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# Contact Less High Speed Data Transfer using Light

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***Abstract:*** ***The project we are going to take-up is "Contact Less High Speed Data Transfer using Light". The purpose of this device is to provide an air gap between systems in different security classifications while transferring data between them. This enables data sharing without worrying about the network/bluetooth/wireless protocols that have been found to be vulnerable. These devices can be used in line of sight areas. The challenges would be to provide data throughputs of the rate of Mbps as these LEDs or Lasers work only at Kbps speeds and also to preserve the integrity of the data transferred. Light is omni present and hence prevention of interference from other light emitting devices would be another challenge. Though LiFi has been talked about almost about 5 years back, there is no robust system in place to provide such systems in a practical environment.***
***Keywords: Li-fi, Bluetooth, Wi-Fi, IDE, I2C, Arduino.***

## I. INTRODUCTION

Generally, a thought in the brain is of no use unless and until it is shared with other individuals and rest of the world. The idea, no matter however brilliant it is, must come out for its successful implementation for it to benefit to all. In-order to make this possible we make use of a communication system which enables the successful transmission of idea or any important information among individuals. The free flow of information between the sender and the receiver takes place because of the communication system. The flow of information can be individual to individual, individual to machine-vice versa and machine to machine. There are various types of communication between systems for the smooth flow of information between two parties like the optical communication system makes use of light as a medium for communication. In this system the transmitter converts the information into an optical signal and finally signal reaches the recipient. The recipient decodes the signal and responds accordingly. The safe landing of aeroplanes works on above principle, another type of system is the radio communication system where the information flows with help of radio waves here in this system the transmitter and receiver are both equipped with an antenna and we also have the duplex communication system where two equipment's can communicate with each other in both the directions simultaneously where as it is vice versa in half duplex kind of systems. Some of the limitations for improper communication are the security, other than spoken face-to-face communication with no possible eavesdropper, it is probably safe to say that no communication is guaranteed to be secure in this sense, although practical obstacles such as legislation, resources, technical issues, and the sheer volume of communication serve to limit surveillance and the interference etc

Few techniques like OTP based communication is used for a two-step verification where in order to transfer bill amount from customer's account to seller's account, a one- Time Password (OTP) is needed which is valid for only one transaction, is generated by OTP Transaction Server of the bank to authenticate their clients and to counter network eavesdropping / replay attacks. However, if the OTP itself gets attacked then there might be chance of attacking to the current transaction and bank account of the client. One other such system is an air gap-based system where if you want to ensure that your device won't be hacked then the only way someone can compromise an air-gapped computer is if they have to be able to walk up and physically plug in a USB drive, or other type of storage media. An air-gapped machine generally functions as a viewing station, a way to work with sensitive files while ensuring they're not subject to being hacked, or themselves infecting your network. We can also remove computer hard drive too. Instead, you can boot it from a USB installed, which ensures that no trace is left on the computer after use. That means you can't store any files on your air-gapped machine. This makes the system impossible for any meaningfully attack.

One another most useful system to ensure best security is the Data-diodes where it is a cybersecurity solution that insures unidirectional information exchange. They are the failsafe way to protect sensitive systems and confidential data. Data diodes are small hardware devices which sit between two networks. Working like a check valve, the function of a data diode is to allow all data to pass in the forward direction, while blocking all the data in the reverse direction. The fibre optical connection makes it physically impossible for data to travel in the opposite direction. And unlike software-based firewalls, as the data-diodes are enforced by hardware mechanisms it cannot be directly attacked by malicious code, which results in high assurance.

