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MULTI PURPOSE SOLAR CITY

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Abstract: The system makes use of a solar panel, battery, transmitter, receiver coil, Charge booster, charge controller, voltmeter display to develop the system. The system demonstrates how electric vehicles can be charged while moving on road, eliminating the need to stop for charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coils energy is transmitted from the transmitter coil to receiver coil. Please note the energy is still DC current that is induced into this coil. Now we store this to DC again so that it can be used to charge the EV battery. The charged battery is measured by voltmeter display. Thus the system demonstrates a solar powered wireless charging system for electric vehicle that can be integrated in the road. The plenty of solar energy available during the day time is stored in a solar cell and the stored energy is used to glow the street lights during the whole night. Also the system provides a power saving mode of operation by adapting the method of automation. A dark sensor and a light sensor provides the automatic "ON"/"OFF" facility to the street lights, so that it will glow automatically when it is required(i.e. when the surrounding will be dark) and it will be turned "OFF" automatically if sufficient light is available in the surrounding.

keywords **– Solar panel, Battery, Transmitter, Receiver coil, Charge Booster, Charge Controller, Voltmeter display**

I. INTRODUCTION

Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing cost of travel by replacing fuel by electricity which is way cheaper. The solar street light has been designed after too much research work. Its uniqueness and best features can make it the most preferable choice in rural area. With gradual development in this research, new features are being added to increase the efficiency.

The proposed model may be considered as the third generation of street light which is also known as intelligent street light. The intelligent street light control system uses the latest international intelligent street light energy-saving control technology. The main aim behind the research of designing the system is to find a way for maximum utilization of available energy with minimum The system makes use of a solar panel, battery, booster, regulator circuitry, copper coils, voltmeter display to develop the system. The system demonstrates how electric vehicles can be charged while moving on road, eliminating the need to stop for charging.

The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The power is converted to AC using transformer and the regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coil's energy is transmitted from the transmitter coil to EV coil. Please note the energy is still DC current that is induced into this coil. Now we stored this to DC, so that it can be used to charge the EV battery.

We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using an AT Mega microcontroller and display this on an voltmeter display. Thus, the system demonstrates a solar powered wireless charging system for electric vehicle that can be integrated in the road.

And the same energy from solar panel is used for automatic street light. The plenty of solar energy available during the day time is stored in a solar cell and the stored energy is used to glow the street lights during the whole night. Also, the system provides a power saving mode of operation by adapting the method of automation.

A dark sensor and a light sensor provides the automatic "ON"/"OFF" facility to the street lights, so that it will glow automatically when it is required(i.e. when the surrounding will be dark) and it will be turned "OFF" automatically if sufficient light is available in the surrounding. Again the auto intensity control mechanism has been applied by the help of a microcontroller to control the light intensity of the luminaries as per the requirement. Hence the loss of energy due to unnecessary glow of the street lights can be avoided.

II LITERATURE SURVEY

1. **A new wireless charging system for EV using two receiver coils, Publisher: www.sciencedirect.com, Naoui Mohamed a, Flah Aymen a, Mohammed Alqarni b, Rania A. Turky c, Basem Alamri d,Ziad M. Ali e,f, Shady H.E. Abdel Aleem**

   The author explains about scarcity of fossil fuels, as well as environmental concerns due to increased demand of electricity. Taken together, these issues have an impact on the automotive industry and are also important for the research and development of electric vehicle (EV) technologies as a solution to these problems. Technological advances in electrica l energy storage have culminated at a sufficient mass density of energy and power to meet automotive needs and researchers are attempting to build good storage solutions and enhance their charging strategy and reliability to reduce the overall cost of the vehicle. Additionally, authors have investigated different control algorithms to improve the system's efficiency. Also, many solutions were provided to boost the energy efficiency of the e- transportation system.

