SMART STREET LIGHT SYSTEM

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ABSTRACT

The huge amount of electrical power of many countries is consumed in lighting the streets. However, vehicles pass with very low rate in specific periods of time and parts of the streets are not occupied by vehicles over time. In this project, we propose a system that automatically switches off the light for the parts of the streets having no vehicles and turns on the light for these parts once there are some vehicles that are going to come**.**

Logically, this system may save a large amount of the electrical power. In addition, it may increase the lifetime of the lamps and reduce the pollutions. This system automatically controls and monitors the light of the streets. It can light only the parts that have vehicles and help on the maintenance of the lighting equipment's. Vehicular Ad-Hoc Networks (IF SENSOR) make it possible to propose such system. IR SENSOR enables the possibility to know the presence of vehicles, their locations, their directions and their speeds in real time.

These quantities are what are needed to develop this system. An advantage of using IR SENSOR is that there is no need to use specific network and equipment's to design the system, but IR SENSOR infrastructure will be used. This decreases the cost and speed up the deployment of such system. This project focuses on the proposal of different possible architectures of this system. Results show that the saved energy may reach up to 65% and an increase of the lifetime of the lamps of 53%

INTRODUCTION

1.1 Overview

Streetlights are an integral part of any developing locality. They are present on all major roadways and in the suburbs too. Every day, streetlights are powered from sunset to sunrise at full strength, even when there is no one around. On a global scale, millions of dollars are spent each day on these street lights to provide the required electrical energy. The maintenance and replacement costs of conventional incandescent bulbs are immense. They consume a lot of electric power to function and their heat emissions are also quite high. All of this contributes to greater demand of electricity production and consequently, more carbon dioxide emissions from powerhouses. So, along with unnecessary light pollution, this practice causes damage to our planet too.

A simple and effective solution to this would be dimming the lights during off peak hours. Whenever presence is detected, the lights around it will glow at the normal (bright) mode. This would save a lot of energy and also reduce cost of operation of the streetlights.

Additionally, a table top prototype has been constructed to display the concept's functioning. The components used for the real-life implementation are substituted appropriately to recreate the ambience.

1.2MOTIVATION BEHIND OUR PROJECT

Main motivation behind this project is as following:-

Electronic Engineering

Electronic and communication Engineering is a very broad field in recent infrastructure of the world due to increasing demand of electronic devices which reduced human efforts by factor of tens. One of the largest and hottest streams of this sea is Wireless Electronics Systems. Electronic and communication Engineering is slightly saturating in some of the streams such as pure digital electronics. This lead us put the effort into Wireless Electronics.

Market in Electronic Systems

In this fast growing electronics world, number of electronics devices have increased dramatically over the years. There are few tradeoffs in the field of electronics, such as, efficiency, convenience and cost issues. Efficiency issue includes losses due to miscellaneous or misuse of energy in streetlight. Also, some of the electronics devices are not available commercially because the efficiency problem is solved with higher cost and high-tech logic circuits and their user interface comes with lots of human efforts.

Motivation

This increasing demand for the smart street light system technology needed more focus so our team has decided to research in this area and try to contribute to the community in order to make this technology available to people at lower cost and higher efficiency. April 7, 2006, that Europe experienced the first large scale implementation of a control network in a street lighting application. The implementation took place in Oslo (Norway) and it was expected to reduce energy usage by 50 percent, improve roadway safety, and minimize maintenance costs. The rest of this paper will describe our bird's eye market survey and issues with available technologies as well as solutions to some of the pre-existing devices. However, our basic and the very first task will be to make a smart street light from bottom up using fundamental electronics engineering concepts.

1.3OBJECTIVES:

Main objective behind this project is as following:-

The main consideration in the present field technologies are automation, power consumption and cost effectiveness. Automation is intended to reduce man power with the help of intelligent systems.

The main aim of the projects is automatic street power saving system with LDR and IR sensors, this is to save the power .we want to save the power automatically instead of doing manual. So it is easy to make cost effectiveness. This saved power can be used in some other cases. So in villages, towns etc. we can design in street light system for uses of street lights.

