communication Engineering.

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SUPERVISORS CERTIFICATION

We certify that the preparation of this project entitled "***Design and implementation IR Communication System for Voice Transmission***", was made under our supervision at Communication Engineering Department/College of Engineering in Diyala university by(Anwar Sajid & Sahar Hazim) as a partial fulfillment of the requirements for the degree of B.Sc. in Communication Engineering.

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CERTIFICATION OF THE EXAMINATION COMMITTEE

We certify that we have read this project entitled "***Design and implementation IR Communication System for Voice Transmission***" and as examining committee examined the students (***Anwar Sajid& Sahar Hazim***) in its contents and that in our opinion it meets the standards of a project for the degree of B. Sc. in Communication Engineering.

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شكـــــر وتـــقـــديـــــر

في مثل هذه اللحظات يتوقف اليراع ليفكر قبل أن يخط الحروف ليجمعها في كلمات ... تتبعثر الأحرف وعبثاً أن يحاول تجميعها في سطور.

سطوراً كثيرة تمر في الخيال ولا يبقى لنا في نهاية المطاف إلا قليلاً من الذكريات وصور تجمعنا برفاق كانوا إلى جانبنا

فواجب علينا شكرهم ووداعهم ونحن نخطو خطوتنا الأولى في غمار الحياة

ونخص بالجزيل الشكر والعرفان إلى كل من أشعل شمعة في دروب عملنا و

وإلى من وقف على المنابر وأعطى من حصيلة فكره لينير دربنا

إلى اساتذتنا الكرام

ونتوجه بالشكر الجزيل إلى الدكتورة

سهى ابراهيم النصار

التي تفضلت بالإشراف على هذا البحث فجزاها الله عنا كل خير فلها منا كل التقدير والاحترام

ونوجه الجزيل من الشكر والامتنان الى أستاذ حسين أحمد على كل ماقدمه لنا من المساعدات والتوجيهات السديدة.

الاهـــــــداء

إلهي لا يطيب الليل إلا بشكرك ولا يطيب النهار إلا بطاعتك ... ولا تطيب اللحظات إلا بذكرك ... ولا تطيب الآخرة إلا بعفوك... ولا تطيب الجنة إلا برؤيتك...

****الله جل جلاله****

إلى من بلغ الرسالة وأدى الأمانة .. ونصح الأمة .. إلى نبي الرحمة ونور العالمين ...

****سيدنا محمد صلى الله عليه وسلم****

إلى من كلله الله بالهيبة والوقار .. إلى من علمني العطاء بدون انتظار .. إلى من أحمل أسمه بكل افتخار .. أرجو من الله أن يمد في عمرك لترى ثماراً قد حان قطافها بعد طول انتظار وستبقى كلماتك نجوم أهتدي بها اليوم وفي الغد والى الابد...

****والدي العزيز****

إلى ملاكي في الحياة .. إلى معنى الحب وإلى معنى الحنان والتفاني .. إلى بسمة الحياة وسر الوجود

إلى من كان دعائها سر نجاحي وحنانها بلسم جراحي إلى أغلى الحبايب...

****أمي الحبيبة****

إلى من آنسني في دراستي وشاركني همومي تذكاراً وتقديراً

****أصدقائي****

الى الذين كانوا عونا لنا في بحثنا هذا ونورا يضيء الظلمة التي كانت تقف أحيانا في طريقنا.

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****اساتذتنا الكرام****

ABSTRACT

Wireless infrared communications refers to the use of free-space propagation of light waves in the near infrared band as a transmission medium for communication.

Infrared radiation is simply light that we cannot see, which makes it great for communication. IR sources are all around us. The sun, light bulbs, or any anything with heat is very bright in the IR spectrum. IR light is very similar to visible light, except that it has a slightly longer wavelength. This means IR is undetectable to the human eye - perfect for wireless communication so it is considered one of the important source use in communication system,

In this project, we designed and implement voice communication system by using Infrared (IR) as a source that established an audio communication(link to transmit and receive voices and music via a l via infrared light. The outcome of this project is to design and implementation an optical wireless system to transmit voice over a certain distance in laboratory.

This project will include the construction of the transmitter and receiver circuits as a complete this optical communication system .this system has many advantages such as is a common, inexpensive, and the transmitter or receiver can be moved to other locations with minimum disruption .

LIST OF TABLES

LIST OF FIGURE

LIST OF ABBREVIATIONS

FSO – Free Space Optical

IR - Infrared

LED - Light Emitting Diode

IrDA - Infrared Data Association

PANs - Personal Area Networks

PDAs - Personal Data Assistants

ELF - Extremely Low Frequency

NIR - Near Infrared

FIR - Far Infrared

IM/DD - *Intensity Modulation with Direct Detection*

WLANs - Wireless Local Area Network

PCB - Printed Circuit Board

IR LED - Infrared Light Emitting Diode

Chapter One

Introduction

1-1 Introduction:

Wireless optical communication system also known as free space optical (FSO) system is a system that modulate visible or infrared (IR) beams through the atmosphere to propagate any data signals via an optical communication link in space .

FSO system uses a light source such as a laser to transmit data. but instead of enclosing the data stream in a glass fiber , FSO transmit the modulate light beam through air.

IR radiation is simply light that we cannot see, which makes it great for communication. IR sources are all around us. The sun, light bulbs, or any anything with heat is very bright in the IR spectrum.

Wireless infrared communications is one of the earliest types of optical communication and it refers to the use of free-space propagation of light waves in the near infrared band as a transmission medium for communication .

