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Solar Panel Cleaner using Sprinkler & Sponge Cleaning Mechanism by using Blynk Application

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Abstract: ***The Internet of Things has a dream where the web reaches out into this present reality, which joins ordinary objects. The IoT permits articles to be detected or controlled remotely over existing system foundation, making open doors for unadulterated coordination of the physical world into PC based frameworks, and bringing about improved effectiveness, exactness and financial advantage notwithstanding decreased human intercession. This innovation has numerous applications like Solar urban communities, Smart towns, Micro frameworks and Solar Street lights thus on. As Renewable vitality developed at a rate quicker than some other time in history during this period The proposed framework alludes to the online showcase of the force utilization of sunlight based vitality as a sustainable power source. This observing is done through raspberry pi utilizing carafe system. Savvy Monitoring shows day by day use of sustainable power source. This encourages the client to investigation of vitality utilization. Investigation impacts on the sustainable power source utilization and power issues.***

I. INTRODUCTION

The created information lumberjack equipment model uses just four sensors for dampness, temperature, voltage, and current detecting. A previously evolved Android application is use for phone to show all parameters continuously reason for a productive observing which can likewise ready to give significant data to support staff for any issues in battery charging. To achieve the assignment, we have built up the equipment usage of remote information obtaining engineering of photovoltaic frameworks dependent on the Internet of Things. The general expense of this model is efficient.The Internet of Things (IoT) is an arrangement of related registering gadgets, advanced and mechanical machines, objects, individuals with one of a kind identifiers and potential exchange of information over a system without human-to-human or human-to computer communication. Physical items those are no more detached from the virtual world, however can be controlled remotely through Internet administrations. A brilliant world is only Smart gadgets, Smartphone, Brilliant vehicles, Smart homes and Smart urban communities. "Keen" objects assume a key job in the vision of IoT, since inserted correspondence and data innovation would have the potential to change [12]. With the developing nearness of WiFi and 4G-LTE remote Internet get to, the development towards inescapable data and correspondence systems is as of now obvious [13]. As indicated by the International Energy Organization (IEA), Renewable vitality will be the quickest developing wellspring of power, in which wind and sunlight based PV are mechanically develop and financially reasonable. Yet at the same time there is increment in world's interest for vitality. Embracing Sustainable power source innovations is one of the development methods for decreasing the natural effect. The most recent release of the IEA's Medium-Term Renewable Market Report indicates the sustainable power source development about 13% more somewhere in the range of 2015 and 2021 than it was in last year's. The portion of sustainable power source in by and large power age will ascend from over 23% in 2015 to practically 28% in 2021. Sun based vitality is all around accessible everywhere throughout the world and can add to limit the reliance of vitality imports. In an hour and a half, enough daylight strikes the earth to give the whole planet's vitality requirements for one year. Sun based PV prompts no ozone harming substance (GHG) outflows and different poisons during activity. Sun based has numerous advantages like framework neighborly organization, improved working procedures, progressed sustainable power source determining and upgraded planning of power plants and furthermore interest in extra adaptable assets, including request side assets, power capacity, lattice framework and adaptable age. The customary strategy centers around the levelized cost of power (LCOE) which is a proportion of cost for a specific creating innovation at the degree of a force plant that is no longer adequate. Around a million sun powered boards were introduced consistently around the globe a year ago. Sunlight based PV leads giving practically 40% of worldwide inexhaustible power limit development over the medium-term. At last, in breaking down the advancement of power and energy consuming parts, it investigates the prime job sun oriented vitality could play in the drawn out eventual fate of our vitality framework. Uses of the checking framework are the Rooftop Sun oriented, Ground mounted Solar, Solar urban areas, Smart towns, Smaller scale matrices and Solar Street lights. sun oriented water warming frameworks, Solar home lighting frameworks, sun

powered lamps, sun powered siphons, sunlight based versatile chargers, sun based cookers, Driven sun oriented light, sun powered RO plant, sunlight based fan, sun based Inverters, and so forth. can be checked through this undertaking. Business Products like Solar traffic signals, sun oriented street studs/signals can likewise be checked through the proposed framework. In India, visit power cut is normal. Because of this issue, it is critical to utilize sustainable power source and checking it. By checking the vitality estimate, families and networks who are utilizing sun based force can use their vitality creation and utilization during great climate.

Fig-I Clean Solar panel and solar panel with dust

Working of photovoltaic cell: The pv cells work on the principle of conversion of light energy into electrical energy. It makes use of semiconductor materials which are photosensitive such as copper indium diselenide (CIS), cadmium telluride (CdTe), and gallium arsenide (GaAs), have been developed for use in PV cells.