The sensitiveness of the street light can also be adjusted in our project we have used two LED (for LDR) and four LED (for IR sensor)

1.4Historical Background

The first record of public street lighting dates back to 10th century Spain, when Cordoba, the capital of the Moorish Empire, installed kerosene lanterns along its main streets. Since then, the street light has undergone several iterations in technology, from lanterns filled with tallow, fat,

wax, and pith wicks in 15th century Europe and Colonial America, to coal gas lamps in the 19th century and electrified arc lamps and incandescent bulbs in the late 1800s. The past decade has seen the emergence of a new lighting technology that can be applied to street lighting, the solid- state light emitting diode (LED), a super-efficient, long-lasting, compact and versatile light source. The largest municipal street lighting system in the United States is found in New York City, with over 300,000 outdoor public lights shining along streets, walkways, public spaces and highways. The story of New York encapsulates the evolution of street lighting in America In Colonial America, street lighting was the responsibility of citizens, not government. In New York in 1697, every seven households were required to share the expense of a candle to burn in a Lantern suspended on a pole from the window of every seventh house. Lamp lighters maintained the system, lighting the candles from within their glass vessels with torches in the evening and blowing out the flames in the morning, trimming the wicks and Replenishing the oil. In 1762, New York installed wooden public lamp posts from which whale oil lamps burned dimly. These were replaced with cast-iron lamps in 1827. For the next thirty years, a Calendar was used to identify those nights when the moonlight was expected to be bright and the lamps were kept off regardless of any overcast conditions. By 1893 there were 1,500 electric arc lights illuminating New York streets. Over the next 100 years, new technologies, from incandescent to high intensity discharge (HID) Evolution of Public Street Lighting fixtures, were introduced, each progressively more efficient, safe, and flexible. In 1999, NYCDOT began updating its high- pressure sodium (HPS) luminaires with more efficient models. From 2001 to 2009, the City converted its incandescent traffic signals to LEDs, reducing energy use by 81 percent. Its 2007 Comprehensive Plan, Planck, called for a 30 percent reduction in greenhouse gas emissions by 2030, a goal surpassed the same year by Executive Order 109 and Local Law 55 requiring the reduction of municipal energy use by 30 percent of 2006 levels by 2017. With street lights

accounting for approximately 6 percent of its energy use, NYCDOT is looking towards 03 generation of LEDs suitable for street lighting. As of 2010, six LED street lighting pilot projects were underway along major arterials, bridges, and in Central Park, with full scale deployment Planned for three sites depending on the test results. As a global city, New York aims to shape the future of more sustainable street lighting infrastructure by helping to evaluate commercial applications of LED technology via the U.S. Department of Energy (DOE) Gateway Program, and by participating in The Climate Group's (TCG) Light Savers program alongside major international cities like Toronto, London, Mumbai, Bangalore, Hong Kong, and Beijing. However, a review of the literature shows that most cities are not considering the additional Opportunities of LEDs as they pertain to performance, place making, way finding, and special event planning, instead focusing.

1.5 REPORT ORGANIZATION:-

We organized this report in five chapters, different chapters consists different topic like first chapter is about the introduction and overview of the project. Second chapter consist of the operation of the project and theoretical description of the principles used in the project, like 8 IR sensor and LDR Technology and hence elaborating all the descriptive works related to the use of every minute instrument used. Third chapter is about hardware description, i.e. the brief description and operational techniques of all the hardware used in the project like Microcontroller, Led, Voltage Regulator, Transmitter And Receivers Modules etc. and the full circuit diagram is also given and described at this part of the report and also the perfect minute details describing all the internal hardware used for making each bite if this project. Now, the fourth chapter is full of data how we worked in a group to complete out project in four months

software analysis & its implementation and also the details of work done for making this project much better on the basis of each week are given here. We discussed another major point in this chapter i.e. difficulties and the challenges faced to complete the project and hence to

make it perfectly working. Now, the last chapter i.e. conclusion, we have concluded the project report by discussing about the future scope of our project and the other modifications which may be possible to add up with our project and which will be more better. Then the references and abbreviations are listed at last. We listed some IEEE papers as reference which helps us to gain our knowledge about our project's topic and about recent researches going on about this matter

1.6THEORITICAL DESCRIPTION

In this project primarily we have used Microcontroller, IR sensor, Relay, LDR, LED, Voltage regulator.