The key component of an infrared system is an infrared LED (Light Emitting Diode) to emit the light and a photo-diode in the television or equipment to receive the light.

Infrared technology, increasingly present in mainstream applications, holds great potential for enabling people with a variety of disabilities to access a growing list of information resources. Already commonly used in remote control of TVs, VCRs and CD players, infrared technology is also being used and developed for remote control of environmental control systems, personal computers, and talking signs.

This project is not expensive (i.e.) It is the cheapest design within the range of lower middle class society, so easy and makeable with the available equipments that the technical as well as non-technical person can construct it by themselves

for their personal use. and can be used for general conversion purpose as well as for confidential data transmission**[1,2,3].**

1-2Problem statement:

The main problem that we faced is the choice of a IR-LED is compatible with the components in this project.

1-3 Objectives:

The main objective of this project can be summarized by these points:

1. To design and Study of the optical wireless optical communication technology with infrared light source as its optical source. And understand transmitter and receiver system that will establish a communication link for voice or music using a light optical source(IR).
2. To study the circuitry and different types of components (resistors, detectors and infrared –LED) in this circuit , and Identification of the parameters and limiting errors to be considered in this project .
3. another very important aspect is through this project ,the understanding on the working principle of this wireless optical signal can assist a better understanding on signal transmission and propagation.

Chapter Two

Literature Review

2-1 Introduction

Wireless information transmission using electromagnetic radiation is ubiquitous. Depending on the requirements such as range (distance) and throughput (the rate at which information is transported), various frequency ranges are selected **[4].**

2-2 Literature Review:

The Infrared Data Association (IrDA), an industry-sponsored organization set up in 1993 to develop standards for infrared communication hardware and software, defines the physical interface specifications and communications protocol standards for short-range data communications in applications such as personal area networks (PANs). IrDA interfaces have been extensively used for communication between devices such as palmtop and laptop computers, mobile phones, and personal data assistants (PDAs). In recent years, Bluetooth has been offered as an alternative interface in such devices, but since the early 2000s has largely replaced IrDa as the wireless interface in new products, since the cost of this technology has fallen rapidly, and unlike IrDa it does not require direct line of sight and can support hardware such as wireless mice and keyboards**[5].**

In 2005, R. Kawano et al. has reported the technology of compactness with high-quality sound generation. The digital signal is converted by ON-OFF keying and transmitted via an infrared LED with 1-bit A/D conversion. The receiver converts the received infrared signal into an electrical signal and then the logic inverter reshapes the waveforms and converts them to analog signal with a simple low pass filter. Finally, the analog signal drives the speaker to regenerate the voice. This simple receiver configuration makes the receiver very small and inexpensive. However, the transmission distance is only 3 meters to 5 meter and its depends upon the number of the transmitter. Besides that, A. Beaver et al. also reported that the distances of operation vary with the intensity of the infrared light that is emitted by the LED on the transmitter. The number

of LED that emitting light is controlled by a single jumper. Each jumper configuration limits the current through the LED to approximately 70mA, where the maximum current the LED can take is 100mA .Wenqi Huang and Hong Yang have reported that the method modulation and demodulation are the key technology of the transmitting terminal and receiving terminal respectively. The scheme I (Laser scheme) use the semiconductor visible laser with wavelength is 650nm as the signal carrier and a photoelectric diode as the detector, the scheme II (Infrared scheme) uses infrared as the signal carrier and an infrared remote control receiver module as the detector, the scheme III (Radio scheme) use radio wave as the signal carrier and a receiving antenna as the detector .The scheme infrared transmission distance is 5 meters, and some small obstacles are allowe because the infrared's transmission path is divergent. Nevertheless, the background noise and vibration environment will also influence the effect of receiving**.[2]**

2-3 Infrared Wireless Comuunication System

Wireless communication, as the term implies, allows information to be exchanged between two devices without the use of wire or cable.in others words the information is being transmitted and received using electromagnetic energy, also referred to as electromagnetic radiation. One of the most familiar sources of electromagnetic radiation is the sun; other common sources include TV and radio signals, light bulbs and microwaves. To provide background information in understanding wireless technology, the electromagnetic spectrum is first presented and some basic terminology defined.

The electromagnetic spectrum classifies electromagnetic energy according to frequency or wavelength as shown in Fig.1-1, the electromagnetic spectrum ranges from energy waves having extremely low frequency (ELF) to energy waves having much higher frequency, such as x-rays. Infrared is an electromagnetic radation of awavelength longer than that of vissible light but

shorter than radio waves. And has wavelength between (750 nm-1mm) as shown in Fig.(2-1),spanning three orders of magnitude .for infrared LEDS,typically they are divided into Near Infrared(NIR) and Far Infrared(FIR).

In this project (NIR) is our interest ,for (NIR) it is further divided into two bands ,which the long wave and shortwave NIR based on how the film and Ccdcameras react. In optical communication ,the part of the infrared spectrum used is divided into several bands based on the availability of the light sources ,transmitting \absorbing metarials (fibers) and detectors .