2. ***Optimized Renewable Energy Integration for EV High- Power, Dynamic Wireless Charging Systems,*** **Publisher:IEEE, Rong Zeng, Veda Galigekere, Omer Onar and Burak Ozpineci.**

   Transportation electrification has drawn wide attention in decades for reducing greenhouse gas (GHG) emissions and mitigating air pollution, electric vehicles (EVs) are becoming a promising alternative to the conventional gasoline vehicles. Due to the physical limit of on- board battery, charging difficulties and range anxiety are two main barriers on the development of EVs. Traditional conductive charging requires heavy power cables to connect with EV, which has potential safety hazards. This paper gives a vision on development of Wireless power transfer, which is an emerging technology to provide contactless charging for EVs, having features like simplicity, reliability, safety, and user friendliness. As one type of wireless charging technology, dynamic wireless charging system (DWCS) enables EVs to be charged in motion. The method can considerably extend the driving range, reduce the on- board battery size, and thus reduce the upfront cost of the vehicle.

2. **Design of Solar-Powered Charging Station for Electric Vehicles in Power Distribution System, Publisher: IEEE, Thanat Jensanyayut, Tipthacha Phongtrakul, Kulsomsap Yenchamchalit, Yuttana Kongjeen, Krischonme Bhumkittipich1, and Mithulananthan Nadarajah.**

   The author proposes design of Solar-Powered Charging Station for Electric Vehicles in Power Distribution System considering increased popularity of electric vehicles (EVs) and increased awareness of renewable energy system (RES) , smart charging of EVs or EV charging facilities to align effectively with available local RES generation, available charging times and at the same time maximize profits by taking into consideration the variance in grid prices. The four main areas of research discussed in modern power system are: power system infrastructure arrangement, grid-connected PV charging systems, EV load demand in a workplace environment, and power management in RES integrated EV charging systems.

4. **Dynamic Wireless Charging Electrical Vehicle, Publisher: IEEE , HemantKumarD, ashora.**

   Over the past 100 years, people become increasingly dependent on cars for meeting life's most basic needs. In most of the world, getting to and from work and holidays, bringing food home from the grocery store, or going to the doctor means using one's car. This reliance on the automobile and on the petroleum-powered internal combustion engine,in particular, comes with significant costs. Dependence on oil makes overall economy and household budgets highly vulnerable to volatile oil prices. The pollutant emissions from vehicles contribute to unhealthy air and global climate change. With this paper author concludes that Vehicles powered by electricity have the potential to reduce many of these problems.

III OBJECTIVES

- To develop a system in which we use 'RENEWABLE SOURCE' So we use 'SOLAR- ENERGY'
- As it will encourage the use electric vehicle even in remote areas where transmission line are not present as it is Solar driven.

IV METHODOLOGY

The prototype model consisting of Transmitter and Receiver coil unit for charging EV on go. Transmitter coil is buried under the ground and the Receiver coil is placed to the electric vehicle. The transmitter unit has solar panel of 12V,10W for using renewable energy. The output of solar panel is used to charge the battery of 12V through charge controller to maintain the charging voltage to 12V. The output from battery is given to the relay to control the flow of charge in the circuit.

