DESIGN AND DEVELOPMENT OF EFFICIENT STREET LIGHT MECHANISM

ASHOK BABU ANE

Assistant Professor

Department of ECE

PVP Siddhartha Institute OF Technology, Vijayawada.

Abstract : Street Light Control System which operates automatically is not only simple but also the intelligent system, which uses AT89C52 microcontroller. This system can be set to operate in automatic mode, which regulates the streetlight according to brightness and dimness. By using this system manual works are totally removed. It automatically turns ON lights when the sunlight intensity become low. This is done by a sensor called LDR which senses the light. When the object is detected by the IR sensor the Street light will glow with 100 percent intensity and when the object is passed away the street light remain with 50 percent intensity.

The energy consumption is also reduced by using this because nowadays the manually operated street lights are not switched off even when the sun rises and also switched on earlier before sunset. In this project, there is no need of setting ON time and OFF time manually.

The system can be widely applied in all places which need timely control such as streets, stations, mining, schools, and electricity sectors and so on. In addition, the system can be improved in terms of power consumption by using solar power as the input power supply. This design can save a great amount of electricity compared to the earlier design.

IndexTerms **–** LDR, microcontroller, Power Consumption

I. INTRODUCTION

Basically, street lighting is one of the important parts of a city's infrastructure where the main function is to illuminate the city's streets during dark hours of the day. Previously, the number of streets in the town and city is very small. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density. There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective, the reduction of crime and minimizing it is effect on the environment. Due to the technological development nowadays, road lighting can be categorized according to the installation area, performance and their used, for an example, lighting for traffic routes, lighting for subsidiary roads and lighting for urban center and public amenity areas. Meanwhile, street lighting technology can be classified according to the type of lamps used such as incandescent light, mercury vapor light, metal halide light, high pressure sodium light, low pressure sodium light, fluorescent light, compact fluorescent light, induction light and LED light. The original contribution of this paper is to design of a streetlight node based on which the system can be set to run in automatic mode, which control streetlight according to Sunrise and Sunset Algorithm and light intensity. This control can make a reasonable adjustment according to the seasonal variation.

II. LITERATURE SURVEY:

Hengyu Wu, MinliTang[1], propose about the core technology of the street light control system is an AT89S52 single-chip microcomputer. It integrates a power circuit, a fault detect circuit, a photosensitive detection circuit, an infrared detect circuit, an LCD display circuit, a street light control circuit, an a1ann circuit, a pressed key control circuit and so on. This system cans automatically tumz on or off the lights and controls the switches according to traffic flow. It expands the fault detect circuit and the corresponding a1ann circuit. It also has a convenient and flexible button control circuit to switch on and off fictions mentioned above. Main weakness is that they didn't say about the working principle behind the system. It also said to use fault detection circuit which when it is damaged, the voltage is zero, so it will create a problem. This paper is and theoretic proof and shows only simulation result but not as a real time set up experiments. The focus of this paper to build a way for the framework which may leads to many follow up research activities in the Low-rate and also plan to investigate the applicability of this proposal to detect performance.

Street lighting system Gustavo W. Denardin[2], deals about a control network for a LED street lighting system. The use of LEDs is being considered promising solution to modern street lighting systems, due to their longer lifetime, higher luminous efficiency and higher CRI. The proposed control network enables disconnection of the street lighting system from the mains during peak load time, reducing its impact in the distributed power system automatically consumption, decrease the management cost and monitor the status information of each street lighting unit. In order to meet the system requirements, a wireless sensor network based on IEEE 802.15.4TM standard is employed. Its network layer is implemented using geographic routing strategy, which provides slow overhead and high scalability features. However, due to well-known drawbacks of the existing techniques, a novel routing algorithm is proposed. Simulations show that this algorithm leads to a significant improvement of routing performance when applied to sparse large scale scenarios, which is the case of street lighting system. Field tests have been performed on IEEE 802.15.4-compliant wireless control units. The obtained experimental results show that the proposed control network is able to meet the requirements of a LED street lighting system. It mainly deals about safer roadways with intelligent

light system to reduce power consumption. This system has automatic street light intensity control based on the vehicular movement and switching ON and OFF of street lights depending on the light ambiance. This will help in reducing the power consumption during hours of meager road usage. The street light module is installed consequently for every certain distance. This paper also aims at reducing road accidents by detecting consumption of alcohol by the driver. This can be implemented using alcohol sensor module which contains skin sensor, breath alcohol sensor and proximity sensor. The skin sensor and breadth alcohol sensor detects the presence of alcohol content and the proximity sensor helps in detecting any kind of malpractice. The novelty of this paper is to effectively reduce the energy consumption of the street lights by controlling the street light's intensity, sensing both human as well as vehicular movement and injury and death caused by drunk driving can be prevented by prior sensing of the alcohol content in drivers by a simple.

