



IOT BASED SMART HIGHWAY MANAGEMENT SYSTEM

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Abstract: Smart Highway is an innovative concept for smart roads of future smart cities. It is a program of innovation that links a different way of looking at things with Innovative ideas that apply the opportunities offered by new technologies in smart ways. Now a days safety on road has become an important factor in our life because there is an increasing number of accidents on the road and there are some places where accident occur frequently such as crossing roads. In this project we present a low-cost innovative technology for smart highway roads. Along with this for a proper management of roads street light management system also plays an important role. Smart highway and smart roads are terms for number of different ways technologies are incorporated into roads, for improving the operation of vehicle for traffic lights and street lightning for monitoring the condition of the road speed and load level of the vehicle.

I. Introduction

In day-to-day life some problems have been observed, one of them is wastage of energy during nighttime, mainly at highway lights. So, our main objective is to decrease the energy consumption of Lights Using Some sensors like Ambient Light Sensor, Proximity Sensor, Current Sensor, and Relay with the help of Raspberry pi3 and monitor the lights working condition through real time monitoring. In most of the areas like highways and some developed areas Highway lights are attached with a solar panel but some areas like villages and some Highways are still having an operator to turn on and off these Highway lights and there will be a timer, it will automatically switch off the lights in case the switch was not turned off in time. But here are some disadvantages like at late nights there will be no vehicles and people on road there is a chance for vehicles and people to move on the road but in a rare case like any emergency, etc. so the proposed idea is A Smart Highway Lighting System. with the help of server client program, it can be able to monitor the working condition of those Highway lights whenever wanted and this is onetime investment

Energy saving is the perspective and this author proposed a technique which is to reduce light pollution and to save the energy for street lights by placing the lights in pattern with certain intensity in respective shape of the road which was on the extensive analysis of lighting adaptability for selected luminaire here the main intention of the author is to say that placing a light with respective to the shape of the road so that energy consumption and light pollution can be reduced. We can find many definitions for the term "smart highway but the most general is that smart highways and smart roads are terms for a number of different technologies incorporated into roads In a deeper way, it is an extensive concept for roads by new technologies in smart ways. Thus, we can say that a smart highway combines physical infrastructures with software and data. In these terms, the road itself can be a platform for innovations. A smart highway will allow for technological integration into current transportation roadways, including connected devices and IoT, to increase transport efficiency, drivers' and pedestrians' safety, clean energy consumption and to promote sustainability.

Literature survey

"IOT BASED SMART HIGHWAY MANAGEMENT SYSTEM ISSN-2349-5162" A smart Highway is an innovative concept for smart roads of future smart cities. It is a program of innovation that links a different way of looking at things with innovative ideas that apply the opportunities offered by new technologies in smart ways. Nowadays safety on road has become an important factor in our life because there is an increasing number of accidents on the road and there are some places where accident occur frequently such as crossings roads. In this project, we present a low-cost innovative technology for smart highway roads, wherein we detect the over speed and heavy load of the vehicle with number plate capture by using IR sensors and IOT devices. The Project also focuses on accident avoiding roller barriers to avoid rule violations. They are different in mechanism than other types of barriers also reduce the hazards or accidents. Smart highway and smart roads are terms for number of different ways technologies are incorporated into roads, for improving the operation of vehicle for traffic lights and street lightning for monitoring the condition of the road, speed and load level of the vehicles' based smart roads intelligent highways with warning message and diversions according to climate conditions.