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Light is a form of energy that causes the sensation of vision. Different theories on the nature of light were proposed on the basis of the fact that energy can be transferred from one point to another, either by particle motion or by wave motion, Some of the important properties of light is that it travels in a straight line , for long distance, at a speed of 3 * 10^8m/s faster than sound and radio waves, it can be reflected, refracted etc , we can also use such light for communication purpose like for example let us take an example of simple LED as light source where a glowing LED indicates a sending data(1) and an off LED indicates a no data(0) so we send the data in such a way that a human eye can't see the off LED, such is the rate at which the data is sent. Until and unless we stop sending the data, the LED will be at high data state (1) and the light from LED is received by photoreceiver at receiving end and accordingly the signal is conditioned and retrieved by the User. A few of the challenges faced in this communication is that it is limited for indoor applications as we use LEDs for communication it is difficult to modulate at a very reasonable rate also the problem is their bandwidth is limited to a few megahertz (MHz) as they are not designed for high bandwidth, interference from external light causes disturbance of data transfer if trying an outdoor application.We have embarked on this project to solve many of the traditional secure communication related problems.

## II. LITERATURE SURVEY

There are many wireless technologies like Bluetooth, WI-FI etc.,Bluetooth operates at 2.4GHz band and its coverage are is small along with that the data rate is very low .To remedy this they have came up with WIFI technology where this technology uses radio Frequency to transmit the data, it provides a speed up-to 150mbps but is not able to accommodate number of users . To over come this we made the transferring of data possible through light where we need not require to accommodate the router like WI-FI . As our project uses light as source for data transfer it can be achieved under water also unlike WI-FI .We can also use electromagnetic waves but there are limitations in using them. In WI-FI technology data is no that secure as it is using radio waves. During these days security is the most concerned part where in WIFI technology the data can be hacked unlike LIFI where the data is a bit secure ,so these all points motivated me to work on a project of LIFI technology.

## III. METHODOLOGY

Here first we will enter our text data which will be displayed **o**n lcd at tx ,so here obviously the text is series of characters ,it checks for the start character if not entered or text completed enter again or is already entered the character is extracted, converted into ASCII, then into binary bits which means each character is converted into 8-bit binary and then appended with CRC bits and then transmitted through laser. The output of the laser will on and off light within no time according to the encoded bits these bits will be transmitted to the Rx.