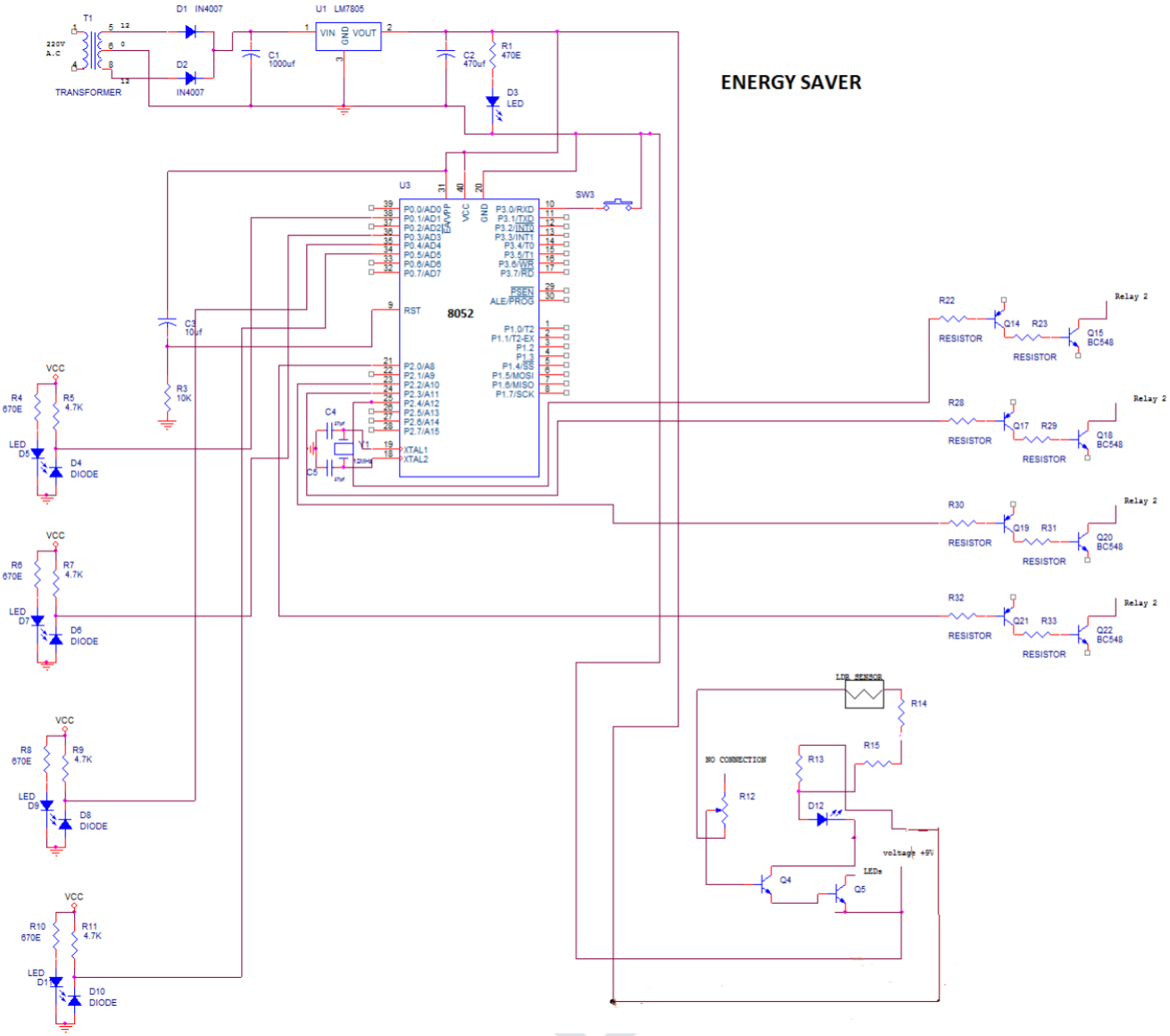
This project can be used across the globe on any express way, highways or used in street lighting. In this we have implemented IR sensors using microcontroller 8052. The microcontroller gives its output to relay and according to that its gives its output to led (street light)

.Components Used Of Project

S.NO.	COMPONENT USED	QUANTITY
1	TRANSFORMER 12-0-12	1
2	DIODES IN4007	O4
3	ELECTROLYTE CAP	04
4	LED	13
5	IR SENSOR PAIR	04
6	RESISTORS	28
7	AT89S52 MICROCONTROLLER	02
8	RELAYS	05
9	TRANSISTORS	12
10	CRYSTAL	01
11	CERAMIC CAP	02
12	WIRES	04
13	MAIN LEAD	02