In infrared communication an LED transmits the infrared signal as bursts of non-visible light. At the receiving end a photodiode or photoreceptor detects and captures the light pulses, which are then processed to retrieve the information they contain. Infrared technology offers several important advantages as a form of wireless communication **[2,5].**

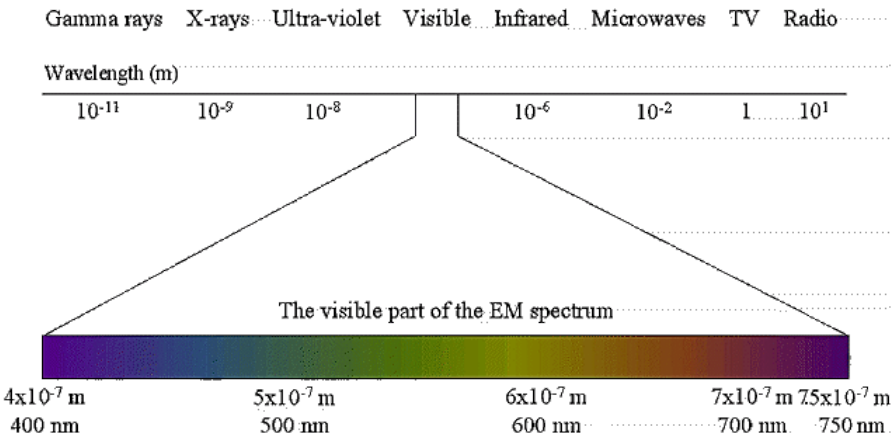

Fig. 2-1: The electromagnetic spectrum

IR communication system requires three main parts transmitter circuit , medium propagation (IR) and receiver circuit as shown in fig.(2.2)

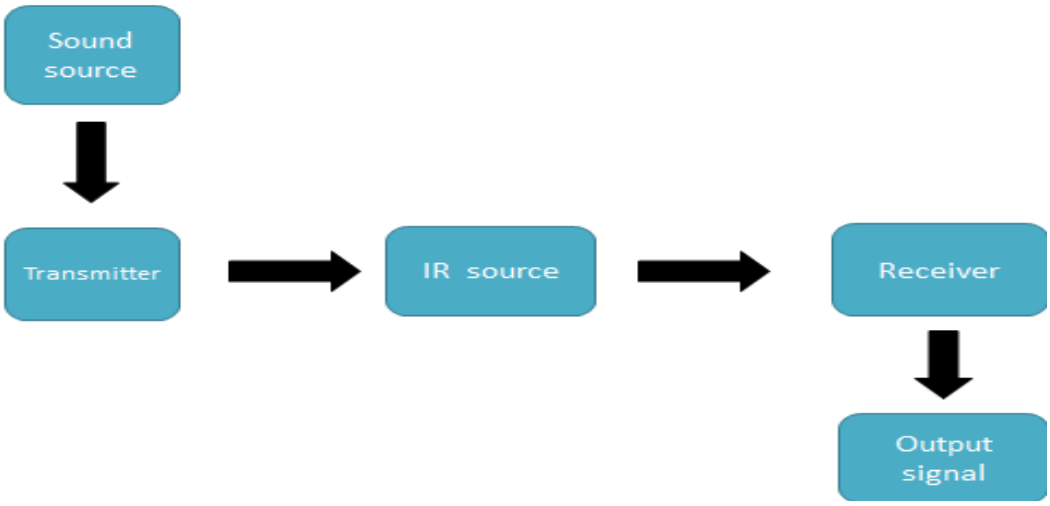

Fig.(2.2): the block diagram of IR communication system

Infrared wireless data communication has been developing rapidly and has been widely used in the close wireless data communication. In this paper, there is the design and achievement of infrared communication system, which has realized the short distance transmission of voice and digital signal (temperature signal). The modem part of the system is implemented by the phase locked circuit composed of TDA2002. At the same time, with the single chip processor as the core, the temperature information which has been encoded is added to the audio signal and then to be transmitted to the receiver to be decoded to restore the temperature information. After the test of implementation, this system can transmit the speech signal and digital signal directly and the voice signal received has no obvious distortion. This system is simple in making and has a good application prospect **[2,5].**

An infrared transmitting device, either a light-emitting diode (LED) or a laser diode, converts an electrical signal to an optical signal. LEDs have a naturally wide transmission path and are suitable for short-range applications. They are also much safer than laser diodes for indoor use. Laser diodes have narrow transmit beams and a relatively narrow spectral width, making them more suitable for point-to-point long-range applications. Most systems *use* intensity

modulation with direct detection (IM/DD) to achieve optical modulation and demodulation. The transmitted signal's intensity or power is proportional to the modulating signal, and a photo detector at the receiver produces an output current proportional to the received optical signal intensity. In most operating environments, the detector is also illuminated by other sources of light energy, include ambient light sources such as sunlight or artificial light sources. These light sources represent a significant noise component at the receiver. The availability of effective, low-cost LEDs and photodiodes operating in the 800-1000 nanometer range has led to the requirement for transmitters to have a peak-power wavelength of between 850 and 950 nanometers**.[3]**

Therefore, this project will provide the initial drive to transmit voice and music by the light source and propagated through free space to be received.

Moreover, this project also undertaken as a solution for problems about limited distance for transmitting the audio signal and reduce the noise.

2-4Advantages and Disadvantages of IR Communication System:

IR Advantages:

1. Low power requirements: therefore ideal for laptops, telephones, personal digital assistants .
2. Low cost .
3. Simple circuitry: no special or proprietary hardware is required, can be incorporated into the integrated circuit of a product.
4. Higher security: directionality of the beam helps ensure that data isn't leaked or spilled to nearby devices as it's transmitted
5. Portable
6. High noise immunity: not as likely to have interference from signals from other devices**[5].**

IR Disadvantages:

1. Line of sight: transmitters and receivers must be almost directly aligned (i.e. able to see each other) to communicate
2. Blocked by common materials: people, walls, plants, etc. can block transmission
3. Short range: performance drops off with longer distances
4. Light, weather sensitive: direct sunlight, rain, fog, dust, pollution can affect transmission
5. Speed: data rate transmission is lower than typical wired transmission**[5]**

2-5 Comparison Between communication by IR and radio media

As a medium for short-range, indoor communication, infrared1 radiation offers several significant advantages. Infrared emitters and detectors capable of high speed operation are available at low cost.