RadhiPriyasree[3] explains a system to reduce the power consumption of street lights by avoiding inefficient lighting which wastes significant financial resources each year. This is done by dimming the lights during less traffic hours. For this purpose PIR sensor is used which detects any movement. This work also aims at reducing the fatal crashes and road accidents caused due to alcohol consumption. This is done using skin sensors placed in vehicle doors and also using breadth sensors inside the vehicle. By implementing this death rates due to drunk driving can be reduced to a great extent. The prototype has been implemented and works as expected and will prove to be very useful and will fulfill all the present constraints if implemented on a large scale. It also aims at detecting consumption of alcohol by the driver and if it exceeds certain level it impairs the driver from entering into the Vehicle. This prevents occurrence of accidents or any fatal crashes. This initiative will help the government to save this energy and meet the domestic and industrial needs.

III. STREET LIGHT MECHANISM:

In the current system, maximum lightning over the freeways is completed through HID (High Intensity Discharge lamps), the energy utilization of HID lamps/lanterns are high. The intensity of HID lamps cannot be controlled, in harmony to the necessity, therefore there is a requirement to swap to a substitute way of illumination system i.e., by making use of LEDs. This lighting system is constructed to conquer the disadvantages of High Intensity Discharge lamps. This lightning system exhibits the utilization of the Light emitting diodes or LED's as the source of light and its intensity control is variable which can be altered as per the requirement. LED's use a lesser amount of power and its life span is good, in comparison to the old HID lanterns/lamps. The more vital and motivating characteristic is that the intensity of LED's can be controlled as per the requirement throughout non-peak hours which is not possible with HID lanterns/lamps. A bunch of LEDs are brought into play to structure a street light.