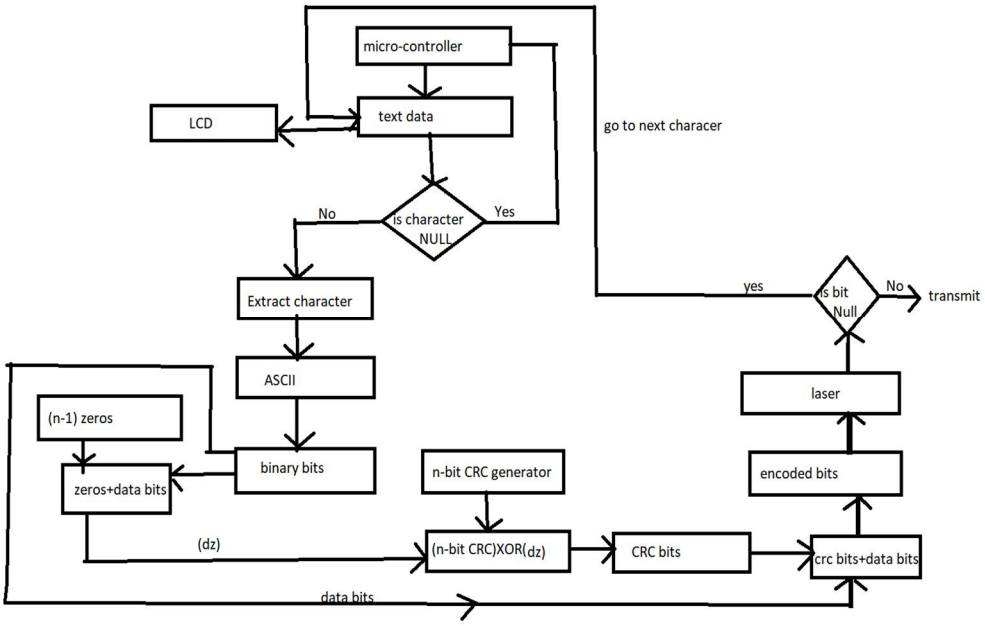



Fig: 1- Transmitter of methodology

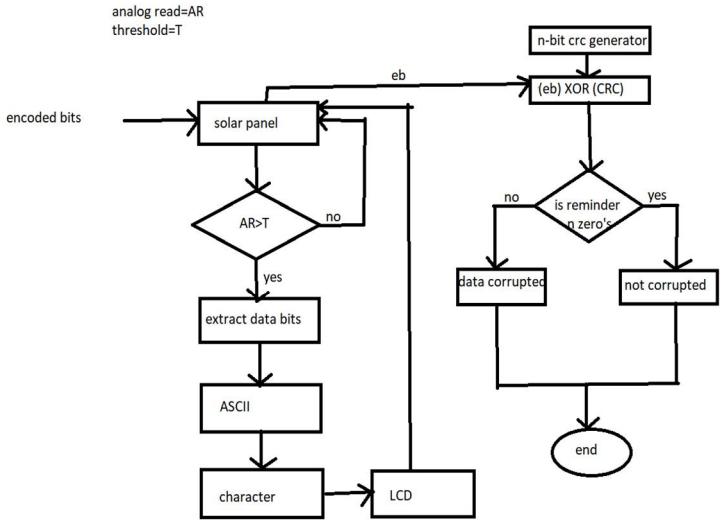



Fig 2 : Receiver Methodology

Here the encoded bits from tansmitter hit the solar panel at the receiver then it gives the analog read value greater than the threshold if not it indicate that no light on panel then the data bits are extracted and converted into ASCII followed by character which is displayed on LCD and then loop goes on for next set of 8-bit i.e. one char until all characters are received ,so in-order to check for the data integrity the encoded bits are straight away xored with n-bit crc from crc generator then if reminder gives n-zeros it is said that data is not corrupted or else data is said to be corrupted.

## IV. IMPLEMENTATION OF PROTOCOL

Here arduino is used as my micro-controller to control laser and lcd at the transmitter , the connections are pretty simple there are three pins of laser and four pins after I2C is soldered to LCD these pins are connected to the arduino as shown above and after the code is written in the IDE it is dumped using the cable and the laser will glow on and off within no time according to the data present this laser is on when bit 1 is transmitted and of when bit 0 is transmitted and this may take place within no time finally the light from the laser is hit on the panel after the crc is implemented

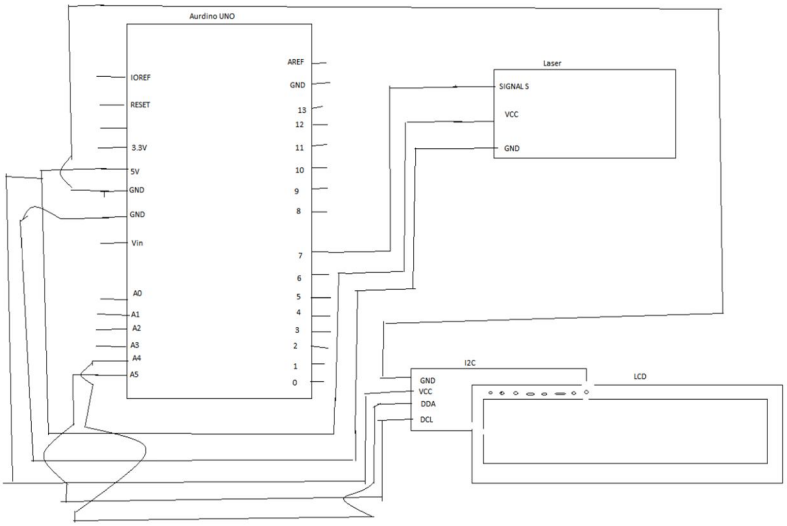



Fig:3- Transmitter Schematic.

