

# Infrared (IR) Serial Communication

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**Abstract:** In order to facilitate serial communication, an infrared communication-based system is developed for transmitting data from the transmitter end to the receiver end using infrared light radiation equipment. In this paper, the authors are trying to transmit data using an IR transmitter by converting it into the low-level format i.e., binary format (0's and 1's) once these bits are transmitted, they are received at the receiver end using an IR receiver and then again converted to the original format which is understandable by us. The intriguing part and epicenter of this paper is studying and formulating a technique of how these bits can be transmitted via infrared radiation. The system has low-cost, reliable transmission of data, stable performance, high-speed communication and almost no limitations of bandwidth range.

## 1. INTRODUCTION

Free Space Optical (FSO) framework is defined as a framework that modulates visible or infrared (IR) radiates within the atmosphere to communicate any sort of signals through an optical communication system in free space. IR radiation is fundamentally light that can't be seen, which makes it amazing for communication. The sun, light bulbs, or anything with heating system is incredibly bright in the IR spectrum. An infrared Light Emitting Diode (LED) is a vital component of an infrared framework to produce the light and a photo-diode in the TV or equipment to receive the light. Infrared emission technology plays a significant role in mainstream applications, it carries a potential for empowering individuals with a variety of disabilities to recover a list of data resources. Moreover, Infrared technology is used and developed for remote control of environmental control systems, PCs, and so on. An inexpensive framework is designed in this paper, so make-able and simple with the convenient equipment that the technical as well as non-technical individual can fabricate it by themselves for their personal deployment and can be utilized for common conversion purpose besides the transmission of data.

## 2. GOALS AND OBJECTIVES

The project aims at experimenting with a conventional form of unguided transmission media i.e. Infrared, in order to transmit the data a logic must be developed considering the fact that infrared LED can be set to either high or low where high means LED is turned on but is invisible to humans with naked eyes, to ensure its working an individual must develop this system to integrate his/her ideas into something concrete such that the data can be transmitted by just using these two states of infrared LED. This project not only aims at developing a product (Hardware or Software), but also the in-depth study of the previous existing products in the same category and their insufficiencies. Accordingly, a methodology is taken to propose a solution, which is better from the past ones in one respect or the other.

In this project for the purpose, we will look at:

1. Formulating a technique so as to transmit data (majorly texts) provided at runtime by performing conversion techniques such that the data can be transmitted by just using the HIGH or LOW state of the infrared LED.
2. Transmitting data serially through an infrared LED by converting digital signal to infrared signal. Then, the received infrared signal is converted back into a digital signal and reformed to the original state by logical system.
3. Proper synchronization and reliability of the data being transmitted such that the message being transmitted is not altered.

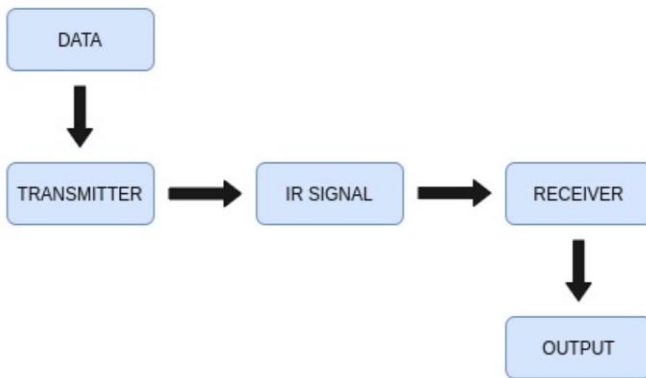
## 3. INFRARED SERIAL COMMUNICATION

Wireless communication permits data to be transmitted between two devices without utilizing wire or cable. The information is being transmitted and received via electromagnetic radiation, the electromagnetic spectrum orders