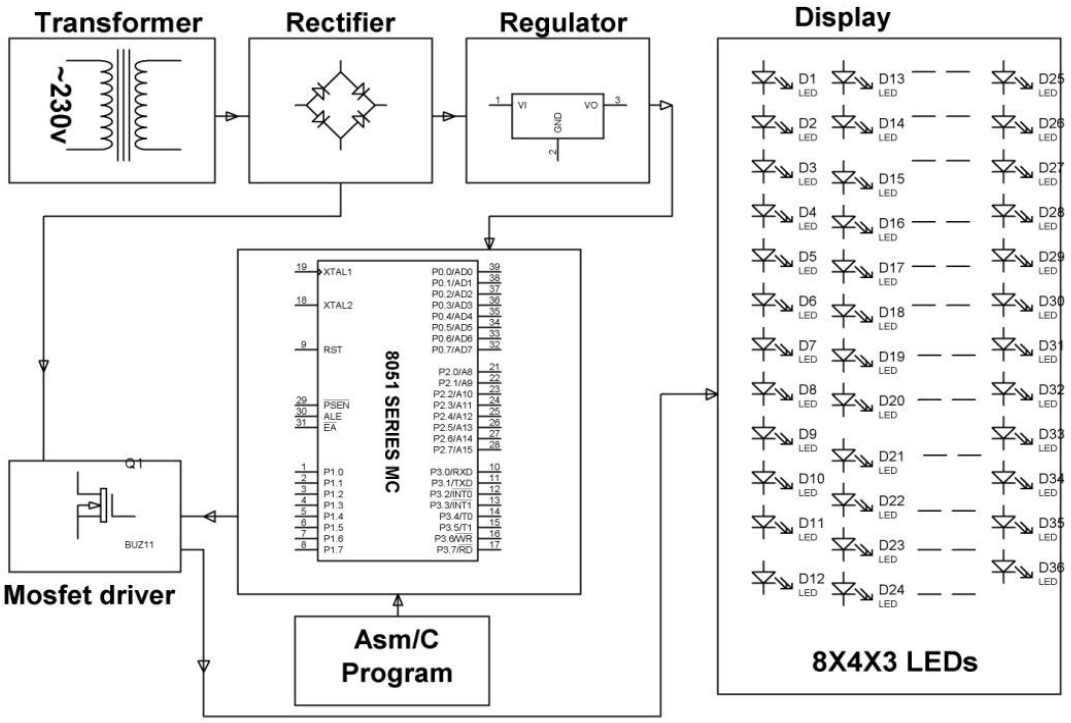

Fig: 1. Block diagram of Street Light Mechanism

The micro-controller includes planned instructions which are used for controlling the intensity of lanterns based on Pulse width modulation (PWM) produced indicators. The lights intensity are kept soaring all through the peak hours, because the street traffic have a propensity to reduce slowly during late night hours, the intensity of the traffic also declines gradually till sunrise. Finally it's totally shuts down at dawn, and it's all over again restarts at 6pm during the dusk. The course of action is repeated.

IV. CIRCUIT DIAGRAM OF STREET LIGHT MECHANISM:

The main goal of this paper is to control the intensity of a street light and also decrease the usage of electricity in the street lights by using LEDs in the place of HID lamps. This project uses AT89C52 microcontroller which generates PWM signals that reminds a MOSFET to switch ON the LEDs to achieve an ideal operation. The hardware and software requirements mainly include a transformer, diodes, resistors, capacitors, LEDs, AT89C592 microcontroller, oscillator , relay, Keil compiler and Assembly language. Mostly the lighting up of roads is done through HID (High Intensity Discharge) lamps, whose energy consumption is high. The light intensity cannot be controlled according to the requirement. This can be overcome by an alternative method of lighting system by using LEDs. This project proves the usage of the LEDs as the light source and its adjustable intensity control, according to the obligation. The lifetime of the lights used in this system is more and also consumes less power as compared to the HID lamps.

