Two Channel Single Transmission Medium Laser Communication

Dileep Gowda H S[1], Preetham Gowda S[2], Sagar Prathik[3], Sujith R[4], SugandhaSaxena[5]

[1]School of Electronics and CommunicationREVA University, Bangalore, India
[2]School of Electronics and CommunicationREVA University, Bangalore,India
[3]School of Electronics and CommunicationREVA University, Bangalore,India
[4]School of Electronics and CommunicationREVA University, Bangalore,India
[5]School of Electronics and CommunicationREVA University, Bangalore,India

Abstract: Light is one of the verbalexchanges that can have aninstructionto words optical facts just like a cord emitting current. It may appear impractical way to apply lasers without a managing medium to transmit data. But it appears impractical to apply laser without a conducting medium to emitting data. Laser verbal exchange is an optical wi-fi verbal exchange estimated to be the subsequent technology wi-fi verbal exchange generation because of inherent traits like extended bandwidth, excessive facts rate, protection and immunity. It is a higher opportunity to traditional verbal exchange schemes because of its capacity features. Therefore, not like RF verbal exchange, layout and trying out the laser verbal exchange gadget is complicated tasks, because it desires to don't forget many elements associated with the conditions.The essential reason of this journey acknowledgessending and receiving instrument to change sound through withouta managing medium the usage of depth modulation with much less quality.Here the line-of-sight conditions plays very important role in transmission and reception of data.They have advantage of doing away with the desires of broadcast cables. This necessity the want of modelling to perform channel unmarried transmission medium laser verbal exchange a good way to examine and optimize the layout.

1. Introduction

Generally, a verbal exchange channel which include an optical fiber or coaxial cable can bring handiest one sign at any second in time. This consequences in wastage of bandwidth. However, we will triumph over this disadvantage with the aid of using the usage of a way known as multiplexing. By the usage of the multiplexing technique, we will without difficulty ship a couple of indicators concurrently over a verbal exchange channel (medium). animist or manual waves. Communication is a part in our daily life. The laser communication system allows the people to communicate around 500 meters of distance.The laser as major attention in early days in the development of communication systems, scientist and engineers in their pursuit have practically built an impressive technology and solved the number of problems regarding communication and also in many other fields.

They work similarly to optic fiber links, except the beam transmitted in free space. while the transmitter and receiver must require line of sight condition, they have the benefit of eliminating the needs of broadcast.Laser communication can be easily developed since they are inexpensive, small, low power and do not require any radio inference studies.The carrier used for the transmission is typically generated by a laser diode. Here we are transmitting two channels using a single transmission medium where transmission is through laser communication
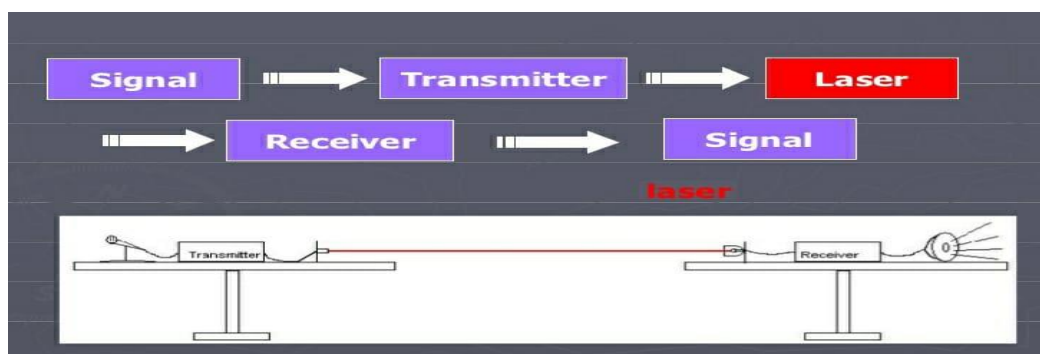

Fig 1. Basic block diagram of wireless laser communication

Fig 2.Red beam laser diode

2. Literature survey

Year of paper	Title of paper	Methodology	Advantages	Limitations
2016	A laser based high speed optical communication system	This up-to-date wireless telecommunications transfer information from one place to another place	To put an end to the need of broadcasting and buried cables veryrapidly communication between two devices	They have various operational distance
2017	Laser in advanced communication domain	A laser lens is used in transmitter and receiver where lens works like a transmission medium	Can communicate directly with each other and delay can be arranged by using design	Need line of sight transmission and highspeed carrier
2019	Wireless communication improvement using lasers	This new technology uses RF transmission in laser communication	It is much faster and safer which are out of reach of RF spectrum	need space between for two-way communication in laser beams

It is a modern communication technology where power requirement and there were various different methods of implementing the projects but due to a smaller number of resources and hence, we designed laser communication where it can be commercially included and convenient friendly system and it reduces complexity. Laser communication is better alternative and it is degraded by atmospheric factorstherefore, unlike RF communication designing and testing of Lasercommunication system is a complex task

3.