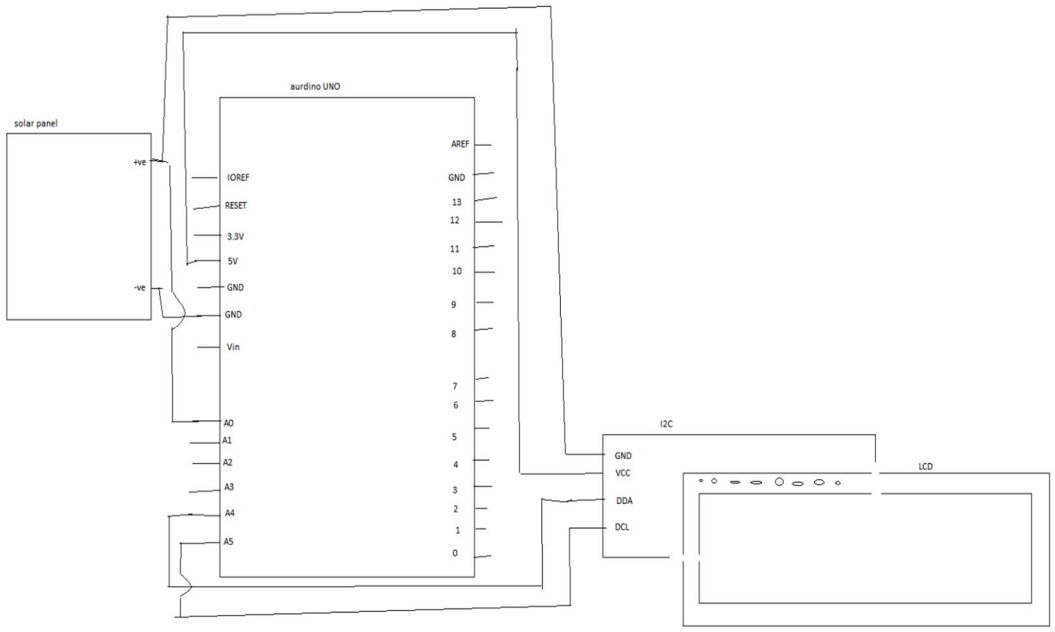



Fig 4: Receiver schematic

Here at my receiver also I used arduino as my micro-controller and LCD with soldered I2C to display the data transmitted from the transmitter here the solar panel will receive the bits from the laser which means if the analog read value of the panel is greater than the threshold set then the bits said to be hitting the panel else if less than threshold then no bits are said to be hiiting or some data is said to be corrupted so to ensure data integrity first the encoded bits are xored with n crc bits generated by crc generator finally if the reminder of the xor operation is an n-bit zeros then the data is said be correct else the data is said to be corrupted.

## V. RESULTS AND DISCUSSIONS

We have successfully completed our project with proper demonstration, the screenshots of our outputs are given below**:**

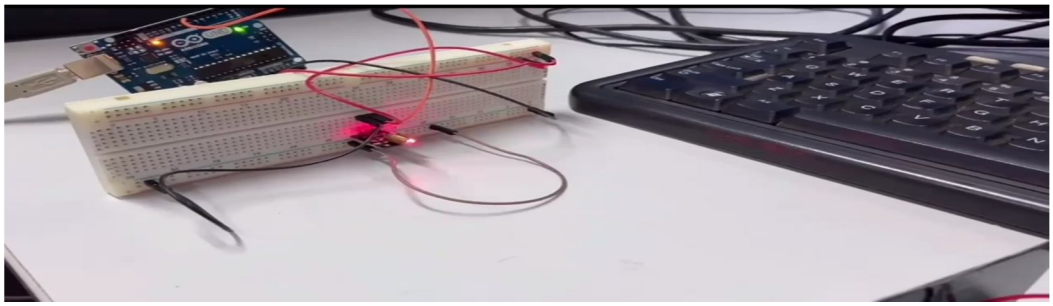


Fig:5-This is how the data is transmited through laser after it is converted into binary bits