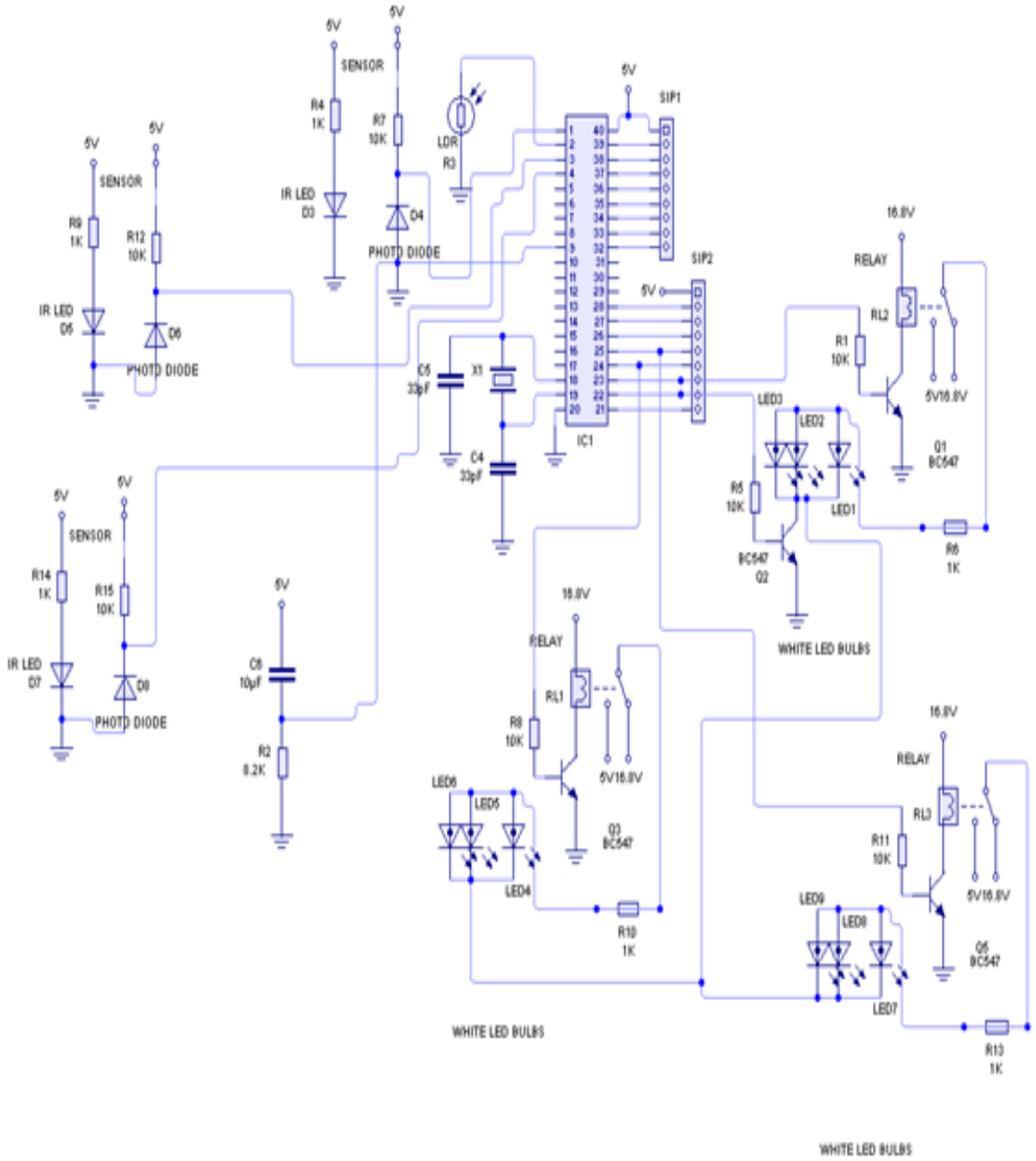

Fig: 2. Circuit diagram of Street Light Mechanism

The LDR senses the light of surrounding and if the light is low the resistance of LDR becomes high and street lights will be turned on with 50 percent intensity and if the light of surrounding is high the resistance of LDR becomes low and street lights will be turned off. Here in the circuit the power supply is given to step down transformer and its gives output of 12V and it is connected to rectifier in order to get pulsating DC (80 percent DC and 20 percent AC) and it is connected to capacitor which acts as a filter and allow only DC supply to regulator which regulates the voltage and again it is passed through the filter and its is given to Vcc of microcontroller and the microcontroller continuously monitors the photo diodes. The output of photodiodes are connected as input of microcontroller and if the object is detected by the first IR sensor then the input is given to the first driver circuit of relay from the microcontroller and then relay will increase the corresponding street light intensity to 100 percent. If the object is detected by the second IR sensor the input is given to the second driver circuit and then the relay will increase the intensity of second street light to 100 percent. If the object is detected by the third IR sensor the input is given to the third driver

circuit and then the relay will increase the intensity of second street light to 100 percent. When the object is passed away all the street lights will be remain with 50 percent intensity.

S. No.	LDR status	IR sensor's status			Street light's (LED's) status		
1	1	X	X	X	O	O	O
2	0	0	0	0	D	D	D
3	0	0	0	1	D	D	F
4	0	0	1	0	D	F	D
5	0	0	1	1	D	F	F
6	0	1	0	0	F	D	D
7	0	1	0	1	F	D	F
8	0	1	1	0	F	F	D
9	0	1	1	1	F	F	F

Table 1: Truth table of Street Light Mechanism Circuit

Where

LDR status: 0- Light intensity falling on LDR is low.
1- Light intensity falling on LDR is high.

IR sensor's status: 0 - Object not detected by IR sensor.
1- Object detected by IR sensor.
X - Don't care.

LED's status: O - Street light is off.
D- Street light will glow with low intensity.
F- Street light will glow with high intensity.