TABLE:1

1CIRCUIT DIAGRAM



2.Steps To Fabricate:

1) We are using a PCB for our project.
2) In this project we can make a +5volt supply for microcontroller.
3) In our power supply circuit we will use a 12-0-12 step down transformer.
4) Then we will use a rectifier circuit for make a DC circuit
5) We will use a filtering circuit by using electrolyte capacitor
6) Then we will use a voltage regulator.
7) Now we will use a led for output
8) We will use a 40 pin IC base for microcontroller
9) We are using a crystal oscillator for oscillations.
10) We will use a reset circuit.
11) We will use a variable resistance
12) We will use relay circuits using transistors and resistance at the output side of the microcontroller.

PROCREDURE TO MAKE PROJECT:-

1) IDEA OF PROJECT

In this stage student select the topic of the project of the project. It's the main stage of project work. It's the area where talented students shows their innovative ideas. Innovative students make project with a new idea then others. We selected this project because we want to do something in with our own hands. We use main electronics components used in the industry. First of all we selected the LDR based project.

Thendrop idea because there was little bit practical electronics to learn and mobile companies already providing those facility.

STUDY MATERIAL AND CIRCUIT DIAGRAM

In this section we collected the study material. We searches about our project on google.com, www.yahoo.com,www.msn.com and www.ludhianaprojects.com But we find many circuits and theory materials for our project. We were not sure about the circuits. Because circuit available on the site were provided by students. So we can really on them. Then we saw www.ludhianaprojects.com a project help provider site. Its help us lot. They helped us lot in our project. We find the circuit of our project in that site.

Trail TESTING OF MAIN CIRCUIT- Then we collect the components of project. It was not an easy task.

Because no shop in our area have all the components. Then after collection of components we test the circuit on bread board - step by step. Because we want to sure about the circuit. We checked it in different steps because it was a big project and was not possible to check it in a single step.

PCB DESIGNING - After testing of circuit sure about the circuit. First of all we designed the layout of PCB.After that we mark the layout on clad board with the help of paint and screen. Then we dip that painted PCB in Ferric chloride solution.After that we drill holes in PCB.Then we washed PCB with Isopropyl solution.

COMPONENT MOUNTING- We kept the hole size from 0.8mm to 1 mm for leads of components. Then we insert components according to their pitches.

Software:-

Kiel compiler or UMPS for programming

Window xp exists which allows us to communicate with the vast 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used, the LCD the 44780 standard requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used, the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used, the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

The three control lines are referred to as EN, RS, and RW. Will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used, the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

The three control lines are referred to as EN, RS, and RW.

The EN line is called "Enable." This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should first set this line high (1) and then set the other two control lines and/or put data on the data bus. When the other lines are completely ready, bring EN low (0) again. The 1-0 transition tells the 44780 to take the data currently found on the other control lines and on the data bus and to treat it as a command.

The RS line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is text data which should be displayed on the screen. For example, to display the letter "T" on the screen you would set RS high.

The RW line is the "Read/Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands--so RW will almost always be low.

2.1Applications

Relays are used to and for:

- Control a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers,
- Control a high-current circuit with a low-current signal, as in the starter solenoid of an automobile.
- Detect and isolate faults on transmission and distribution lines by opening and closing circuit breakers (protection relays),

3.2.5 PRINTED CIRCUIT BOARD (PCB)

PCB means printed circuit board .PCB is one of the most important elements in any electronic system. They accomplish the interconnection between the components mounted on them in a particular manner .PCB consists of conductive circuit pattern which is applied to one or both sides of an insulating base copper which is most widely used as conductor material. Aluminum nickel, silver, brass is used for same special application.

The thickness of conducting material depends upon the current carrying capacity of the circuit. Thus, a thicker conductor layer will have more current carrying capacity.

3 SOFTWARE ANALYSIS

KEIL: Keil development tools are used to solve the complex problem facing embedded software developers. To start a project,we need to select a microcontroller we use in project and compiler, assembler, linker and memory are set by µVision .The Keil µVision Debugger simulates on-chip peripherals of the microcontroller. Simulation helps us to understand hardware configurations and avoids time wasted on setup problems. It is easier for us to simulate in hardware after knowing the and rectifying the mistakes done in software.

In keil we generally use two languages, one is assembly and other is embedded C. In this project we started with Embedded C programming. As many times assembly languages make the programming complex so we use Embedded C to make it easy.