4. Methodlogy

Transmitter (Tx1/Tx2):
Transmitter is an electronic device which transmits data by using different modes
In this laser communication system transmitter transmits laser beam which consists
Information in it.
It consists both active and passive components and a band pass filter of -3db for 200KHZTo 2KHZ.
Switcher/Mixer:
It consists of timer circuit which enables the switching of both the circuit alternatively at
The frequency of 40KHZ
Memory feedback circuit:
It consists of capacitor of (22pf) connected in series alternatively to restore the signals lossed

During switching.

Optical terminal:

It is the transmission medium of which the source signal is passed through visible light wavelength
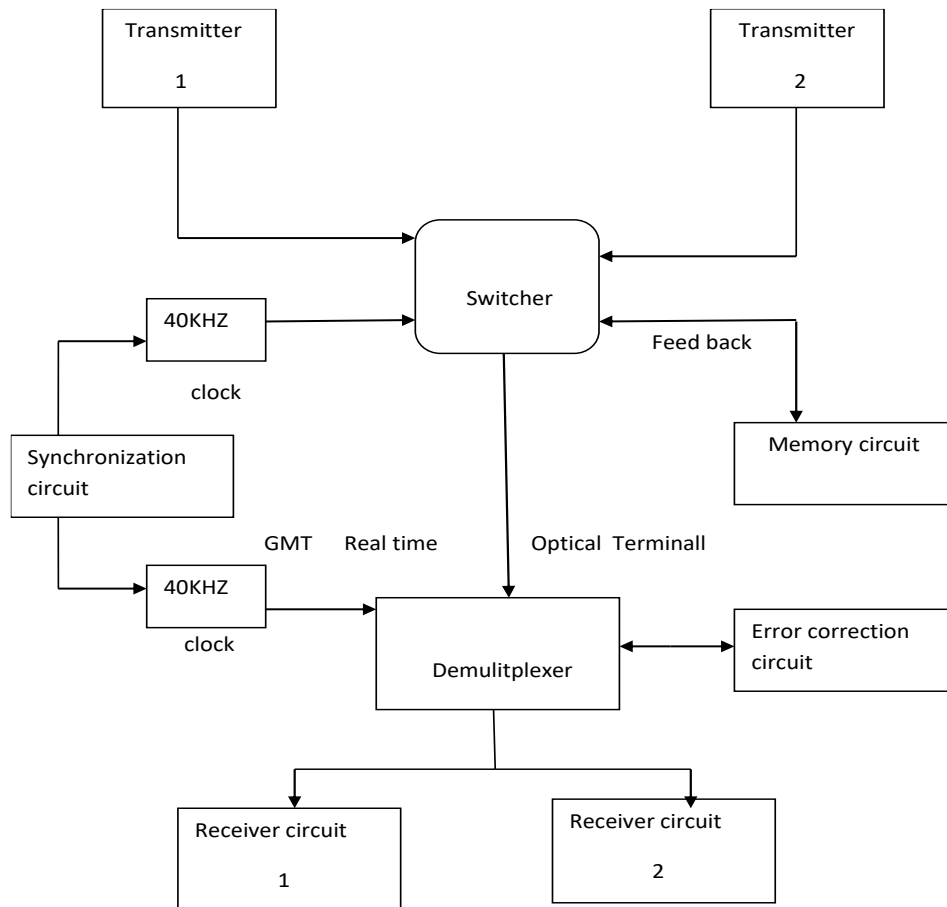Of 620-720mm

Fig 3. Block diagram of two channel laser communication

Demultiplexer:

It removes the mixed signal and gives the signal to the following circuit destination.

Error correction circuit:

It is the feedback circuit which is used to restore the losses during transmission and to eliminate the noise and disturbance in the signal

Receiver circuit(Rx1/Rx2):

The receiver circuit receives the following data in the laser beam and displays the
Data through audio with the help of speaker.