3.1 Block Diagram

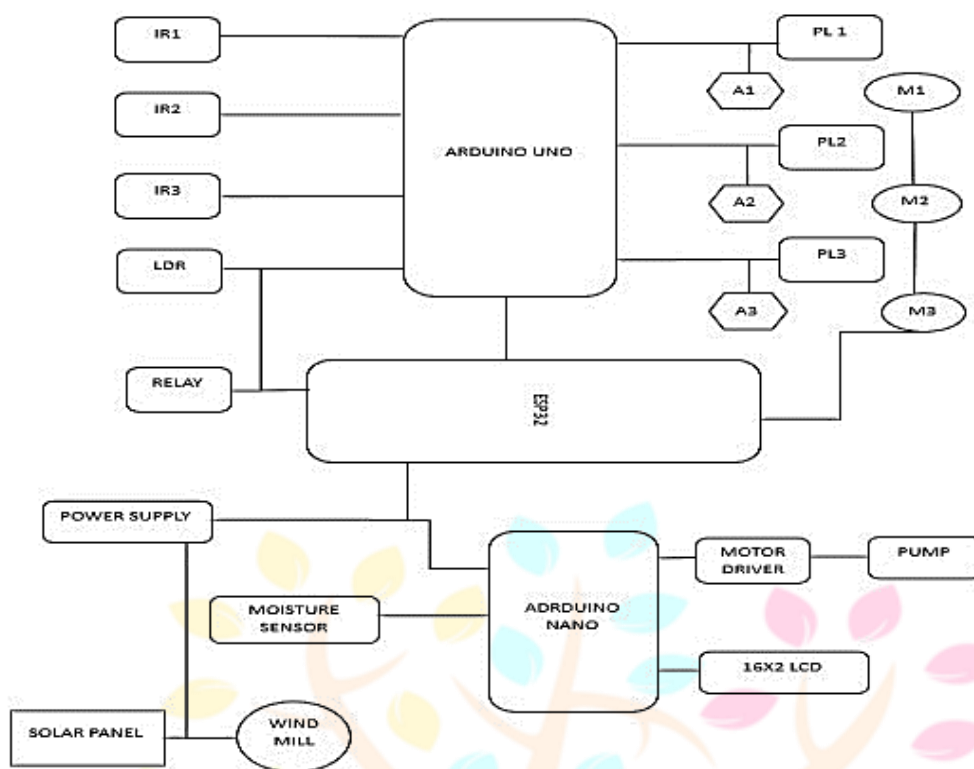


Figure 1: block diagram

Above block diagram we are using Arduino nano and ESP8266 NodeMCU microcontroller for controlling all the aspects. At input section we are used virtual pins to sense input from mobile device. IR sensors are connected to input side also LDR sensor to input side of Arduino nano. At the output side of Arduino nano PL1 to PL3 is pole light and A1 to A3 is alert buttons are connected. On the ESP8266 side mobile input is given by virtual pins and at the output side A1 to A3 and M1 to M3 are Alert and maintenance buttons are connected. For irrigation section we are using Arduino nano for control and in input side moisture sensor are connected and on the output side 16x2 LCD and motor driver are connected. For power generation demo we are using solar panel in series manor and windmill in hybrid form.