The infrared spectral region offers a virtually unlimited bandwidth that is unregulated worldwide. Infrared and visible light are close together in wavelength, and they exhibit qualitatively similar behavior. Both are absorbed by dark objects, diffusely reflected by light-colored objects, and directionally reflected from shiny surfaces. Both types of light penetrate through glass, but not through walls or other opaque barriers, so that infrared transmissions are confined to the room in which they originate. This signal confinement makes it easy to secure transmissions against casual eavesdropping, and it prevents interference between links operating in different rooms. Thus, infrared wireless LAN's can potentially achieve a very high aggregate capacity, and their design may be simplified, since transmissions in different rooms need not be coordinated.

Freedom from multipath fading greatly simplifies the design of infrared links.

The infrared medium is not without drawbacks, however. Because infrared cannot penetrate walls, communication from one room to another requires the installation of infrared access points that are interconnected via a wired backbone. In many indoor environments there exists intense ambient infrared noise, arising from sunlight, incandescent lighting and fluorescent lighting, which induces noise in an infrared receiver. In virtually all short-range, indoor applications, IM/DD is the only practical transmission technique.

Often, infrared links must employ relatively high transmit power levels and operate over a relatively limited range. While the transmitter power level can usually be increased without fear of interfering with other users, transmitter power may be limited by concerns of power consumption and eye safety, particularly in portable transmitters.

The characteristics of radio and infrared indoor wireless links are compared in Radio and infrared are complementary transmission media, and different applications favor the use of one medium or the other. Radio is favored in applications where user mobility must be maximized or transmission through walls or over long ranges is required and may be favored when transmitter power consumption must be minimized. Infrared is favored for short-range applications in which per-link bit rate and aggregate system capacity must be maximized, cost must be minimized, international compatibility is required, or receiver signal-processing complexity must be minimized**[6,7]**

2-6 Application of Wireless IR Communication System:

Wireless infrared communication systems can be characterized by the application for which they are designed or by the link type, as described below.

A. Applications

The primary commercial applications are as follows:

1- short-term cable-less connectivity for information exchange (business cards, schedules, sharing) between two users. The primary example is IrDA systems

wireless local area networks (WLANs) provide network connectivity inside buildings. This can either be an extension of existing LANs to facilitate mobility, or to establish networks where there is no LAN. The primary example is the IEEE 802.11standard

2-building-to-building connections for high-speed network access or metropolitan- or campus-area networks.

3- wireless input and control devices, such as wireless mice, remote controls, wireless game controllers, and remote electronic keys **[1].**

B. Link Type

Another important way to characterize a wireless infrared communication system is by the \link type", which means the typical or required arrangement of receiver and transmitter **[1].**

Chapter Three

Methodology

3-1 Introduction:

This chapter will illustrate the steps which employed to prepare the IR communication system for voice transition , starting from design the transmitter circuit and then design receiver circuit, also it explains equipment which used for both of transmitter and receiver circuits.

The design of IR communications systems in this project can be easily deployed since they are inexpensive, small, low power and do not require any radio interference studies. Two parallel beams are needed, one for transmission and one for reception. The carrier required for transmission of signal in this communication system is generated by IR-LED.

For this project, the circuit for transmitter and receiver has being designed by using Proteus software and the circuit is fabricated using printed circuit board (PCB).

3-2 Methodology:

To prepare this low cost project, several related circuit diagram has been downloaded from different websites. After verification, a suitable circuit has been chosen for modification according to the equipment available in our country for preparing a low cost design. The design was modified in such a way so that general people of Iraq can make it quite easily with affordable equipment here. The designed circuit was constructed on a bread board. The transmitter and the receiver circuit were tested differently and every stage output was examined carefully by using an adopter for power supply instead of 9V battery at Communication department, University of Diyala Engineering college. The circuit consists of a transmitter and a receiver. Both the transmitter and the receiver are built around TDA 2002, powered by a 9V battery.

Among different stage test, first the transmitter was tested using IR available in anywhere in the market. Electronic equipment have been changed in different

stages according to the need and availability in our country in order to get proper output with the possible minimum cost. After getting desired output, the efficiency as well as the range of the system was verified. Comparison of cost of this system and available low cost system has been done.

3-2-1 Circuit Diagram - Transmitter:

Fig. 3-1 shows the transmitter circuit by using infrared (IR) emitter LED as the light sources. It uses popular melody generator IC (TDA2002) that can generate a continuous musical tone. IC (TDA2002) production is fed to the infrared (IR) driver stage to get the maximum range. Here, the red LED flashes according to musical tones generated by IC (TDA2002), indicating modulation. The electrical signal from melody generator this component is converted into an invisible infrared light signal by the infrared light emitting diode (IR LED) type (TSAL 6400) has special specification as shown in appendix A.