5. Circuits and working principle

Transmitter are very useful component parts of all wired and wireless communication the transmitter will transmits the following signals of waves which it has been working under, In this laser based communication system. Transmitter section consists of a high pass filter , a compression microphone, transistor(T1), BC548, operational amplifier μA741 (IC1), a pot meter(1 mega ohm), VR1 is used to regulate the profit of the operational amplifier, an additional transistor (T2), gets the output from IC1 as the input signal between the base and then generate the modulated laser beam at the output terminal the transmitter circuit is charged by a 9v battery and the audio signal is collected by the microphone with the help of a coupling capacitor (C1), audio signal is fed to the transistor(T1), there the signal is increased to some amount and is passed towards (IC1) through another coupling capacitor c2 then the increased audio signal is sent to the transistor(T2), it regulates the power to the led and set down the audio onto the light beam. In this project a pot meter VR1 performs as a gain adjuster for IC and for noise free result, capacitors C3, C4, and a resister R7 are used as power filter.
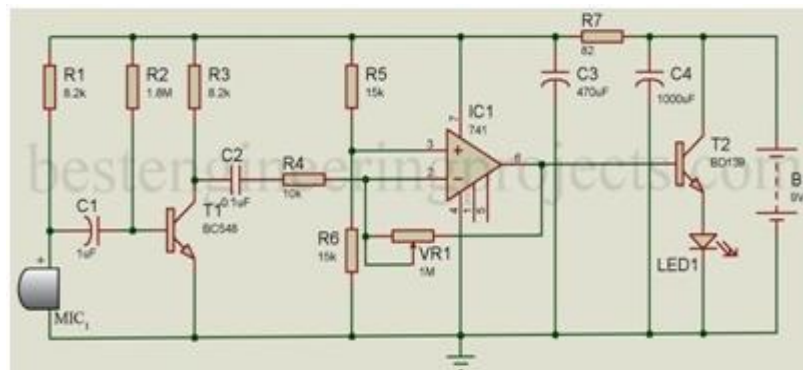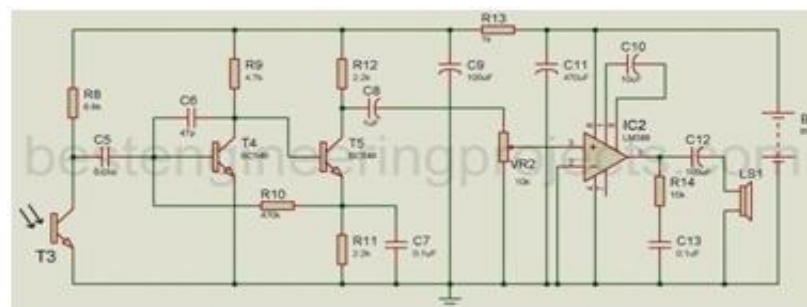
Fig 4. Transmitter Circuit Design

Fig 5. Receiver Circuit Design

The receiver consists of a photo transistor T3. The laser beam transmitted by the transmitter is received by T3 and produces a signal in correspondence to the light signal received from the LED of transmitter circuit, Hence the signal is demodulated and gone through at another end capacitor C5 combines the demodulated signal to transistors T4 and T5 which consists the amplified category of the received signal. And then the signal is combined through C8 to VR2 is working to adjust the volume level of the signal for IC2 in IC1, the signal is again increased and it directs to the speaker (LS1).

Indentations and Equations:
- High pass filter =1/2*3.14*frc
- R=1K
- C=1mf
- Fc=1/2*3.14*frc
- Cut off frequency = 159.23HZ

Clock circuit:
- F=40KHZ
- Duty Cycle=50%
- T=25ms
- C1=10mf
- R1=1k
- R2=1.78K
- The period is the time covered for one pulse
- T=1/f=(R1+2R2)C
- T=1/f=0.694(R+2R2) C
- Marks Space Ratio =T1/T0
- Duty cycle=T1/T*100
- The high time(t1)and low time(t0)
- T1=0.694(R1+R2)CT0=0.69

Advantages:

- • Higher data rates
- • High security regarding interception
- • less frequency restrictions
- • High accurate

Fig 6. Deep space data transmission

Disadvantage:

- • If the line of sight is slightly moved or any object is placed in between the transmission of the data is quite impossible.