ADVANTAGES

- Less maintenance cost
- No need to control street lights manually
- Simple and efficient
- Cheap and economical
- Reduced energy consumption

V. RESULTS AND CONCLUSION:

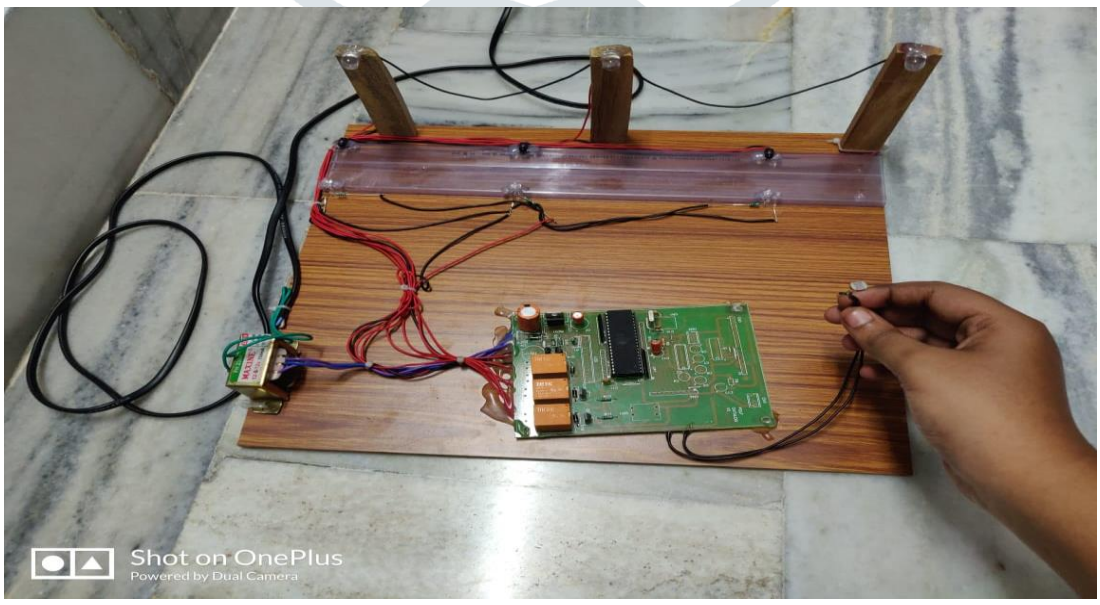

Fig 3: ON condition with high light intensity falling on LDR

Fig 4: With 50 percent intensity (Low light intensity falling on LDR)