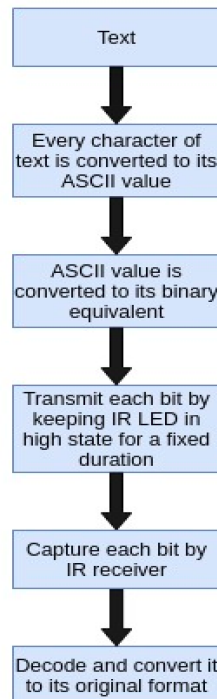
electromagnetic energy according to wavelength or frequency, the electromagnetic spectrum is a range that varies from energy waves having extremely low frequency to energy waves having a lot higher frequency, e.g. x-rays. Infrared is an electromagnetic radiation which has a wavelength longer than that of visible light but shorter than radio waves and has wavelength between (750 nm-1mm)

Infrared LEDs are classified into Near Infrared and Far Infrared. In this paper NIR is our interest, it is divided into two bands the long wave and short wave NIR. IR communication system consists of three main parts transmitter circuit, medium propagation (IR) and receiver circuit.



In this paper, short distance transmission of text is accomplished by the conversion of each character from the text to its associated ASCII value, then this ASCII value is further converted to its binary equivalent and hence, these bits are transmitted serially i.e. one after the other. Since IR LED is only capable of of staying in two states i.e. either HIGH or LOW we developed the technique to accompany the transmission of data error free and with utmost efficiency by assigning a specific duration of gap for which it stays in LOW state in between the transmission of bits, for transmission of ‘0’

bit there is a 50 ms duration and for transmission of ‘1’ bit there is a 70 ms duration. Now in order to define a gap between each word of a string there is a 90 ms duration which determines the space ( ‘ ’) after transmission of each word and if the duration of IR LED staying high for more than 110 ms determines that the transmission of data is complete.



4. TOOLS AND TECHNOLOGY USED

**C language:** C is a general-purpose, procedural, imperative computer programming language. C is the most widely used computer language. C programming is considered to be a low-level language and the base for other programming languages, it is used in operating system, embedded system, network drivers, etc.



**Raspberry-Pi:** The Raspberry Pi is an inexpensive computer that runs Linux (Raspbian), but it also provides a set of GPIO (general purpose input/output) pins that allows to control electronic components for physical computing and explore the Internet of Things (IoT) with wide variety of hardware.

**IR transmitter:** IR transmitter is a device that emits an infrared signal, it resembles to any normal LED that has anode and cathode but unlike LED it emits radiation that is not visible to naked eyes.

**IR receiver:** These are the devices that catches infrared signals from your IR transmitter (remote control) just like a television or music system. After receiving an IR signal, they decode and amplify the signal via low-voltage wiring. Receivers must be located within a close proximity where one wishes to use the remote control since this requires line-of-sight transmission.

**Jumper Wires:** A jump wire is basically an electrical wire or group of them, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or circuit with other components without the need for soldering them which makes them convenient to use.

**Breadboard:** A breadboard is a construction base for establishing a connection of electronic devices. Breadboards are used to help you connect various electronic components to complete your basic circuit. It is basically used along with jumper wires and are ideal for creating a small connection setup.

## 6. REQUIREMENTS

- Around 5 MB secondary storage space for the tool to operate
- Around 10 MB of RAM requirements
- C compiler like GCC
- Raspberry-pi, Arduino or any other micro-controller
- Jumper Wires
- Bread Board
- IR TRANSMITTER and 3-pin IR RECEIVER
- Internet connectivity in order to remotely control the device

## 7. CONCLUSION

This paper is focusing on transmitting infrared signal from the transmitter end to the receiver end using the infrared light radiation equipment, this design is called the optical wireless system. The designing in this paper is devoted on the development of the conventional infrared radiation for transmitting data and is successfully achieved by generating a technique that can handle transmission of large texts with utmost reliability, likewise this system has unique advantages such as minimal effort with low cost, high speed transmission of data and almost no limitations of bandwidth range. This project can be made and utilized successfully at conference room, political assembly, and study halls and for general conversation between two houses. So, the lowest cost of this design is better to use for general conversation where confidentiality is a prime issue.

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