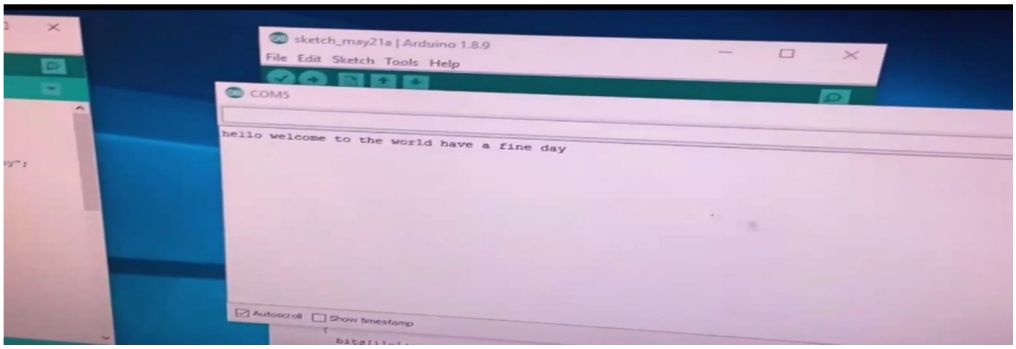



Fig:6- After receiving the data through solar panel this is how it is displayed at the receiver serial monitor.

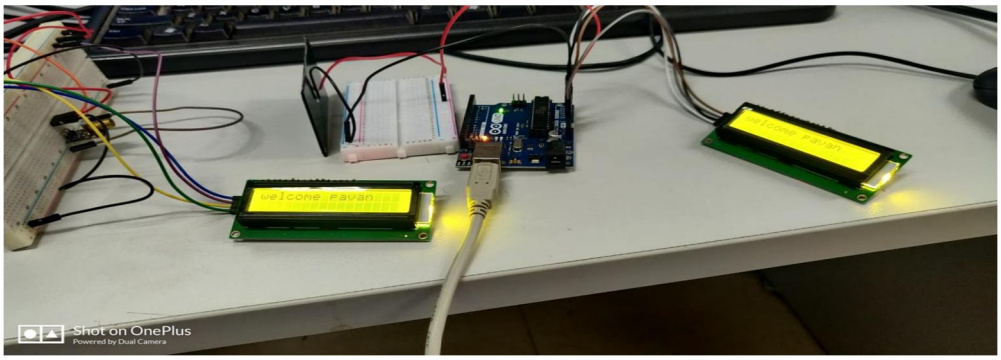



Fig 7: After we have added the lcd's the data is displayed at both ends i.e at the sender side after entering the data and receiver side after receiving the data it is shown as below