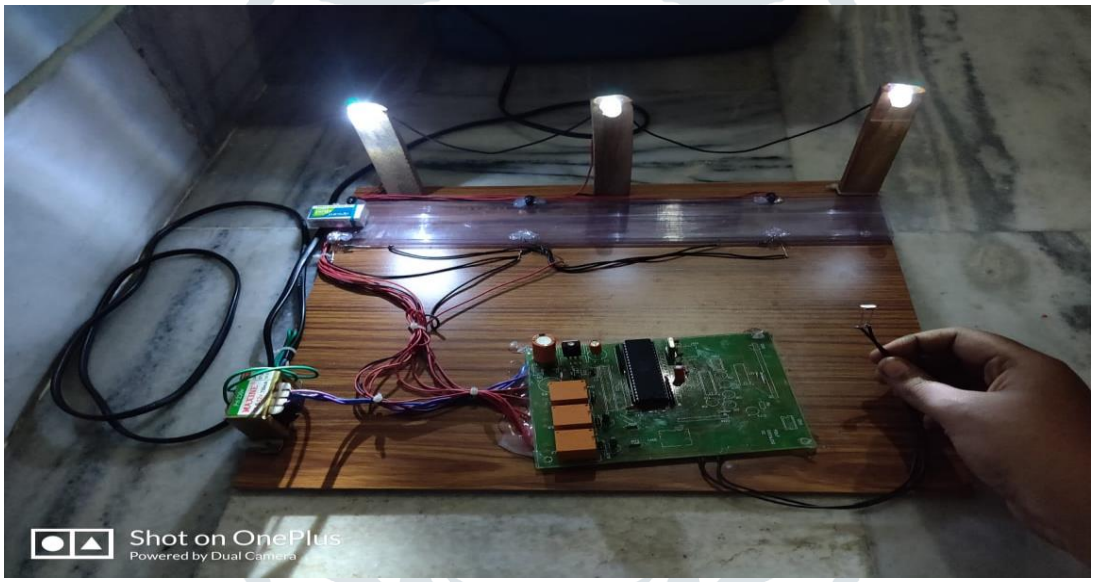

Fig 5: First street light with 100 percent intensity

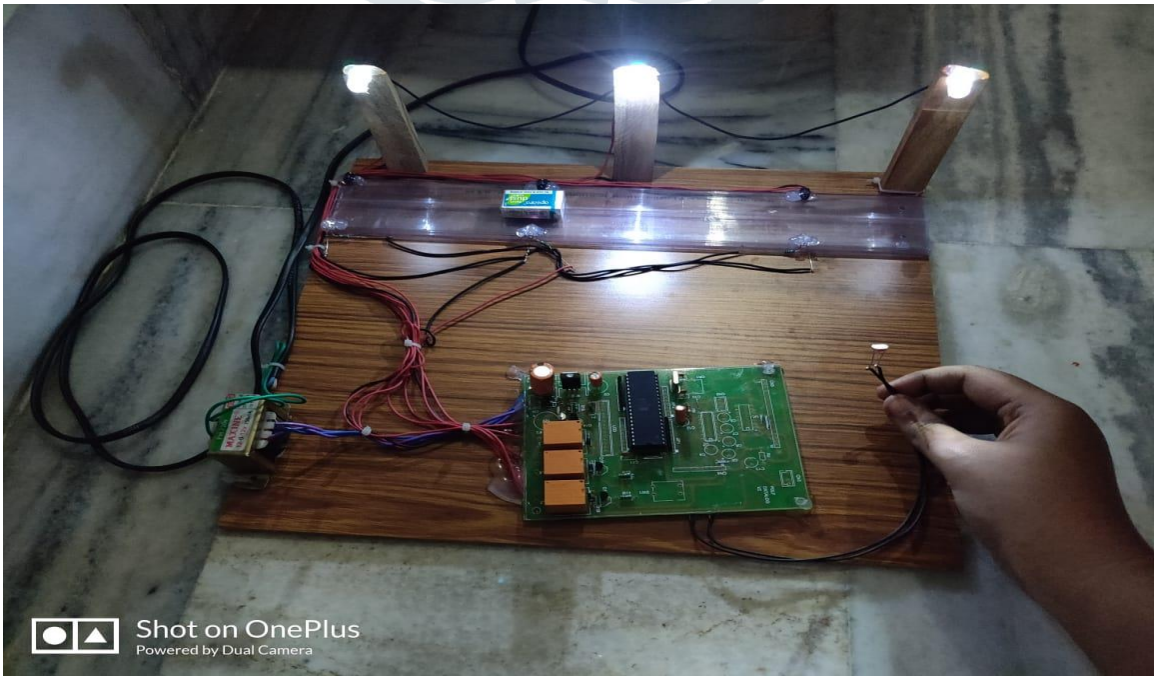

Fig 6: Second street light with 100 percent intensity

Fig 7: Third street light with 100 percent intensity

The project work has been studied and implemented a complete working model using a AT89C52 microcontroller. The programming and interfering of AT89C52 microcontroller has been mastered during the implementation. This work includes the study of energy saving system in many applications. The design and verification of Automatic Street light successfully. The main advantage of the present system is power saving. It requires the initial cost only for designing and installation and not for utilization. Hence, such systems are very much useful for the government to reduce the utilization of conventional power (generated by hydraulic power stations).Therefore, such systems are once implemented on a large scale can bring significant reduction of the power consumption caused by street lights. This initiative will help the government to save this energy and meet the domestic and industrial needs. The other advantages of the circuit are that it is simple circuit, avoids constant supervision of time and flexibility in design.

After having implemented this Intelligent System, what remains is the scope for improvements. Firstly, we could directly go for Wireless Power Transmission which would further reduce the maintenance costs and power thefts of the system, as cable breaking is one of the problems faced today .In addition to this, controlling the Traffic Signal lights would be another feature that we could look into after successful implementation of our system. Depending on the amount of traffic in a particular direction, necessary controlling actions could be taken. Also emergency vehicles and VIP convoys can be passed efficiently. Moreover, attempts can be made to ensure that the complete system is self- sufficient on nonconventional energy resources like solar power, windmills, Piezo-electric crystals, etc. We hope that these advancements can make this system completely robust and totally reliable in all respects.

VI. REFERENCES:

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