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SMART TOLL COLLECTION USING LI-FI TECHNOLOGY

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Abstract : Automatic Toll Tax systems has reduced the heavy congestion caused at toll collection in the metropolitan cities. As the population is increasing day by day which results in high traffic congestion on roads. Most of the people find it difficult to be a part of long queue at toll for toll collection system. This causes high fuel consumption while waiting for a payment, which is going to extinct in coming years. The research is providing a great solution to this problem. LIFI is emerging technology in today's era. Here, we are using the power of LIFI for wireless communication to transmit user information from vehicle to toll. Every vehicle will be having a microcontroller and a memory connected to it. In addition, the setup will be used to send useful encoded data like vehicle number via LED .The LIFI receiver is present in middle of road at toll booth. An intelligent processor will be there at receiver side, which will automatically process the toll tax payment according to the type of vehicle through a wallet linked with vehicle number.
Keywords: LIFI , LED , Congestion etc

I.INTRODUCTION

In today's time wireless communication has become the integral part of our life. There are many technologies that can be used for wireless communication. Wi-Fi is one of those. Undoubtedly, Wi-Fi is very eminent technology that has large applications in both our personal and professional life.One of its application is for wireless communication between vehicle and toll for toll collection. At tollbooth we require eco-friendly environment and a situation where there is no need for a vehicle to stop at tollbooth These issues led to development of a new concept called LIFI for short range communication, which can be used at tollbooth LIFI basically refers to light fidelity which means transferring the information with the help of light. In this technology the light waves are modulated according to the information which is to be sent. At toll booth we are using LIFI to decrease the stoppage time at toll and save fuel. Moreover it will be less costly than all other similar technologies. Its main components are LED, photodiode, amplifier and microcontroller. Wireless automatic Toll collection system has many advantages such as, shorter queue at toll plazas, faster and more efficient services, and minimization of fuel wastage and reduced emissions by reducing deceleration rate, waiting time of vehicles in queue, and acceleration, cost reduction in toll collection, expanding capacity without building more infrastructures.

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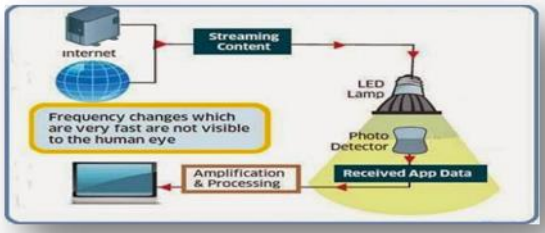
II.TECHNOLOGY AND COMPONENTS USED

1. Li-Fi

Li-Fi stands for Light-Fidelity. Li-Fi technology, proposed by the German physicist—Harald Haas, provides transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. This paper focuses on developing a Li-Fi based system and analyzes its performance with respect to existing technology. Wi-Fi is great for general wireless coverage within buildings, whereas Li-Fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues. LiFi is a wireless optical networking technology that uses light-emitting diodes (LEDs) for data transmission. Li-Fi provides better bandwidth, efficiency, availability and security than Wi-Fi. Li-Fi has already achieved by list erringly high speed in the lab. The low cost of LEDs and lighting units there are many opportunities to exploit this medium.



2. EMBEDDED SYSTEM

An embedded system is a controller programmed and controlled by a real-time operating system (RTOS) with a dedicated function within a larger mechanical or electrical system, often with real-time consumption of embedded systems computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured to serve as embedded system component.

Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented

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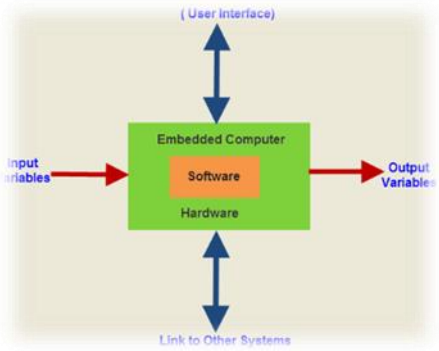
functions, well beyond those available. For example, intelligent techniques can be designed to manage power.



3. ARDUINO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board and a piece of software, or IDE (Integrated Development Environment) that runs on your computer. It is used to write and upload computer code to the physical board. the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package. Arduino board designs use a variety of microprocessors and controllers.