3.2 Circuit Diagram

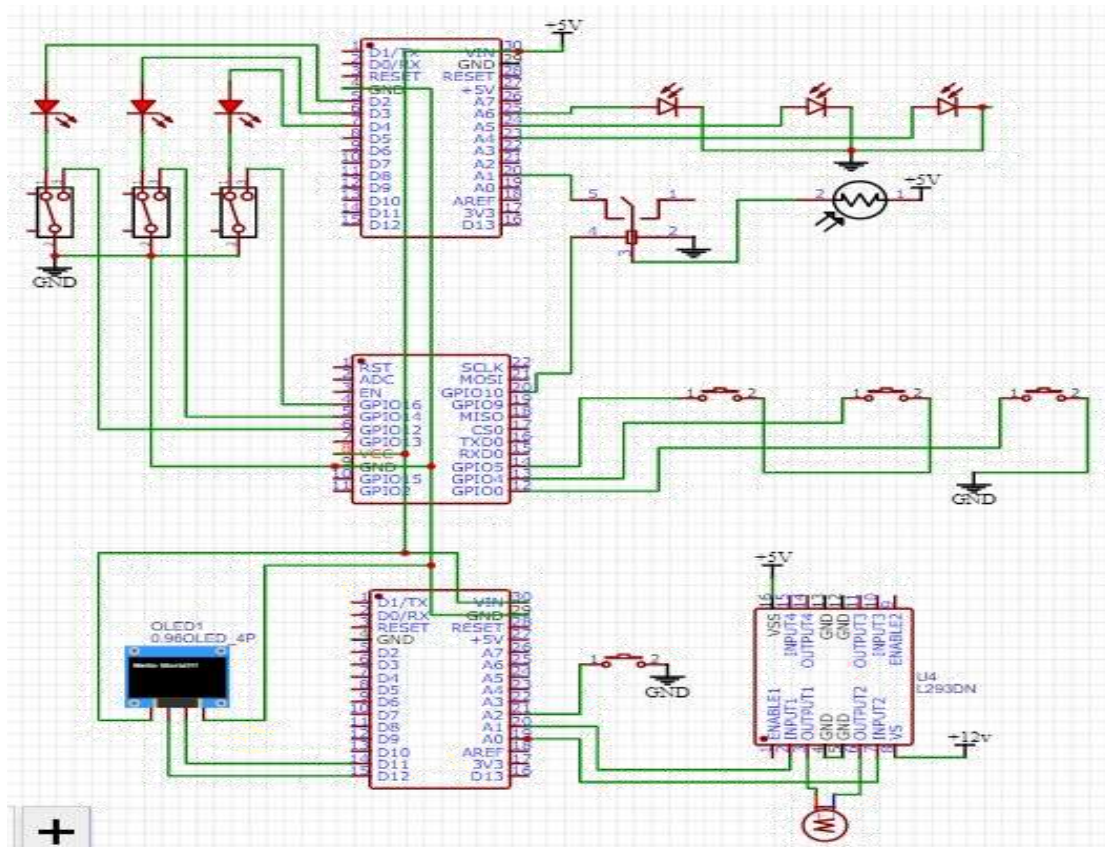


Figure 2: Main Circuit Diagram

In this project we are using above circuit diagram for controlling streetlight. For IR and LDR based operation we are using Arduino uno, LDR sensor, IR sensor. For IOT based operation we are using ESP8266 nodemcu, push to ON switch, three terminal buttons. And last for irrigation operation we are using Arduino nano, motor driver L293d, DC motor, 16x2 LCD with Adder. For streetlight we are using Bright white LEDs on poles. For power generation we are using solar panel and windmill

4. Operation

4.1 Case 1: LDR based street light control:

In this case at input side, we are connected three IR sensors and one LDR sensors. Basically, LDR start working basis of light when light fallen on sensor then it increases its resistance and giving LOW signal to microcontroller. After getting LOW signal from LDR microcontroller will order to output port to turn OFF and at the output port we are connecting LEDs so LEDs will turn OFF. When sunset will happen then LDE sense less light than it decreases resistance and give HIGH signal to microcontroller. Microcontroller will order to output port to turn ON with $\frac{1}{4}$ capacity. Because we want our streetlight will consume less energy while zero need

4.2 Case 2: IR based street light control:

When LDR turn ON then all streetlights will be turn ON with $\frac{1}{4}$ capacity. Whenever any vehicle passes IR sensor or cut IR sensor then it will be turn ON by full capacity on that particular pole. In program we write code in which normally that pole light getting $\frac{1}{4}$ power means 255/4 we are giving signal. After crossing IR it get 255 signal.

4.3 Case 3: manual IOT based control:

In this case when we want to turn ON the pole light manually and this action, we required remotely then best way is IOT. In IOT we use GPIO pin 10 to control the manual action. In this case it will eliminate LDR from the circuit. For controlling we are giving blynk IOT portal on respective authorities. They can turn ON and OFF by manually by clicking the icon on APP. This will work remotely any ware from the world.

And operation also much easy.

4.4 Case 4 Emergency Button:

As we are implementing some time in night or day on highway accidents are happens then that time no one is there for help. So, in this project we are implementing emergency button using IoT. When someone needs help then press that button location of that pole is send that time one signal will go to central hospital and police station. By this signal anyone can track them easily.

4.5 Case 5 maintenance alert button:

When any of the pole light goes OFF or under maintenance then it will be detected on the BLYNK portal using indicators. In this project for demonstration, we are using push to ON button for demonstration. When we switch off the light then LOW signal will go to ESP then ESP will process the signal and send ON signal to portal. It will be very easy to display which pole under maintenance.

4.6 Case 6 Hybrid power generation:

For hybrid power generation we are implementing solar panel and windmill. Both will generate electricity and store in battery it will father used by our project.

Table 1: results

Sr.no	Day	time	Voltage
1.	14/01/2023	00pm	24v
2.	15/01/2023	01pm	24.1v
3.	16/01/2023	11am	24.5v
4.	17/01/2023	02pm	24

4.7 Case 7 irrigation system:

For irrigation section we are using Arduino nano for control and in input side moisture sensor are connected and on the output side 16x2 LCD and motor driver are connected. When soil moisture gets less than 300 then water pump will be turn ON. When soil moisture is higher than 300 then water pump will be turn OFF.

Table 2: results

Sr.no	Day	Soil moisture	Pump state
1.	14/01/2023	250	ON
2.	15/01/2023	340	OFF
3.	16/01/2023	280	ON
4.	17/01/2023	320	OFF

4.8 Final Hardware Snapshot



(a)

(b)

figure 3: a b final hardwired

4.9 Conclusion

In present scenario, this project plays an important role in producing green energy (CO₂ free) as we are using renewable energy resources. Also, to promote the use of Electric Vehicles we are providing charging stations which makes this project environmentally friendly. Using IOT we are controlling streetlight & its intensity which save energy. Trees planted near roadside are also irrigated by this system which helps in controlling air pollution near roads/ Highways.

II. Acknowledgement

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