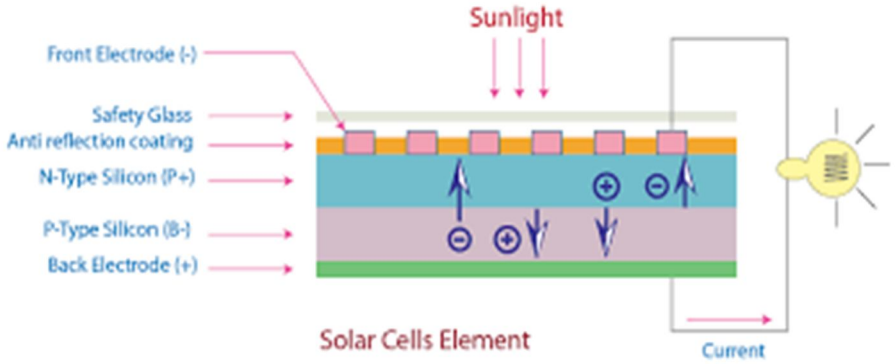


Fig-II PV cell working

A. Operation

First IR sensor detects the dust on panel. If the sensor gives 1 signal to microcontroller means no dust accumulated or its density does not affect solar panel performance. When it gives 0 to controller means need to remove dust by cleaning mechanism. Microcontroller take action as per programmed in uploaded in it. It drives the drive mechanism within control of limit sensors and make one complete cycle for cleaning After further check IR module check for dust on panel if it is clean then wait for dust to be accumulated as on cycle is going on.

B. System Components

1) IR Sensor: used for detecting dust on solar panel
2) Arduino Uno: Open source low cost micro controller
3) Driver: 12volt dc motor driver
4) Limiting Switch: used for limit the path

Current and voltage Sensor

C. Arduino Programming

We are using an Arduino Uno, Arduino Duemilanove, Nano, Arduino Mega 2560,or Decimal. Aurdino programmed on arduino open source software available on arduino web site. The Programmed use as below;