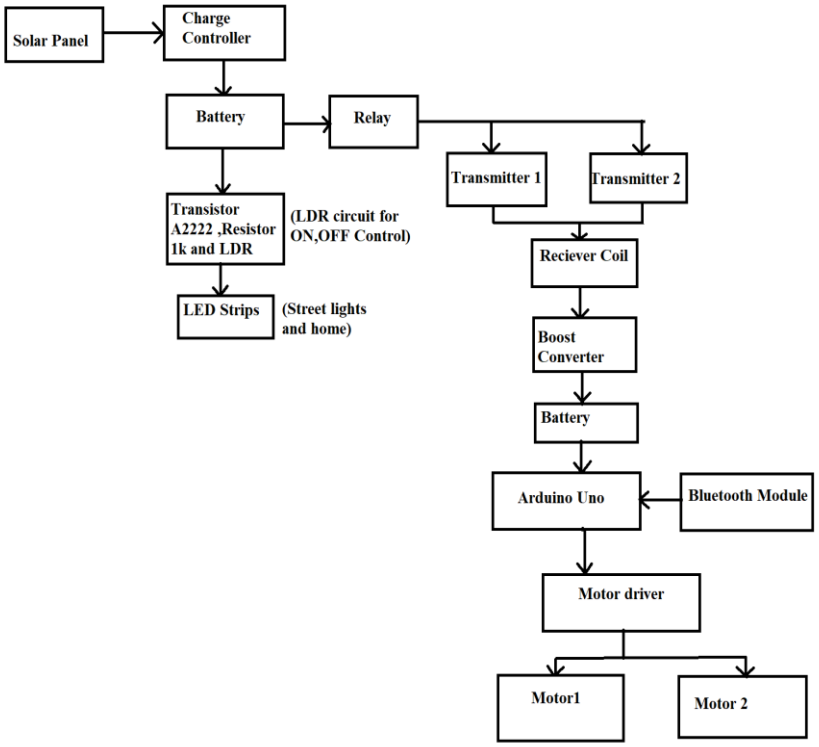
Transmitting coil receives the output from switching relay and convert it to electromagnetic resonating waves for transmitting purpose. The receiving unit receives the electromagnetic resonating waves and converts it into electrical output.

The system makes use of a Solar panel, Battery, Copper coils, Boost converter, relay, voltmeter display to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The power is transmitted using relay to the transmitting and receiver coil.

This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coils energy is transmitted from the transmitter coil to receiver coil. Please note the energy is still DC current that is induced into this coil. This power of DC given to the EV battery. Now the charged Dc can be seen on the voltmeter display. Thus the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

Flowchart of "Automated Solar Street Light System for Highway Application" is shown in diagram. The system works absolutely in the darkness, avoiding waste of energy during sunny day when the solar panel recharges the battery. The sensors enable the system to operate absolutely when necessary. The system used highly economical LEDs to ensure correct illumination and assure energy savings. The system is proposed to be low power consumption, minimizing the battery capacity and also the energy supplied from the solar panel. Hence, the condition of the street lamp status is monitored by this system.

This feature allows great energy conservation. In addition, any faulty LED will be automatically turned OFF which would reduce more energy wastage caused by these faulty LEDs. If any fault occurs on street lights, a GSM module send will SMS to the control room. The maintenance will be easier by this method. If heavy traffic on the road, a SMS will send in the police control room which will help traffic control.