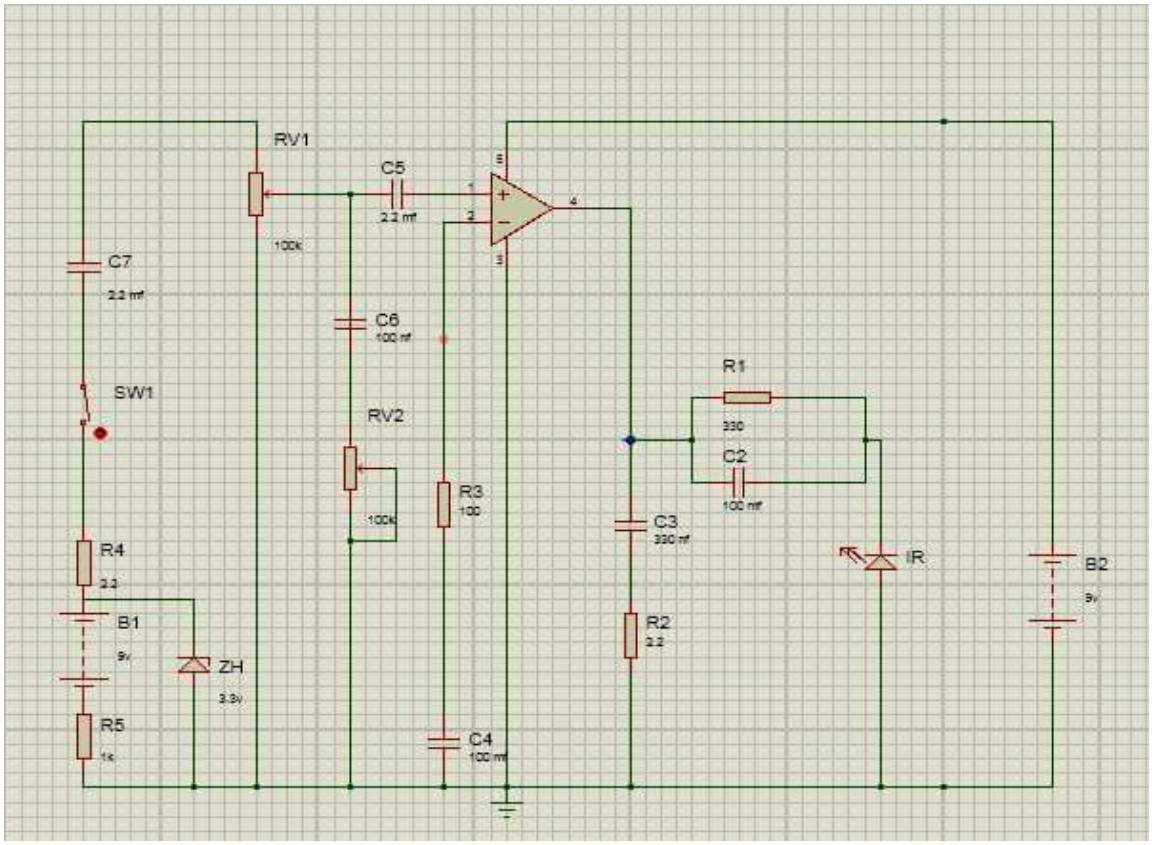

Fig. 3-1 :Transmitter circuit by using Proteus software

Here a laser diode (LD1) with maximum operating voltage of around 3.3V DC and maximum operating current of 45 mA is used to transmit the audio signal. The voltage divider network formed by R1, and R2 keeps the voltage as well as the current for the laser diode in the safe region.

VR1 (100K Ω) is used to change the level of the input audio signal. The audio input (Vin) is taken from the preamplifier output of the music system (CD player, DVD player, etc.). Capacitor C6 and preset VR2 are used to vary the gain of the IC (TDA2002).

Components Used for Transmitter circuit

"Tab. 3.1" represents the necessary equipment for preparing transmitter circuit.

Tab. 3.1:The important components for transmitter circuit

Resistors	Capacitors	Other
R1=330 Ω	C1=100 μF	IR-LED TSAL 6400
R2=2.2 Ω	C2=100μ F	ZH=3.3 v
R3=100 Ω	C3=330 nF	Battery=9 v
R4=2.2Ω	C4=100μ F	IC (TDA2002)
R5=1kΩ	C5=2.2μ F	
VR1=100K Ω	C6=100 nF	
VR2=100 Ω	C7=2.2 μ F	

3-2-2 Circuit Diagram - Receiver:

Fig. 3-2 shows the receiver circuit by using transistor IR-PNP type (SFH203FA) as shown in Appendix (B) to receive the signal from IR-LED and then it come out from the speaker has a low amplitude voltage with keep the 9V battery inside the receiver cabinet.