Programming for automatic solar panel cleaning robot system

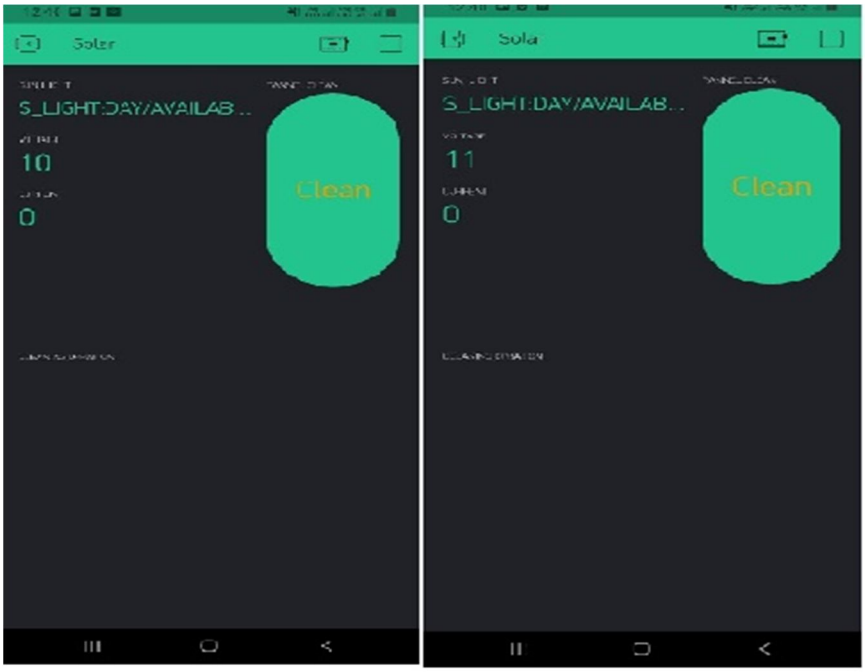
```
#include "ACS712.h"
#define BLYNK_PRINT Serial
#include <WiFi.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);  // pos, line
ACS712 sensor(ACS712_05B, 35);
char auth[] ="A40b2wlJFNozlgfYFE54KV-XcU7j4_I";// iot project
char ssid[] = "project";
char pass[] = "123456789";
int sensorValue = 0;  // variable to store the value coming from the sensor
float I;

float voltage;
#define V_pin 34
#define LDR_pin 13
#define Relay_pin  4
#define M1 5
#define M2 18
#define Solar_clean 19
#define IOT_clean 2
int offset =1;// set the correction offset value
//-------------------------------------------------
void setup()
{

  pinMode(LDR_pin, INPUT);
  pinMode(Solar_clean, INPUT_PULLUP);
  pinMode(Relay_pin, OUTPUT);
  digitalWrite(Relay_pin, LOW);
  pinMode(M1, OUTPUT);
  pinMode(M2, OUTPUT);
  digitalWrite(M1, LOW);
  digitalWrite(M2, LOW);
  pinMode(IOT_clean, OUTPUT);
  digitalWrite(IOT_clean, HIGH);
  lcd.init();
  lcd.backlight(); // turn on LCD backlight
  lcd.print("starting....");
  Serial.begin(9600);
```

```
 Blynk.begin(auth, ssid, pass);
 sensor.calibrate();
 delay(3000);
 lcd.clear();
}
//=============================================================
void loop()
{
 if(digitalRead(LDR_pin)==LOW){
   Blynk.virtualWrite(V0, "S_LIGHT:DAY/AVAILABLE");
   lcd.setCursor(0, 0);
   lcd.print("S_LIGHT:DAY/AVAILABLE");
 }
 else{
   Blynk.virtualWrite(V0, "NIGHT");
   lcd.setCursor(0, 0);
   lcd.print("S_LIGHT:CLOUD/NIGHT ");
 }
 //-------------------------CURRENT-----------------------------
   I = sensor.getCurrentDC();
   Serial.println(String("I = ") + I + "A");
   if(I>=0.00){
   lcd.setCursor(0, 2);
   lcd.print(String("I: ") + I + "A ");
   Blynk.virtualWrite(V1, I);
   }
   else{
   I=0.00;
   lcd.setCursor(0, 2);
   lcd.print("I: 0.00A ");
   Blynk.virtualWrite(V1, I);
   }
 //-------------------------------------------------------------
   //sensorValue = analogRead(V_pin);
  // voltage = (12.0*sensorValue)/(500.0);                // Voltage detection
  //    voltage    =    (25*sensorValue)/(2900.0);    //2900    for    12v//4095    for    24V//    Voltage    detection        voltage    =
(12.30*sensorValue)/(4095.0);
   int volt = analogRead(V_pin);// read the input
   double voltage = map(volt,0,1478, 0, 24) + offset;// map 0-1023 to 0-2500 and add correction offset
   Serial.println(String("V: ") + voltage + "V ");       // Get Voltage from sensor
   Serial.println(String("sensor_value: ") + volt + "sd");

   if(voltage>1){
     Blynk.virtualWrite(V2, voltage);
     lcd.setCursor(0, 1);
     lcd.print(String("V: ") + voltage + "V ");
   }
   else{
     voltage = 0.00;
     Blynk.virtualWrite(V2, voltage);
```

```
    lcd.setCursor(0, 1);
    lcd.print(String("V: ") + voltage + "V ");
   }
//---------------------------------------------------------------------------
   if(digitalRead(Solar_clean)==LOW){
    Blynk.virtualWrite(V3, "Pannel Cleaning...");

    lcd.setCursor(14, 2);
    lcd.print("Pannel");
    lcd.setCursor(0, 3);
    lcd.print("Cleaning START...");

    digitalWrite(Relay_pin, HIGH);
    delay(3000);
    digitalWrite(Relay_pin, LOW);
    digitalWrite(M1, HIGH);
    digitalWrite(M2, LOW);
    delay(20000);
    digitalWrite(M1, LOW);
    digitalWrite(M2, LOW);

    delay(2000);
    digitalWrite(M1, LOW);
    digitalWrite(M2, HIGH);
    delay(24000);
    digitalWrite(M1, LOW);
    digitalWrite(M2, LOW);
    lcd.setCursor(14, 2);

    lcd.print("Pannel");
    lcd.setCursor(0, 3);
    lcd.print("Cleaning FINISH...");
    delay(3000);
   }
   else{
    digitalWrite(M1, LOW);
    digitalWrite(M2, LOW);
    digitalWrite(Relay_pin, LOW);
    Blynk.virtualWrite(V3, "      ");
    digitalWrite(IOT_clean, HIGH);
    lcd.setCursor(14, 2);
    lcd.print("      ");
    lcd.setCursor(0, 3);

    lcd.print("                ");
   }
   digitalWrite(IOT_clean, HIGH);
 Blynk.run();
}
```

II. RESULTS AND DISCUSSIONS

The result of the system is displayed on the Blynk Application in the form of contains current in amperes, voltage in volts, humidity, temperature, UV radiation and dust density with respect to date and time.The monitoring data sent to the cloud is store in separate fields. Each fields display the individual graphs, the output of the monitoring system obtained in four different cases as shown in the Fig.