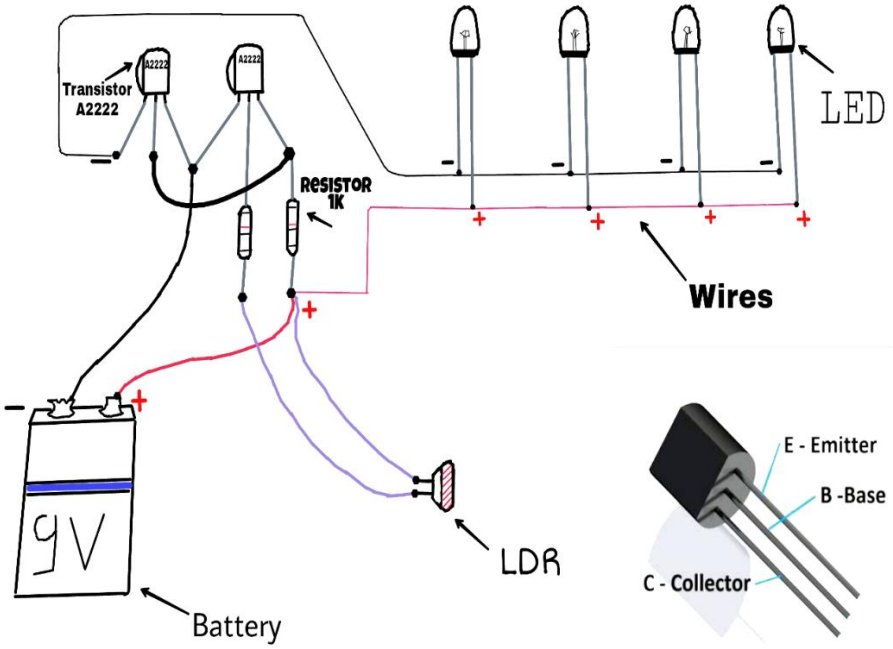
V. RESULTS AND DISCUSSION

The circuit consist of two Transistor A2222, Four LED, LDR, Battery 12V, Resistor 1K. The Transistor A2222(T1) Collector terminal is given common to all the negative terminal of the LED's, all the LED's positive terminal is made common and given to one end of the Resistor (R1) and connected that terminal to the positive terminal of the battery 12V.

The Resistors (R1) where the LED's connected, the other end of that resistor(R1) is connected to the Transistor (T2) emitter terminal. where the Collector end of the transistor(T2) and Emitter end of other transistor (T1) is connected and the base of Transistor (T1) connected to Transistor's emitter end (T2).

The LDR have two terminals where one of the terminal is connected to the Resistor (R2) and to the base of the transistor(T2). The other terminal of LDR is connected to the common node of the battery and the Resistor (R1) connected.

Transistor act as amplification and controlling in the circuit to transmit the charge and the resistor is used to resist the flow of charge. The LDR is used to detect the day and night time where it makes the circuit to operate during the dark time.



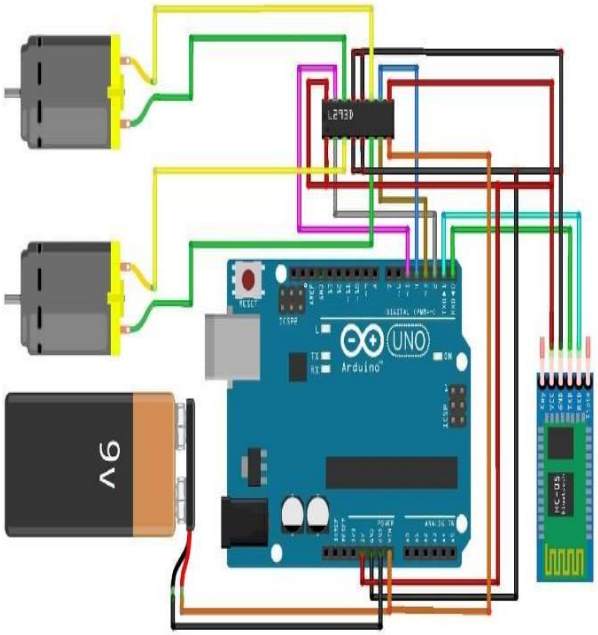
The Model circuit consists of Solar panel, Charge controller, Battery, Relay, Transmitter, Receiver, Boost Converter, EV Battery. The Solar Panel of 12V,10W is used to collect the energy from the sun and the converting of energy to power is done where approximately 12V is generated. The generated power is supplied through charge controller to the battery to store the power where the battery has capacity of 12V.The charge controller maintain the constant supply from the solar panel to battery.

From the battery, the stored power is transmitted to the transmitter through the relay where relay act as switch and control the flow of current. The transmission is through the process of wireless power transmission (WPT). The wireless power transmission can be defined as the energy that can be transmitted from the transmitter to a receiver through an oscillating magnetic field. The magnetic flux is created upon the pressure given to the transmitter, input to the transmitter is 12V. The generated magnetic flux in fed to the receiver by placing approximately near to the transmitter.

As soon receiver placed inside the EV vehicle receive the magnetic flux it produces the constant output 5V. The output 5V produced at constant is at static position where the production is not constant during dynamic of EV vehicle it causes some fluctuations while is dynamic so booster is used to boost the output during the dynamic of EV vehicle.