Application:

- • Data relay services for UAVs
- • Data relay services for satellites
- • Inter-satellite links
- • Deep space data transmissions

Fig 7. DefenseApplication

6. Conclusion

The project laser-based communication system was completely successful. The actual project is based on the wireless communication communication used in the project is based on radio communication. The data is transferred from one point to other point by using the help of wireless communication where the data is transferred through laser beams and the radiation does not affect the flow of data. And it transmits the data much faster than the other ongoing systems and hence it can be widely used and thus the paper is analyzed by laser communication system

References

1. Agrawal, G. P "Nonlinear fiber optics", In Nonlinear Science at the Dawn of the 21st Century Springer, Berlin, Heidelberg,pp 195-211. 2000.

2.   Liu, X." Hysteresis phenomena and multipulse formation of a dissipative system in a passively mode-locked fiber laser", Physical Review A, Vol-81,Issue-2,2010.

3.   Martel, G, Chédot, C, Réglier, V, Hideur, A, Ortaç, B, andGrelu, P,"On the possibility of observingbound soliton pairs in a wave-breaking-free mode-locked fiber laser", Optics letters, Vol-32,Issue-4, pp 343-345,2007.

4.   Chedot, C., Martel, G., Hideur, A., &Grelu, P," On the possibility of observing bound soliton pairs in awave-breaking-freemode-locked fiber laser", European Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference , pp. 1-6,2007.

5.   Schmogrow, R, Nebendahl, B, Winter, M., Josten, A., Hillerkuss, D, Koenig, S, and Leuthold, " Error vector magnitude as a performance measure for advanced modulation formats", IEEE Photonics Technology Letters, Vol-24,Issue-1, pp 61-63,2011.

6.   Tang, D. Y, Zhao, L. M, Zhao, B, and Liu, A. Q, "Mechanism of multisoliton formation and soliton energy quantization in passively mode-locked fiber lasers", Physical Review A, Vol-72,Issue-4,2005.

7.   Soto-Crespo, J. M., Grapinet, M., Grelu, P, and Akhmediev, N," Bifurcations and multiple-period soliton pulsations in a passively mode-locked fiber laser", Physical Review E, Vol-70, Issue-6.

8.   Chang, W, Soto-Crespo, J. M, Ankiewicz, A, and Akhmediev, N," Dissipative soliton resonances in the anomalous dispersion regime",Physical Review A, Vol-79,Issue-3, 2009.

9.   Weill, R., Bekker, A., Smulakovsky, V., Fischer, B., & Gat, O" Spectral sidebands and multipulse formation in passively mode-locked lasers" Physical Review A, 83(4), 2011.

10.   Agrawal, G. P. "Nonlinear fiber optics", In Nonlinear Science at the Dawn of the 21st Century Springer, Berlin, Heidelberg,pp. 195-211,2000.

11.   Kong, L., Xiao, X., & Yang, C,"Operating regime analysis of a mode-locking fiber laser using a difference equation model", Journal of Optics, Vol-13(10), 2011.

12.   Kong, L., Xiao, X., & Yang, C," Operating regime analysis of mode-locking fiber laser with difference equation model" ,Conference on Lasers and Electro-Optics/Pacific Rim, 2010.

13.   Dr. D. Kavitha, Mrs. Y. Padma, Mrs. J. Sirisha, "REVIEW ON FAKE NEWS DETECTION TECHNIQUES ", International Journal Of Advance Research In Science And Engineering http://www.ijarse.com IJARSE, Volume No. 10, Issue No. 01, January 2021 ISSN-2319-8354(E).

14.   Amiri, I. S., Ali, J., &Yupapin, P. P," Enhancement of FSR and finesse using add/drop filter and PANDA ring resonator systems", International Journal of Modern Physics B, 26(04), 2012.

15.   Lin, Y. H., Yang, C. Y., Lin, S. F., Tseng, W. H., Bao, Q., Wu, C. I., & Lin, G. R. " Soliton compression of the erbium-doped fiber laser weakly started mode-locking by nanoscale articles", Laser Physics Letters, 11(5),2014.

16.   Lin, Y. H., Yang, C. Y., Lin, S. F., Tseng, W. H., Wu, C. I., Lin, G. R., & Bao, Q," Soliton compression of the erbium-doped fiber laser weakly started mode-locking by nanoscale p-type Bi {sub 2} Te {sub 3} topological insulator particles", Laser physics letters ,2014.