Design and Implementation of Wireless Communication System for Toll Collection using Lifi

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***Abstract* - The modern period where every age group holds a Smartphone whether they require or not. The utilization of these mobile phones is not up to the standards. It is known that the queuing is still a drawback in the toll gate system. There is no such system to eliminate this queue. So, we propose a concept of queue eliminating system using Li-Fi technology. As we use the technology of Li-Fi, a fastest data communication is achieved. So, the queuing system is eliminated with the help of this system**

***Index Terms* - LIFI – light Wi-Fi, OWC - optical wireless communications, VLC – Visible Light Communications, LED- Light Emitting Diode**

I.INTRODUCTION

Li-Fi (short for light Wi-Fi) is wireless communication technology which utilizes light to transmit data and position between devices. The term was first introduced by Harald Has during a 2011 TED Global talk in Edinburgh In technical terms, Li-Fi is a light communication system that is capable of transmitting data at high speeds over the visible light, ultraviolet, and infrared spectrums. In its present state, only LED lamps can be used for the transmission of visible light. In terms of its end use, the technology is similar to Wi-Fi the key technical difference being that Wi-Fi uses radio frequency to transmit data. Using light to transmit data allows Li-Fi to offer several advantages, most notably wider bandwidth channel, the ability to safely function in areas otherwise susceptible to electromagnetic interference (e.g. aircraft cabins, hospitals, military), and offering higher transmission speeds. The technology is actively being developed by several organizations across the globe Li-Fi is a derivative of optical wireless communications (OWC) technology, which uses light from light-emitting diodes (LEDs) as a medium to deliver network, mobile, highspeed communication in a similar manner to Wi-Fi. Visible light communications (VLC) work by switching the current to the LEDs off and on at a very high speed, too quick to be noticed by the human eye, thus, it does not present any flickering. Although Li-Fi LEDs would have to be kept on to transmit data, they could be dimmed to below human visibility while still emitting enough light to carry data.

II. EXISTING SYSTEM

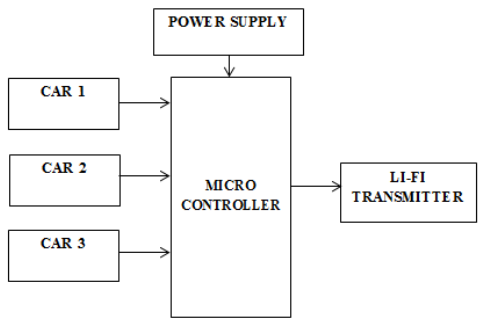
An RFID based tolling system is carried out. This elimination of the queuing system is not perfectly done as it takes time for RFID receiver to receive and analyse data. Also, a human operation is required to monitor the driver's details and open the toll.

III. PROPOSED SYSTEM

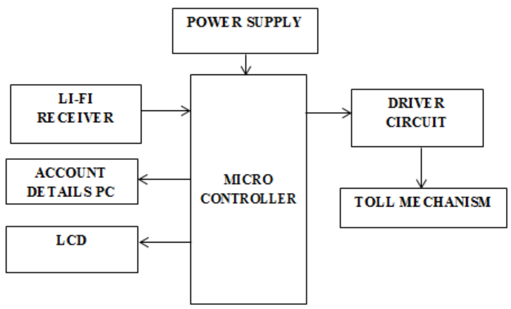
The drawbacks in the existing system are eliminated by this system. The system consists of three car -based prototype consisting of three Li-Fi data in the controller.

Whenever a specific car is selected, then the data of that car is transmitted using Li-Fi. The transmitted data is received by the Li-Fi receiver placed at the toll section. The toll section, after the reception of data provides the data to the controller. The controller checks whether the person has money for paying the toll. If money is present in the driver's account, then he is permitted to pass through. Now the toll mechanism is operated and the vehicle to let to pass through. If the driver's account has lower balance for paying the toll, then the vehicle is restricted to pass through and the LCD displays the status.