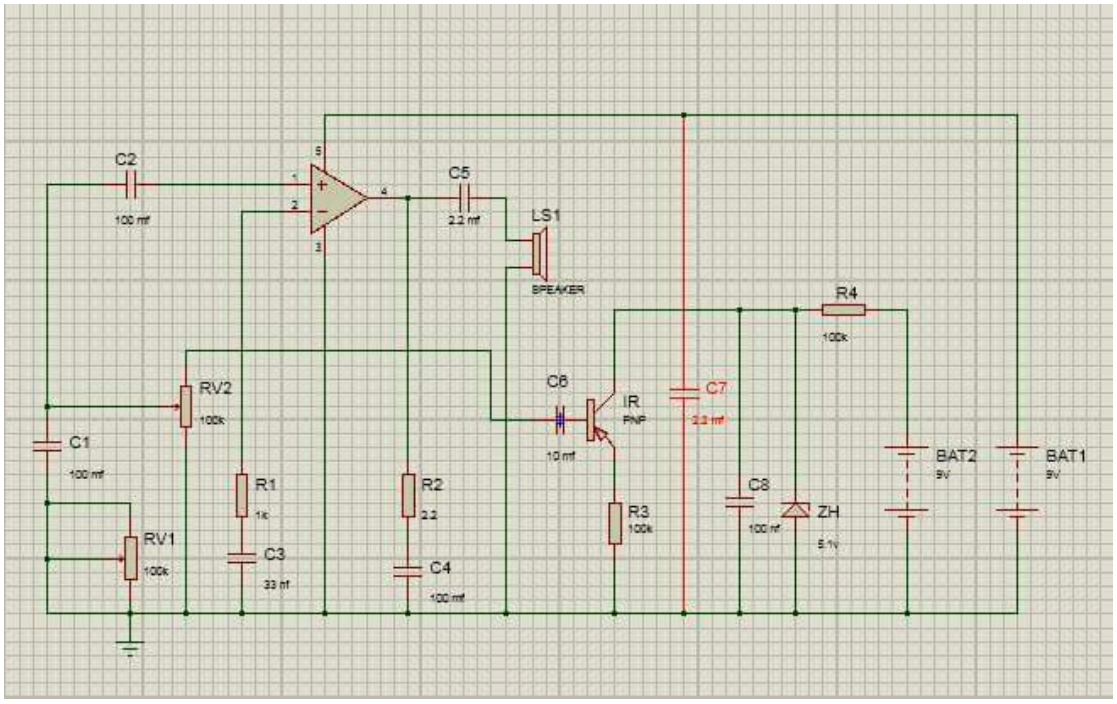

Fig. 3-2: Receiver circuit by using Proteus software

The photodiode in the receiver converts this invisible infrared light signal into an electrical signal at the receiver circuit. The infrared (IR) audio system receiver uses popular operational amplifier IC (TDA2002) and audio frequency amplifier along with photodiode and some discrete components. The melody generated by IC (TDA2002) is transmitted through IR LED, received by photodiode and fed to pin 2 of IC (TDA2002). Its gain can be varied using variable resistor VR1. The output signal is fed to IC (TDA2002) via capacitor and variable resistor VR2). Finally, this larger electrical signal drives the speaker which turns electrical energy into sound energy. The melody produced is heard through the receiver loudspeaker. Variable resistor VR2 is used to control the volume of loudspeaker .

For maximum sound transmission needs to be oriented towards and must hit the infrared (IR) PNP transistor at the receiver.

Components Used for Receiver circuit

"Tab. 3.2" represents the necessary equipment for preparing receiver circuit.

Tab. 3.2: The important components for receiver circuit

Resistors	Capacitors	Other
R1=1K Ω	C1=100 μF	IC- TDA 2002
R2=2.2 Ω	C2=100μ F	IR-PNP (SFH203FA
R3=100K Ω	C3=33 nF	ZH=5.1 v
R4=100Ω	C4=100μ F	Battery=9 v
VR1=100K Ω	C5=2.2μ F	
VR2=100K Ω	C6=10 μ F	
	C7=2.2μ F	
	C8=100 nF	

3-3 Design and Working of the System

There were two sections, transmitter and receiver, both powered by a separate 9V fixed voltage power supply.

Infrared (IR) audio transmitter system uses popular melody generator IC- TDA 2002 that can generate a continuous musical tone. IC-TDA 2002 production is fed to the infrared (IR) driver stage (built cross transistors BC547 and BD140) to get the maximum range. Here, the red LED flashes according to musical tones generated by, indicating modulation. The electrical signal from melody generator IC-TDA 2002 is converted into an invisible infrared light signal by the infrared light emitting diode (IR LED). For maximum sound transmission needs to be oriented towards and must hit the infrared (IR) photodiode at the receiver. The photodiode in the receiver converts this invisible infrared light signal into an electrical signal at the receiver circuit. The infrared (IR) audio system receiver uses popular operational amplifier IC (TDA2002) along with photodiode and some discrete components. The melody generated by IC (TDA2002) is transmitted through IR LED, received by photodiode and fed to

pin 2 of IC (TDA2002). Its gain can be varied using variable resistor VR1. Finally, this larger electrical signal drives the speaker which turns electrical energy into sound energy. The melody produced is heard through the receiver loudspeaker. Variable resistor VR2 is used to control the volume of loudspeaker.

Chapter Four

Results and Discussion

4-1 Introduction:

This chapter is divided into three sections the first section contains design and construction the transmitter circuit ,the second part contains the construction and design receiver circuit, the last part contains the construction and operation IR communication system for voice transmission with unique properties such as inexpensive, small, low power and do not require any radio interference studies.

Both transmitter and receiver circuit powered by a separate 9V fixed voltage power supply. An LDR was in the receiver as a receiving element and the high gain amplifier with a basic audio output stage powers a small speaker.

4-2 Transmitter Circuit:

Fig. 4-1 shows the construction of transmitter circuit with components as shown in chapter 2. The transmitter board contained a microphone and an IR source with 210 mw at opposite ends. The input signal is from radio or mobile, so the output of the radio or mobile will amplifier by an amplifier. Thus the main part of Circuit is an amplifier. This sound signals (even at a distance of 1 meters from the mic) are picked up by the condenser microphone and converted into electrical variation, which are amplified by the op-amp. (Operational amplifier) IC- TDA2002 is use in the inverting mode with a single supply using divider network of resistor the gain of IC can be set be varying the feedback through R5/6 resistance (can place a 1M variable) here the output of IC is further amplified by the push-pull amplifier using transistor IR-PN(SFH203FA pair, in this circuit are R2 is feedback resistance with R1/8 and C1/3 to connected IC- TDA2002 . The IC's pin 2 is connect VR1 (variable resistance) through connect to O/P of (transistor) also use 6volt DC. The microphone should be placed near the circuit with the shield wire to suppress tune. The output of the amplifier is taken from emitter of two transistors, with a filter C5 from speaker. Same process continues in the second amplifier.