The circuit consist of Arduino UNO Board, HC-05/HC-06 Bluetooth Module, L293D Motor Driver IC, a pair of DC Geared Motors of 200 RPM and a 9V Battery. The TX, RX pins of Arduino is connected to Rx, Tx pins of Bluetooth Module. The Bluetooth Module is supplied with 5V. Similarly, the left DC motor is connected to pins no 3 & 6 of L293D and the right DC motor to pins no 14 & 11 of L293D. Arduino digital pins 2,3,4,5 is connected to L293D 2, 7, 10, 15 respectively. The L293D IC Pins 2, 5, 12, and 13 are GND pins, and 9, 1, and 16 is supplied with 5V. But pin 8 of L293D is directly supplied with 9V.

The Android App: The app for this project is given below. It is designed using MIT App Inventor. The UI looks something like this. The internal architecture and programming has also been implemented so that the Android app can wirelessly control the Robot with Bluetooth. After final design the Android App looks something like this.



Users Command	Arduino O/P Digital Pins (2,3,4,5)	L293D Input Pins (2, 7, 10, 15)	L293D Output Pins (3, 6, 11, 14)
Forward	H L H L	H L H L	H L H L
Backward	L H L H	L H L H	L H L H
Left	- H L L L for 1s, then H L H L if previous Command was Forward - H L L L for 1s. then L H L H if previous Command was Backward		
Right	- L L H L for 1s, then H L H L if previous Command was Forward - L L H L for 1s, then L H L H if previous Command was Backward		
Stop	L L L L	L L L L	L L L L

As mentioned above App Logic Command are processed by phone. The command is then sent to the receiver side via Bluetooth. Command received via Bluetooth is forwarded to Arduino Uno board using UART serial communication protocol. Arduino code checks the commands received. Whenever the command is a matching string, Arduino controls the movements of the robot accordingly in forwarding, backward, Turning Right, Turning Left & Stop. Signal logic levels at the different stages of the circuits for proper controlling of the robotic car are given below.