CAR SECTION:



TOLL -SECTION:



IV HARDWARE DESCRIPTIONS

POWER SUPPLY

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units

Block Diagram of Power supply:

V WORKING PRINCIPLE

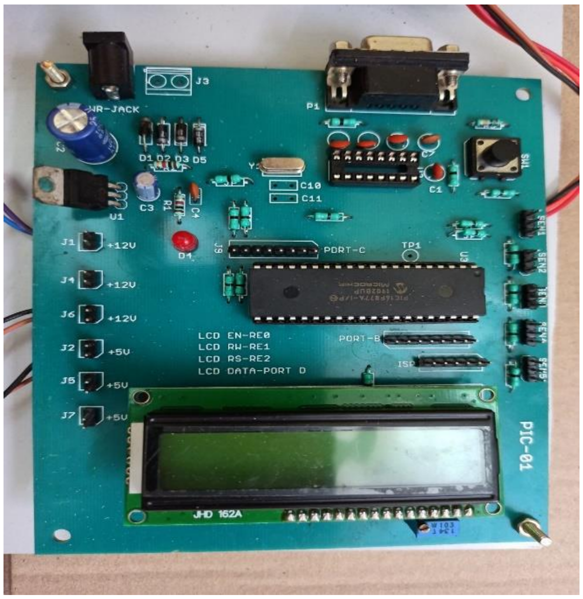
Transformer:

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output.

Bridge rectifier

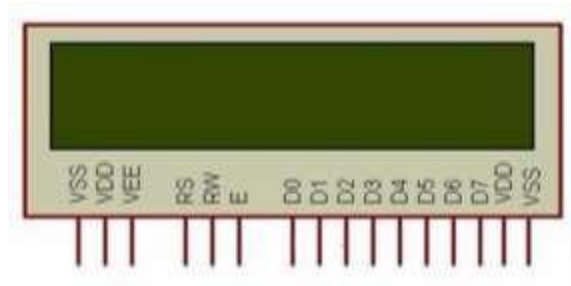
When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. The positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow the path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. This path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3. One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier. One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits. The peak voltage developed between points X and y is 1000 volts in both circuits. In the conventional full-wave circuit shown—in view A, the peak voltage from the center tap to either X or Y is 500 volts. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts.

The maximum voltage that appears across the load resistor is nearly-but never exceeds-500 volts, as result of the small voltage drop across the diode. In the bridge rectifier shown in view B, the maximum voltage that can be rectified is the full secondary voltage, which is 1000 volts. Therefore, the peak output voltage across the load resistor is nearly 1000 volts. With both circuits using the same transformer, the bridge rectifier circuit produces a higher output voltage than the conventional full-wave rectifier circuit.



LIQUID CRYSTAL DISPLAY

LCD screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special and even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.



16X2 LCD pinout diagram

PIN NO.	FUNCTION	NAME
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	VCC
3	Contrast adjustment; the best way is to use a variable resistor such as a potentiometer. The output of the potentiometer is connected to this pin. Rotate the potentiometer knob forward and backwards to adjust the LCD contrast.	Vo / VEE
4	Selects command register when low, and data register when high	RS (Register Select)
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given; Extra voltage push is required to execute the instruction and EN(enable) signal is used for this purpose. Usually, we make it en=0 and when we want to execute the instruction we make it high en=1 for some milliseconds. After this we again make it ground that is, en=0.	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight VCC (5V)	Led+
16	Backlight Ground (0V)	Led-

VI SPECIFICATIONS

1. Transmitter Specification
Power supply: DC +12V
Data input: UART(TTL)

2. Receiver Specification:
Power supply: DC +5V, Data Output: UART (TTL), Larger Bandwidth (10,000 times the radio bandwidth), High Efficiency

APPLICATIONS

Intelligent transportation systems
Cellular communication
RF Restricted Areas

DC MOTOR

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source—so they are not purely DC machines in a strict sense. We in our project are using brushed DC Motor, which will operate in the ratings of 12v DC 0.6A which will drive the flywheels in order to make the robot move.

DRIVER CIRCUIT:
The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers. The ULN2003 has a 2.7kW series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices.

FEATURES:
500mA rated collector current (Single output)
High-voltage outputs: 50V
Inputs compatible with various types of logic.
Relay driver application

VII RESULT

This paper is developed to reduce the time for the vehicles passing through tollgates. This method focuses on implementing the tag in the car and tollgate section and it cannot be able to rob since it was place in the car head light and the communication passes through light. The main advantage of this is to control the traffic near the tolls and easy communication between the user and the toll section. This product is built and obtained at low cost.

VIII CONCLUSION

The paper mainly motives to reduce the manual paperwork and to save time, effort, and manpower through processing the toll payment automatically. 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 data in the database.

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