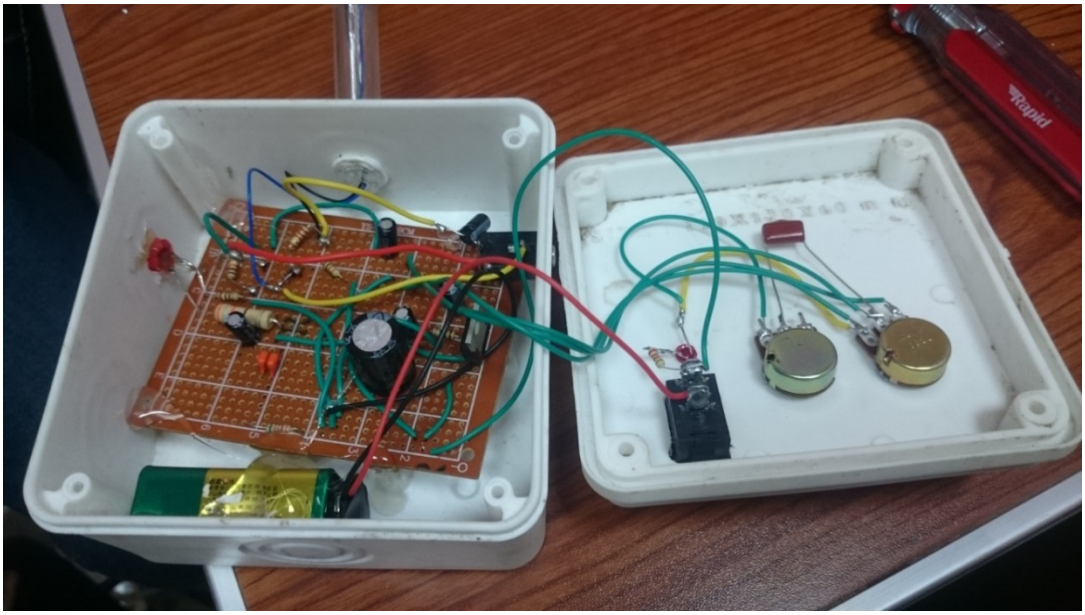

Fig. 4-1 : Transmitter circuit

4-3 Reciever Circuit:

Fig. 4-2 shows the construction of receiver circuit, we use a PNP transistor to receive the signal from IR and then it come out from the speaker has a low amplitude voltage .

The receiver uses infrared modules IR-signal from the transmitter is sensed by the sensor through and its output PIN 1 goes low and switched LED. IC-TDA2002 is worked on clock pulse which receives to infrared modules at Pin No. 14. Its output at Pin No 2 troughs high.

The output signal from IC is also used for lighting LED-1 indicating presence of signal. When no signal is available output of sensor module goes high and transistor LED is switched ‘OFF’. When another signal arrives, LED is switched ‘ON’. This makes the LED to switch ‘ON’ the appliance at first pulse and ‘OFF’ the appliance at its Second pulse arrived at its sensor.

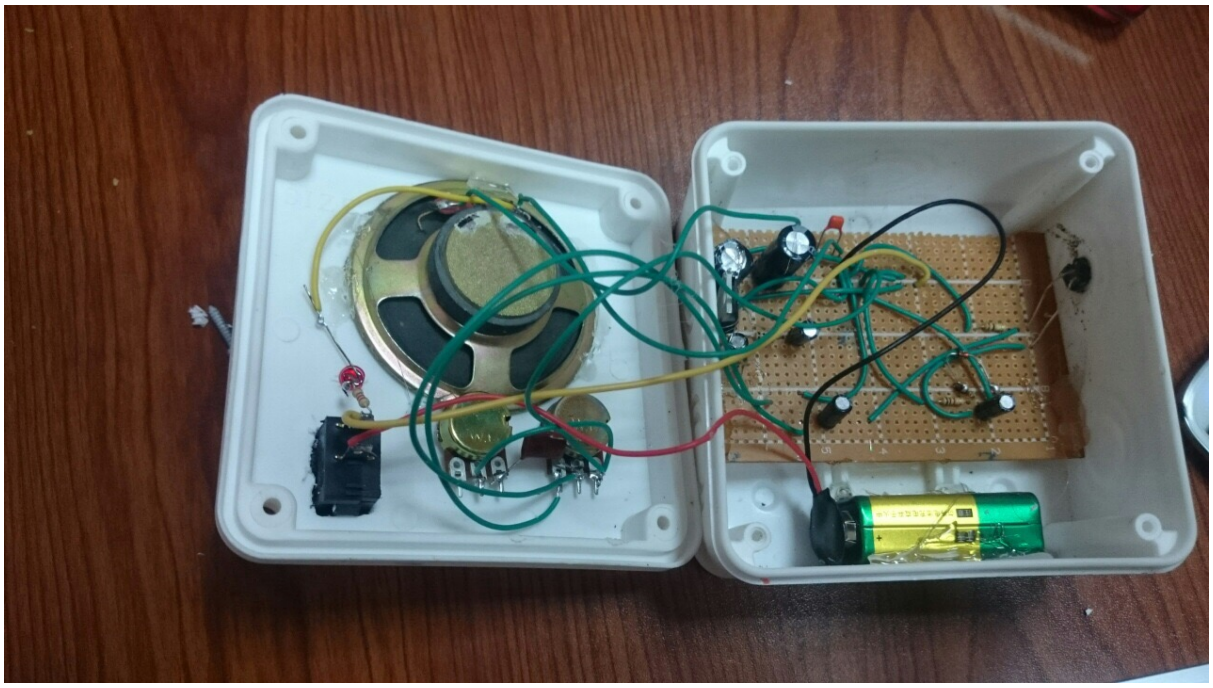

Fig. 4-2: Receiver circuit

4-4 Design and Working of the System :

At the first we connected the transmitter and receiver circuits by using IR-LED and another components as (Battery and switch and capacitors and resistors etc..) as shown in Fig. 4-3 which shows the completed prototype of IR wireless audio communication system. Both IR transmitter and receiver work by using battery (9V).