We have used burn–o-mat for burning purpose of AT89S52 and for programming we are using KEIL to generate HEX file.

Proteus: It is simulation software for various design with microcontroller. It is available for all the microcontroller so it is used to test the embedded design and programs. We can simulate our programming of microcontroller in proteus 8 simulation software. As it is designed to be practical that is easy to use, efficient and consistent. It has powerful string manipulation and having advanced data structure.As it is fully functional so we can first simulate our project in this and then do it on hardware. So due to that we can implement our hardware

3.1WORKING ANALYSIS

We completed our project in following weeks:-

1st week:-

Firstly we decided the name of the topic for the project and searched about the block diagram in internet. After deciding we discussed with our mentor about various modules used in the project such transmitter and receiver And various equioments used in a our project..

2nd week:-

After the study of theory we started making block diagram. After a deep study of material we decided to work and prepare an overview to be done further. We started working on the concept of the project. We searched report material and tried to accumulate more concept for completion of project. We learned the basics of the components. Specification of the components has been assembled from the different websites.

3rd week:-

After making the block diagram, we searched for the circuit diagram, and listed out the component required. Then we collected all the components from market. After collecting list of components we understood about the working of each component and tried to collect more ideas.

4th week:-

In fourth week we divided our project in three parts. In first part decided to work upon coding then in second part we worked upon software i.e, simulation in keil and proteus , and in third the last part after simulation in software we assembled all the components in hardware.

5th week:

In this week we faced some of the problems regarding 'delay' in the programming part and later on we overcome this problem after the discussion with the Mentor. Our mentor guided us about that and we get idea how to do that.

6th week:

After the software part we started with the hardware part, we burn microcontroller with the coding and created rough connection on breadboard. After the connection on bread board we started implementing it on PCB(Printed circuit board).

7th week:

In this week we again worked on Hardware part by assembling Transmitter and reciver Module module with microcontroller. Then connected DTMF and various internal connections with the controller.

8th week:

In eight week we continuously worked on hardware part and software part after that we made program for times which was too complex and time consuming after the hard work of 6 days in that week we have successfully implement the coding on microcontroller 8052

9th week:

In week 9 we worked on rest of programming part, in programming we faced some problem. Because of small errors the programming was not running. .. Finally we completed the source code as per our requirement in the project.

10th week:

In week 10 we implemented the complete circuit on the PCB board. We burnt the all the HEX File in microcontroller. And after the number of practices we got our result.

11th week: In week 11 we worked on final completion of our hardware part and software part. We revised the project once again thoroughly and tried to rectify minute problems. After that we assembled the whole project on the board and implemented the process twice and thrice

. **a) STEP BY STEP DEMONSTRATION**

- Firstly we need to connect the power source,And power is supplied to all the sources.
- We Need to set the 5v with potentiometer..
- Then passes to a vehicle on the road
- IR sensor transmit to a singal to microcontroller
- Microcontroller process the signal and output is transmitted to relay
- Relay amplifies the transmitted signal(current) to LED
- LED glow the light
- After vehicle passes,LED light switch off

3.2WORKING COMMAND USED IN PROJECT

Command for microcontroller

```
ORG 00H
AJMP START
ORG 30H
START:


 start1:                  //energy saver

 jb p1.0,motoraction3 ; left
jb p1.1,motoraction4
 jb p1.2,act1
 jb p1.3,act2
sjmp start1

motoraction3:
clr p2.0
clr p2.1
setb p2.2
setb p2.3
setb p2.4
acall delay2
acall delay2
```

```
acall buzz ret
motoraction4:
clr p2.1
clr p2.2
setb p2.0
setb p2.3
setb p2.4
acall delay2
acall delay2
acall buzz
ret
act1:
clr p2.2
clr p2.3
setb p2.0
setb p2.1
setb p2.4
acall  delay2
acall  delay2
acall buzz

ret
act2:
clr p2.3
clr p2.4
setb p2.0
setb p2.1
setb p2.2
acall delay2
acall delay2
acall buzz



buzz:
clr p2.0
acall delay1
acall delay1


setb p2.0                delay2:
ret
```

```
        a       ll delay1 acall
        c       delay1
        a


        ret
DELAY:

    MOV R4,#255
    AGAIN22: MOV R5,#1


    BACK22:   DJNZ R5,BACK22
    DJNZ R4,AGAIN22
    RET
delay1:
MOV R6,#255
AGAIN: MOV R7,#255
BACK:   DJNZ R7,BACK
DJNZ R6,AGAIN
RET

End
```

3.3DIFFICULTIES FACED

Since smart street light system is a recent technology, there is not enough information available about this technology. The work that has been done in this project is totally new and different than any other street light.