Source Code/Program: The source code for Wireless Bluetooth Robot Arduino is given below. You can copy the code and upload it directly to Arduino Board.

```
String readvoice;
int k=0;
void setup()
 {
Serial.begin(9600)
              ;
pinMode(2,OUTPU
            T);
pinMode(3,OUTPU
            T);
pinMode(4,OUTPU
            T);
pinMode(5,OUTPU
            T);
}

void loop() {
while (Serial.available())
{
delay(3);
        char c =
    Serial.read();
readvoice += c;
}

if(readvoice.length() > 0)
{
Serial.println(readvoice);

if(readvoice == "forward")
{
digitalWrite(2,
HIGH);
digitalWrite(3,
LOW);
digitalWrite(4,
HIGH);
digitalWrite(5,
LOW); k=1;
}
if(readvoice == "backward")
{
digitalWrite(2,
LOW);
digitalWrite(3,
HIGH);
digitalWrite(4,
LOW);
digitalWrite(5,
HIGH);k=2;
}

if(readvoice == "right")
{
if (k==2)
{
   digitalWrite(2,
         HIGH);
   digitalWrite(3,
         LOW);
   digitalWrite(4,
         LOW);
```

```
    digitalWrite(5,
         LOW);
     delay(1000);
    digitalWrite(2,
         LOW);
    digitalWrite(3,
         HIGH);
    digitalWrite(4,
         LOW);
    digitalWrite(5,
         HIGH);
 }

                                                    {
    digitalWrite(2,
         HIGH);
    digitalWrite(3,
         LOW);
    digitalWrite(4,
         LOW);
    digitalWrite(5,
         LOW);
     delay(1000);
    digitalWrite(2,
         HIGH);
    digitalWrite(3,
         LOW);
    digitalWrite(4,
         HIGH);
    digitalWrite(5,
         LOW);
 }
 }

 if(readvoice == "left")
 {
 if (k==2)
 {
    digitalWrite(2,
         LOW);
    digitalWrite(3,
         LOW);
    digitalWrite(4,
         HIGH);
    digitalWrite(5,
         LOW);
     delay(1000);
    digitalWrite(2,
         LOW);
    digitalWrite(3,
         HIGH);
    digitalWrite(4,
         LOW);
    digitalWrite(5,
         HIGH);
 }
 else
 {
digitalWrite(2, LOW);
digitalWrite(3, LOW);
digitalWrite(4, HIGH);
digitalWrite(5, LOW);
delay(1000);
 digitalWrite(2, HIGH);
```

```
digitalWrite(3, LOW);
digitalWrite(4,High);
digitalWrite(5,
LOW);
}
}

 if(readvoice == "stop")
 {
 digitalWrite(2,
 LOW);
 digitalWrite(3,
 LOW);
 digitalWrite(4,
 LOW);
 digitalWrite(5,
 LOW);
 }
 }
 readvoice="";
 }

    digitalWrite(2,
         HIGH);
    digitalWrite(3,
         LOW);
    digitalWrite(4,
         LOW);
    digitalWrite(5,
         LOW);
     delay(1000);
    digitalWrite(2,
         HIGH);
    digitalWrite(3,
         LOW);
    digitalWrite(4,
         HIGH);
    digitalWrite(5,
         LOW);
}
}

 if(readvoice == "left")
 {
 if (k==2)
 {
    digitalWrite(2,
         LOW);
    digitalWrite(3,
         LOW);
    digitalWrite(4,
         HIGH);
    digitalWrite(5,
         LOW);
     delay(1000);
    digitalWrite(2,
         LOW);
    digitalWrite(3,
         HIGH);
    digitalWrite(4,
         LOW);
    digitalWrite(5,
         HIGH);
 }
```

```
  else
  {
digitalWrite(2, LOW);
digitalWrite(3, LOW);
digitalWrite(4, HIGH);
digitalWrite(5, LOW);
delay(1000);
 digitalWrite(2, HIGH);
digitalWrite(3, LOW);
digitalWrite(4,HIGH);
digitalWrite(5,LOW;
}
}
if(readvoice == "stop")
{
digitalWrite(2,LOW);
digitalWrite(3, LOW);
digitalWrite(4, LOW);
digitalWrite(5, LOW);
}
}
readvoice="";
}
```

V CONCLUSION

Transportation is a major concern in the development of any country. Whereas electric vehicle is the future of the transportation industry. While a lot of research has been done on this topic in the previous decade, a large part of it is yet to be explored. From our project, we conclude that a wireless charging system is implemented by our group. Along with this, a battery management unit is designed, which shows the battery voltage. Battery voltage is measured by the microcontroller & displayed on a voltmeter. We have used inductive coupling technology for wireless power transfer, but it is useful only for low power applications and where the distance between receiving and transmitting coils is less. But for real world applications, the power requirement is high and the distance between receiving and transmitting coil should also be increased. So for this purpose, Magnetic Resonant Coupling technology is appropriate and suitable. Also, we conclude that the wireless charging method requires more time to charge a battery than the other types of charging methods. Our project only represents the prototype of Automation in the wireless charging of electric vehicle systems. It is not only the way to save energy but also an idea to make a proper utilization of available solar energy which is radiating everyday without being used. Though the initial investment is very high, still it can be considered as to be economic if we will think about a long term period, because we are using here the solar energy, which is available free of cost. Hence after the installation no more payment is to be given regarding electricity. Also the automatic solar street light system is completely Noiseless, Smoke-free and free from fire hazards. Hence it will not only save the electricity bill but also will illuminate the path in an eco-friendly way.

In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional s ources are depleting very fast, then it's time to think of alternatives.

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