FIELD OF THE INVENTION:

This invention relates to the ﬁeld of Electronics& Communication, Internet of Things and Automation Engineering. This invention is based on the concept of automated, optical data transmission in confined places.

BACKGROUND OF THE INVENTION:

**Industrial communication network**is a backbone for any automation system architecture as it has been providing a powerful means of data exchange, data controllability, and flexibility to connect various devices.

In Early days during the times of Ford’s assembly line system, not much communication took place between machines, rather every person working in the assembly line was itself the part of machine. Thus, major chunk of communication took part verbally with use of few signals to indicate certain process. But as technology developed newer and more efficient methods to communicate were developed such as communication via RF. This method involved use of radio frequencies, transmitted using analog signals. Communication via analog signals was the main method to communicate for quite some time before being replaced by digital communication. This was to reduce the complexity involved with the process of analog communication, and at the same time improve the efficiency as well. And it is with the use of proprietary digital communication networks in industries over the past decade that has led to an improvement in end-to-end digital signal accuracy and integrity.

Communication Networks, which can be either LAN (Local Area Network, which is used in a limited area) or WAN (Wide Area Network which is used as global system) enabled to communicate vast amounts of data using a limited number of channels. Industrial networking also led to the implementation of various communication protocols between digital controllers, field devices, various automation related software tools and also to external systems. But, As the[industrial automation systems](https://www.electricaltechnology.org/2015/09/what-is-industrial-automation.html)become complex and large with more number of automation devices on control floor, today, the trend is toward Open Systems Interconnection (OSI) standards that permits to interconnect and communicate any pair of automation devices reliably irrespective of the manufacturer.

With the advancements in digital technology, fieldbus technology is now ruling the automation field as it provides multidrop communication facility that results cost effective and cable saving communication. But even after making so much progress in the field of networking and digitizing the communication method the medium is still heavily RF dependent. To improve on the demerits of RF systems, newer communication systems based on optical transmission of data have become the next step to usher forward into the new age of communication systems. This invention is based on the principle of optical communication.

PRIOR ART:

Communication Networks, (which can be either LAN or WAN) have been heavily used and have enabled to communicate vast amounts of data using a limited number of channels. Based on these communication networks one of the most popular communication system now days is SCADA.

At the,26th Annual Conference of the International. Group for Lean Construction, in the research paper published by Ricardo Antunes and Mani Poshdar, highlighted the problems such as lack of innovation, insufficient knowledge, insufficient rigor, little cross functional cooperation and inconsistency that lead to slower and inferior development process. They further elaborated on the topic as to how they plan to tackle this, “*This research stands on the four pillars of manufacturing knowledge and lean production (production processes, production management, equipment/tool design, and automated systems and control). The framework offers benefits such as increased information flow, detection and prevention of overburdening equipment or labor (Muri - 無 理 ) and production unevenness (Mura - 斑), reduction of waste (Muda - 無駄), evidential and continuous process standardization and improvement, reuse and abstraction of project information across endeavors.*”

They further went on to describe in great detail how their improved methods can be applied to existing communication system of SCADA.

SCADA stands for supervisory control and data acquisition. It is a type of software application program for process control.  SCADA is a central control system which consist of controller’s network interfaces, input/output, communication equipment and software. SCADA systems are used to monitor and control the equipment in the industrial process which include manufacturing, production, development and fabrication.  The SCADA system takes the reading of the meters and checks the status of sensors in regular interval so that it requires minimal interference of human. Generally, SCADA system is a centralized system which monitors and controls entire area. It is purely software package that is positioned on top of hardware. A supervisory system gathers data on the process and sends the commands control to the process. The SCADA is a remote terminal unit which is also known as RTU. The SCADA system allows operators to change the set point for the flow, and enable alarm conditions in case of loss of flow and high temperature and the condition is displayed and recorded. The SCADA system monitors the overall performance of the loop. The SCADA system is a centralized system to communicate with both wire and wireless technology to Clint devices. The SCADA system controls can run completely all kinds of industrial process.

OBJECTIVE OF THE INVENTION:

The world we live in today is developing rapidly in terms of technology. Yet when it comes to communication systems, especially within confined spaces we often face problems such as, time delay in sending and receiving the signal to the local panels, overload situation due to less storage capacity in the control panel room, big percentage of faults occurring in I/O module**,** Problems occurring due to the electromagnetic interference (EMI) and Radio frequency interface (RFI) while trying to send and receive data. This often results in hazardous situations where some machinery stops working and results in creating huge faults throughout the powerplant and on several other occasions machines catch fire and end up causing collateral damage to the properties. Simply put, the existing methods to communicate within confined spaces aren’t competent enough to keep up with the advancement of technology happening around them, which causes several serious problems as mentioned. To avoid all the above-mentioned problems a more robust and efficient communication system needs to be developed. A system which is capable of overcoming the shortcomings of its predecessors and also keep up with the technological advancements happening around it.

The objectives object of the invention is –

* To improve on the current communication systems available.
* To implement a system that is capable of sending and receiving data without having huge I/O defaults and at the same time having high immunity to noise and very negligible amount of time delay as well.
* To automate the whole process using IoT.
* To get the state of machines being used as an input/feedback and act/send information based on the feedback received.

SUMMARY OF INVENTION:

This invention is related to a system for improved means of communication using light and without use of human efforts. The system comprises of:

**LASER Module**: It is used to transmit the data via means of visible light transmission. This is done by changing the data to be transmitted into digital signal and then transmitted by flickering the light at a very high speed as per the digital data input.

**Receiver**: It will receive the signal that is being sent by the laser.

**Transmission Media**: Highly potent unidirectional Light beam, being our transmission media/channel would help us in achieving astounding speeds of transmission up to 223gbps with a very small amount of delay in between.

**The novel features include**:

* An automated system to send and receive information without human intervention.
* Li-Fi technology used to deliver the said information at very fast speed.

**We claim,**

1. We claim that this system will efficiently send and receive information via optical means at high speed. The optical media being laser is highly direction and thus would be the best choice for this setup.

It consists of –

* + - * IoT enabled Hub to which all devices will be connected to.
      * Lasers to send and receive information.
      * A virtual path to eliminate any foreseeable noise that might affect the communication.
      * Temperature sensor to sense the temperature of machines connected to the IoT hub.

1. We claim that the communication system would reduce the human efforts and would decrease the instances of disaster caused by negligence and inefficiency of the prior systems.

ABSTRACT:

Our system for, automated data transmission via LASER using visible light communication can be divided into 4 parts:

1. Transmitter

2. Transmission Media

3. Receiver

4. IoT Hub

The transmitter would be a highly potent unidirectional source of light i.e. LASER. It would transmit the data via the means of visible light communication. This would be achieved by converting all the data to be transmitted into its digital equivalent and then using LASER to send the data across so as to be received by the receiver. The receiver would be attached to machines being used and the machines would all be part of an IoT Hub and would constantly send feedback regarding the state of the machine and if something out of the usual order is noticed the LASER would send data to the machine to switch off or reboot as per the given requirement. IoT hub will act as a method for us to automate the whole process and sending instructions based on the feedbacks sent from the machines. Since the transmission media is light, speed of sending the data would be significantly high thus reducing the issue of time delay. Also, an important thing to note is that, light being our transmission media make it highly immune to noise and the method being employed to send the data reduces the chances of huge I/O faults significantly. Thus, enabling us to not only come up with a communication system that is more competent but also a more up to date, efficient, automatic and robust communication system well.