## VI. CONCLUSION

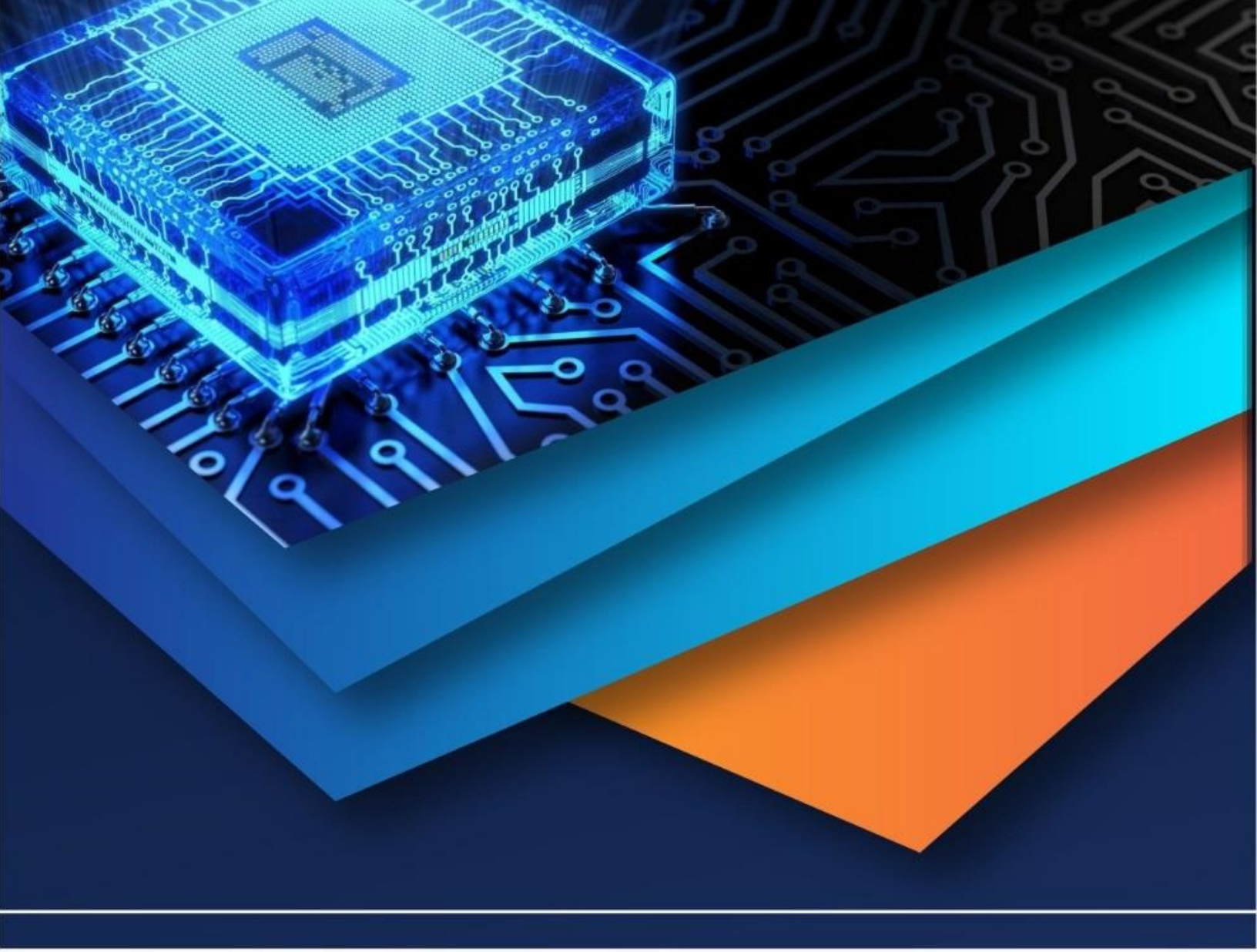
We have successfully completed the project and we are able to transmit some chucks of the data using this system and we have tested this transmitted for a distance of 1 feet, 3feet and 5 feet distance between tx and rx ,we have also ensured the data integrity by using one of the standard algorithm called CRC-32 check though we are also having some other algorithms like parity check, CRC-64 etc, here parity check cannot detect for more than one bit change while CRC-64 is very complex for implementation ,so we felt than CRC-32 algorithm is sufficient for our system so we have used it. I feel that data rates can be improved by using some high efficiency lifi sensors . in present days where more usage of radio frequency waves will lead to the greater impact on the health of living beings so if we make such kind of small prototype's and them to the larger end product it may be helpfull in many ways .

## VII.FUTURE SCOPE

There are lots of improvements can be made in future like at present we are only transmitting some chunks of data where as in future we can transmit bigger files as well and with the same concept we can make the system to full duplex system unlike the present which is a half duplex system , we can also combine this system with some encrypting concepts and transmit the data for more secure transmission like we can use compression followed by entrophy or vice versa but the resultant output of the data is encrypted data any way finally we can also improve the speed factor by using some high standard lifi sensors which can give a speed upto 12Mbps. At present if some data will be corrupted during the transmission we are only detecting the issue but not correcting the error so in future this can also be made possible.

## REFERENCES

[1] Shubham Chatterjee, Shalabh Agarwal, Asoke Nath, "scope and Challenges in Light Fidelity(LiFi)Technology in Wireless Data Communication", International Journal of Innovative Research in Advanced Engineering(IJIRAE), Issue 6, Vol 2, Page 1-9,(June 2015).
[2] Savage, Neil (2014). Li-Fi Gets Ready to Compete with Wi-Fi http://spectrum.ieee.org/telecom/internet/lifi-gets-ready-to-compete-with-wifi
[3] Quick, Darren (2014). 10 Gbps Li-Fi System Shows Wireless Data Transfer in New Light http://www.gizmag.com/li-fi-wireless-technology/32968/
[4] Cuthbertson, Anthony (2015). LiFi Internet Breakthrough: 224 Gbps Connection Broadcast with an LED bulb http://www.ibtimes.co.uk/lifi-internetbreakthrough-224gbps-connection-broadcast-led-bulb-1488204



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