IR sensor is rarely available in the local market because of shortage . sometimes IR sensor should not work properly and was used first did not perform well with the design. But later on after studied properly we get implemented

CONCLUSION

4.Discussions

In our project the main goal was to design and implement a system which is efficient to save the electricity for further use . In this purpose IF sensor both transmitter and receiver is implemented. Microcontroller is connected to the power supply and its output is connected to the relay which gives its supply to the led. Sensor transmits the signal as any vehicles pass through it

.sensor passes signal because signal transmission between transmitter and receiver breaks down .

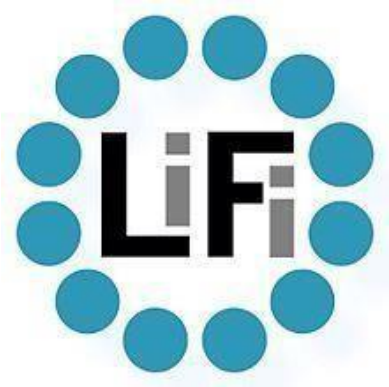
4.1Suggestions for Future Work

As its versatile field many more thing can done over it -

Currently best application is li-fi which works on led lights Light Fidelity (Li-Fi) is a bidirectional, high speed and fully networked wireless communication technology similar to Wi-Fi. The term was coined by Harald Haas and is a form of visible light communication and a subset of optical wireless communications (OWC) and could be a complement to RF communication (Wi-Fi or Cellular network), or even a replacement in contexts of data broadcasting. It is so far measured to be about 100 times faster than some Wi-Fi implementations, reaching speeds of 224 gigabits per second.

It is wireless and uses visible light communication or infra-red and near ultraviolet (instead of radio frequency waves) spectrum, part of optical wireless communications technology, which

carries much more information, and has been proposed as a solution to the RF-bandwidth limitations.



4.2Safety Features

The system also provides some safety features:

1. Weather resistant

2. Environmental factors such as snow or rain would have no effect on the smart street light system

3. Less vulnerable to tampering or accidental damage when compared to normal street light alternatives

4. Low maintenance for commercial and public

installations 5.No moving / mechanical parts

6.Effective across larger air gaps, allowing for a greater vehicle ground clearance

7. Accommodates greater misalignment between vehicle resonator and stationary resonator, is not required

4.3Benefits of the Technology

The benefits of using this technology are:

1. Less consumption of electricity

2. Enables easy, automatic detecting a vehicle in a road . System activates the moment a vehicle is aligned with the IR sensor

3.Minimal driver action needed and it works automatically on and off

4.4Conclusion

The goal of this project was to design and implement a smart street light for low power devices via IR sensor. After analyzing the whole system step by step for optimization, a system was designed and implemented. Experimental results showed that significant improvements in terms of power-transfer efficiency have been achieved. Measured results are in good agreement with the theoretical models.

It was described and demonstrated that IR sensor can be used to deliver to detect the vehicle from a source to a transfer and glow a led power . This mechanism is a potentially robust means for saving the electricity

As it was mentioned earlier, smart street light system could be the next big thing.

5.REFERENCES:-

Books:-

a) The 8051 Microcontroller and embedded system by Muhammad Ali Mazidi and Janice Gillispie Mazidi

b) Fundamentals of Microprocessor and Microcontroller by

B.Ram c)Electronics devices and circuits by J.B Gupta.

Various Links :

a) http://www.electronicslab.com/projects /index.html
b)http://www.electronicsforu.com/electronicsforu/lab/
c) http://www.engineersgarage.com/electronic-circuits/wireless

d) http://www.imagesco.com/catalog/index.html

e) http://nationalsemiconductors.com

f) http://info.ee.surrey.ac.uk/Workshop/advice/coils/air_coils.

html g)http://en.wikipedia.com

h)http://www.smeter.net/electronics/solnoid3.php

i)http://inhabitat.com/tag/resonant-inductive-coupling-

charger/ j)http://www.delphi.com

k)http://seminarprojects.com