Transmitter uses light IR LED as a data carrier. Transmitter was modulation frequency to produce a series of audio signal encoding. Then, the receiver will receive the signal light, modulated and enforced signals that can be sent by voice amplifier where the music can be heard.

Fig. 4-3 : design and working the IR- communication system

When switch key is pressed, circuit is energized. The output of The transmit IR beams modulated at same frequency 1KHz. The receiver uses infrared module. The IR- signal form the transmitter is sensed by the receiver sensor.

In transmitter circuit using infrared (IR) radiation which emitter LED as the light sources. It uses popular melody generator IC TDA2002 that can generate a continuous musical tone. IC TDA2002 production in receiver circuit is fed to the infrared (IR) driver stage (built cross transistor PNP) to get the maximum range. Here, the LED flashes according to musical tones generated by IC-TDA2002 , indicating modulation. The electrical signal from melody generator TDA2002 is converted into an invisible infrared light signal by the infrared light emitting diode (IR- LED). For maximum sound transmission needs to be oriented towards and must hit the infrared (IR) photodiode at the receiver. The photodiode in the receiver converts this invisible infrared light signal into an electrical signal at the receiver circuit .The infrared (IR) audio system receiver uses audio frequency amplifier TDA2002 and PNP transistor with photodiode and some discrete components. The melody generated by IC TDA2002 is transmitted through IR LED, received by photodiode. Its gain can be varied using variable resistor VR1.

Finally, this larger electrical signal drives the speaker which turns electrical energy into sound energy. The melody produced is heard through the receiver loudspeaker. Variable resistor VR2 is used to control the volume of loudspeaker

Finally, this larger electrical signal drives the speaker which turns electrical

energy into sound energy. The melody produced is heard through the receiver loudspeaker.

Chapter Five

Conclusions and Future Works

5-1 Introduction:

This chapter explain the conclusions and future works related in the project .

5-2 Conclusions

This is new wireless technology to transmit sound signal from one section to other section through the IR beam of the system.

The optical wireless audio system can be used to transmit musical information from the receiver end to the transmitter end using the infrared radiations. Based on this project, we have improve the traditional infrared communication by increasing the transmission distance and the effective signal coverage area, which is also has the advantage of low cost, high speed communication and almost no bandwidth limits.

5-3 Future Works

In the future, we recommend to improve the efficiency of optical wireless transmission by using another type of IR such as laser diode (LD) as the light source, because the LD can hit the laser over long distance with low noise.

Furthermore, this project will proceed to transmit audio and video simultaneously with low noise in the future.

Therefore, this system should be a good system and has high potential of commercialization that can be used in various applications such as wireless communication in the museum, airplane, intercom, TV sound system and closed circuit cameras.

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الخلاصة

تعتبر الاتصالات بواسطة الأشعة تحت الحمراء لاسلكية وذلك لاستخدام انتشار الفضاء الحر من موجات الضوء في نطاق الأشعة تحت الحمراء بالقرب من وسيلة نقل للاتصال. الأشعة تحت الحمراء هي ببساطة تعتبر الضوء الذي لا نستطيع أن نراه، مما يجعلها جيدة في عملية الاتصال .مصادر الأشعة تحت الحمراء في كل مكان حولنا .الشمس والمصابيح الكهربائية، أو أي شيء مع الحرارة هو مشرق جدا في الطيف تحت الحمراء .ضوء الأشعة تحت الحمراء هي مشابهة جدا للضوء المرئي، إلا أنه يحتوي على الطول الموجي الأطول قليلا .هذا يعني أنه لا يمكن الكشف عنها للعين البشرية بحيث يعتبر واحدا من استخدام مصدرا مهما في نظام الاتصالات في هذا المشروع قمنا بتصميم وتنفيذ صوت نظام الاتصالات باستخدام الأشعة تحت الحمراء (IR) كمصدر لنقل الصوت (وصلة لإرسال واستقبال الأصوات والموسيقى عن طريق الأشعة تحت الحمراء، ونتائج هذا المشروع تتلخص في تصميم وتنفيذ نظام لاسلكي بصري لنقل الصوت عبر مسافة معينة في المختبر.

ويشمل هذا المشروع بناء دوائر الارسال والاستقبال كنظام متكامل والذي يتميز بالعديد من المزايا مثل هو شائع، وغير مكلفة، وجهاز الإرسال أو الاستقبال يمكن نقلها إلى مواقع أخرى مع الحد الأدنى من الانقطاع.

وزارة التعليم العالي والبحث العلمي

جامعة ديالى

كلية الهندسة

قسم الاتصالات

تصميم نظام اتصالات لنقل الصوت بواسطة الاشعة تحت الحمراء

مشروع

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متطلبات نيل درجة البكالوريوس في هندسة الاتصالات

من قبل

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