4.ALCOHOL SENSOR

The alcohol sensor (MQ-6) is suitable for detecting alcohol concentration on your breath, just like your common breath analyser. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

5.LED (Light Emitting Diodes)/ Photodiode

The OWC technology uses light from light-emitting diodes (LEDs) as a medium to deliver networked, mobile, high-speed communication. Li-Fi could lead to the Internet of Things with LED lights on the electronics being used as Li-Fi internet access points. LED and photodiode are the major components of

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Li-Fi circuit. LED are used to transmit the data at transmitting end. At receiving end a photodiode is connected to PC which senses the transmitted data. Transmitter data feed to the PC. A PIC microcontroller can be used for toggling of LED at transmitting end. At receiving end also one has to use a PIC microcontroller connected to output of photodiode.

I. EXISTING SYSTEM

In the existing, the automatic toll payment is with Radio-frequency Identification (RFID) technology and is affixed on the vehicle's windscreen after the tag account is active where ETC (Electronic Toll Collection) pass is linked to a prepaid account from which the applicable toll amount is deducted.

DRAWBACKS OF EXISTING SYSTEM

1. The system is not always as fast as one would want to be. On top of that, the transceiver location is not always constant.
2. Some toll booths have it located few meters ahead of boom barrier, while some has it next to boom barrier.
3. Not all the vehicles are affixed with the RFID tags. A separate lane has to be maintained for the vehicles which hold the RFID tags.

II. PROPOSED SYSTEM

In the existing time, all vehicles which get manufactured are initially registered by their manufacturing company with the government authority. Only the registered vehicles display a vehicle registration plate and carry a vehicle registration certificate. This certificate is different from vehicle licensing and roadworthiness certification. These details get stored into the microcontroller embedded

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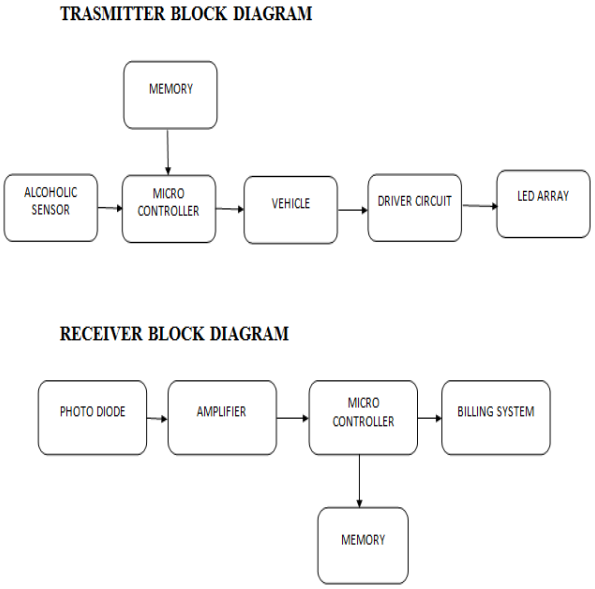
within the vehicle which is the actual data which gets transferred through Li-Fi to the toll plaza. As a result at the time of police verification these details may be transferred at a stretch with ease.
Now when the vehicle approaches the toll gate, initially the IR sensors placed on either side of the toll booth detect the arrival of a vehicle as it interrupts the IR waves passing .At this point of time, the gate gets closed and the vehicle's position is in such a way that the Li-Fi transceiver in the vehicle door and the Li- Fi receiver at the toll booth communicate.

III. BLOCK DIAGRAM



I. EASE OF USE

The paper mainly motives to reduce the manual paper work and to save time, effort, and man power through processing the toll payment automatically. Then to identify the person who is drunk during driving and inform to the police nearby. It would be useful in finding out how many times a vehicle is passing through the toll gate in a day as it stores all details in database.

II. CONCLUSION AND FUTURE USE

Now Wi-Fi is getting overloaded and so for short-range high-data rate links, it seems useful to offload the excess demand to Li-Fi. The idea of Li-Fi technology is currently attracting us and thus offers tremendous scope for future research and innovation. As light is everywhere and free to use possibilities increases to a great extent to the use of Li-Fi technology. The use of Li-Fi technology along with Wi-Fi in automatic toll payment will be more efficient. This idea not only reduces the time for the users but

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also reduces the manual paper work that is being done at the present. Thus the use of Li-Fi will increase the speed of data transfer and also it is accessible in many banned places.

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