III. CONCLUSION

There are numerous advantages from such an undertaking. To start with, practical advantage, where there is no more cash will be paid to a cleaning office. Second, it is efficient, where there is no time will be spent to clean those sunlight based boards. Other than that, much of the time cleaning will guarantee that the sun based board works with a decent transmittance. At last, wellbeing and strength of laborers in destinations. Since robots are fit for working in unsafe situations, more perilous tasks are being taken care of by robots. In this way the security and soundness of laborers is guaranteed, along these lines decreasing uses on wellbeing and medications.

The proposed system introduced a novel approach of automating the task of cleaning the solar panels. Various techniques and approaches have been studied and the disadvantages associated with them are frictional losses, scratches , leakage in encapsulation assembly. The cleaning head used in this project is sponge which avoids frictional losses and proves an efficient daily basis cleaning of solar panels. The sprinkler system ensures optimum use of water thereby reducing water wastage and easy implementation of these systems in areas having water shortage etc. The automated solar panel cleaning system ensures increased efficiency of solar panel systems.

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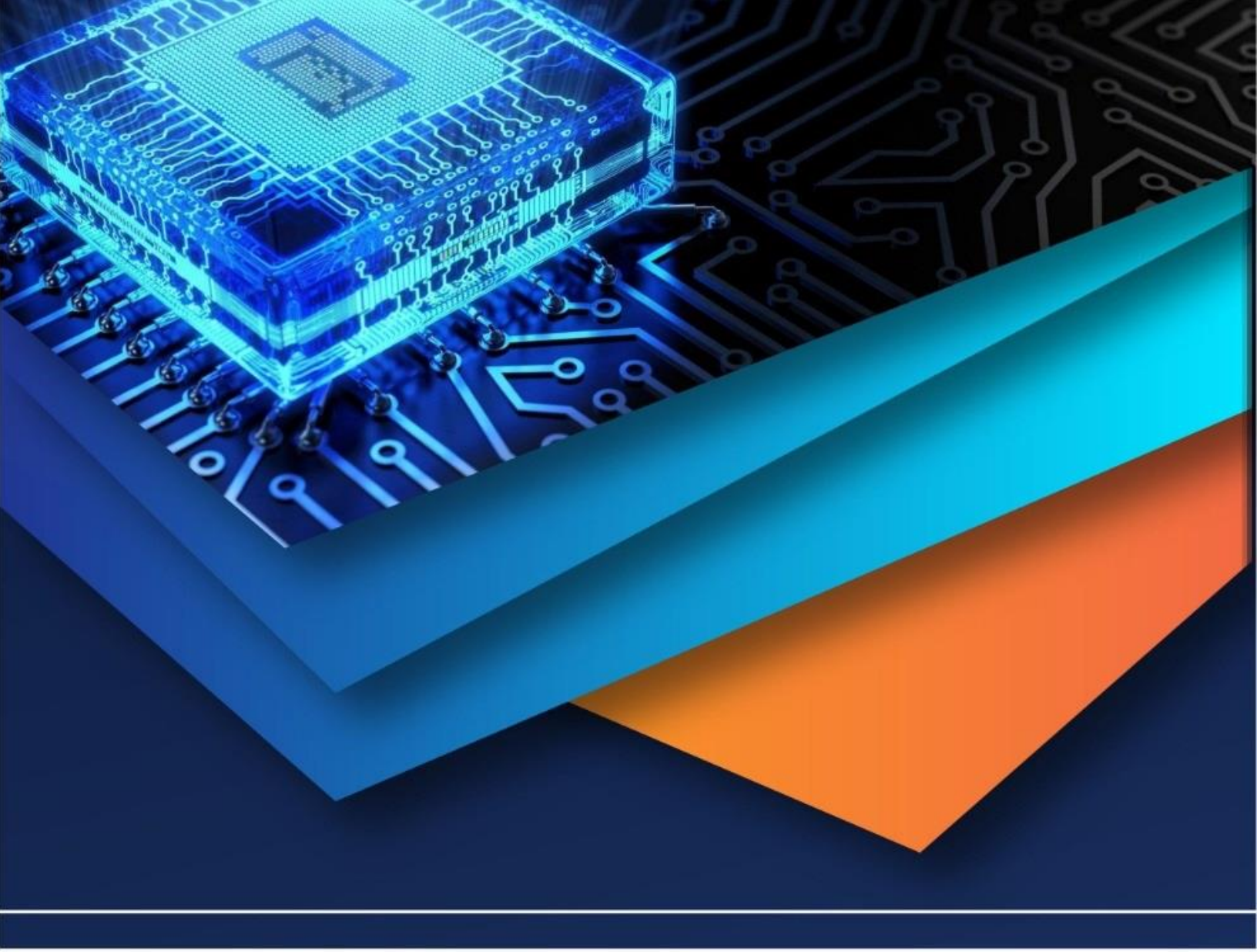

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