SMART DRINKING WATER DISPENSER USING DUAL AXIS SOLAR TRACKER

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ABSTRACT

It might not appear big at the first time, but if your tap dripped a drop of water once every second it would take only about five hours for you to waste one gallon of water, that is enough water for an average human to survive for two days. Also the hardness in changing the water can for usage is also a heck of a job for any physically challenged person, even for a normal person it is hard and may cause any physical pain or injury. So what can be done to stop this? As always the answer, for this, lies with improvement in technology. If we replace all the manual water dispensing method with a smart one that starts and stops on its own automatically not only we can save water but also have a healthier and easier lifestyle since we don't have to operate with any manual contact or neither with our dirty hands. So in this project we build an Smart Drinking Water dispenser using IR sensor that can automatically give you water when a glass is placed near it and stops water flow, when removed. The usage of solar tracking system would increase the efficiency of the electrical energy produced through the solar radiation. The maximum output from solar system increases higher generation which could meet the necessity of demand. It makes a pathway for the renewable energy by not using conventional electrical energy and by using this solar power to operate the automatic drinking water dispenser by using the IR sensor. This system uses the power source from the solar tracking system and thus encouraged. This sounds much innovative and for any small appliances which is being used at houses regularly this becomes a new concept of operation.

Index Terms— *IR sensor, Dual axis solar tracker, Relay switch, water dispenser, silicon tube, Dual axis, Rain sensor, Temperature Sensor, li-ion battery.*

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1 INTRODUCTION

1.1 Background of project:

Nowadays household appliances play a vital role. Based on their usage they are classified into three different categories such as small appliances, major appliances, and consumer electronics.

Consumer electronics are which include electronic gadgets which we use in our regular life such mobile phones and laptops and tablets. Major appliances are which reduce the human manual work which the machine does such as washing machine, dishwasher and etc. Small appliances are devices which does smaller work for the human by reducing our time such as microwave oven, coffee maker, toaster etc. Now we humans tend to invent all types of gadgets, device and appliances reduce the human effort and intend in the evolution of mankind. Thus in the inventive world for creation of devices only few remain in our day to day life for our daily use so we should not only concentrate on inventing new devices but also the inventions should also be useful for our mankind in all aspects. Water saving is a main thing which our generation should concentrate on, efficiently dispensing drinking water technique may also save water in a larger quantity if each individual keeps attention on it.

1.2 Automatic drinking water dispenser using solar tracker:

The water dispenser system using automation through sensor and solar tracker, mainly runs on power source of renewable energy and in this system we incorporated the renewable energy as the solar power. The mode of the solar power obtained through dual axis tracker system. This system act as the energy saver as well as reduces the water consumption. Dispensing the water from a water can (such as 20 liters) in houses for regular usage is

becoming a tough work for an individual human. Lifting a big size water can be difficult task for physically disabled person. This may cause any physical injuries to the humans. The innovation of smart drinking water dispenser will create an easier and safer way to dispense the water using solar dual axis tracker. This concept of this water dispenser will reduces manual work and becomes the development for humans. In this invention of smart drinking water dispenser using dual axis solar tracker, we use the IR sensor as the key for dispensing the water from the drinking water can and this process happens as when the IR sensor detects an object if comes in its path and it stops when the object is removed from its path. This is the ideal way this smart drinking water dispenser is being invented. The IR sensor is being used to detect the object and this detection will indicate the motor to operate when it detects the object and the motor operates which sucks the water from the water can and sends out through the water outlet and then stops the water flow as soon as the object is removed from the IR sensor. We are using dual axis solar tracker this system enables more efficiency than ordinary solar panel. The axis of the solar panel tilts to the axis of the sun by depending on the solar tracking system according to the zenith angle and azimuth angle. The dual axis solar tracker changes its position according to the sun light, as the incident ray from the sun falls on the LDR. Light dependent resistor(LDR) which is present at few optimal position that detects the sunlight and gives the control command to the driver so that tracker change its axis.

1.3 Statement of the problem:

1.3.1 Water dispensing system:

During the study of the project, we got acknowledged to various scenarios, where manual changing of drinking water causes an issue for aged people & physically challenged people to change the 20l drinking water can. Wastage of drinking water is a major problem in urban area which causes large amount of drinking water scarcity.

1.3.2 Dual axis solar tracker:

During the study of the project, we got acknowledged to various scenarios, where the manual shifting of solar panel along the directions of the sun rays is quiet complicated. The directions of the sun rays for every season are up to certain angle. The placing of solar panel is based on zenith, azimuth and elevation angles which makes it tougher.

1.4 Aim and objective of the study:

To reduce the manual work load of dispensing drinking water can for the old and physically challenged people, thus to create an automatic water dispensing method using dual axis solar tracking which lowers the manual contact.

1.5 Scope of the study:

Future is based on 6th generation products which are about to be highly automated and it is based on INTERNET OF THINGS (IOT). We have implemented smart sensing in the drinking water dispenser which draws power source from renewable energy from the dual axis solar tracker. Which can be incorporated in corporate companies, public transports and social gathering areas where usage of similar products is **incorrigible.**

2 WATER DISPENSING SYSTEM

2.1 Automatic water dispensing system

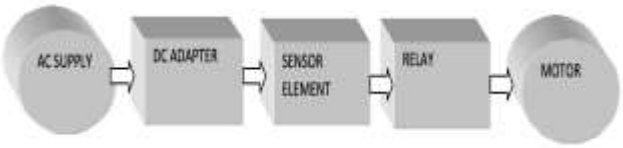


figure-1 circuit diagram

2.2 Diaphragm Pump

A diaphragm pump is a positive displacement pump that uses a combination of the reciprocating action of a rubber , thermoplastic and suitable valves on either side of the diaphragm (check valves, butterfly valves, flap valves, or any other form of shut-off valves) to pump a fluid

There are three main types of diaphragm pumps:

- Those in which the diaphragm is sealed with one side in the fluid to be pumped, and the other in air The diaphragm is flexed, causing the volume of the pump chamber to increase and decrease. A pair of non-return check valves prevent reverse flow of the fluid.
- Those employing volumetric positive displacement where the prime mover of the diaphragm is electro-mechanical, working through a crank or geared motor drive, or purely mechanical, such as with a lever or handle. This method flexes the diaphragm through simple mechanical action, and one side of the diaphragm is open to air.
- Those employing one or more unsealed diaphragms with the fluid to be pumped on both sides. The diaphragm(s) again are flexed, causing the volume to change.

When the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and fluid is drawn into the chamber When the chamber pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is forced out. Finally, the diaphragm moving up once again draws fluid into the chamber, completing the cycle. This action is similar to that of the cylinder in an internal combustion engine Diaphragm Pumps deliver a hermetic seal between the drive mechanism and the compression chamber, allowing the pump to transfer, compress, and evacuate the medium without a lubricant.

An elastomeric diaphragm can be used as a versatile dynamic seal that removes many of the limitations found with other sealing methods. They do not leak, offer little friction, and can be constructed for low pressure sensitivity. With the right material consideration, diaphragms can seal over a wide range of pressures and temperatures without needing lubrication or maintenance.

Characteristics

- Have good suction lift characteristics, some are low pressure pumps with low flow rates; others are capable of higher flow rates, dependent on the effective working diameter of the diaphragm and its stroke length. They can handle sledges and slurries with a relatively high amount of grit and solid content.
- Pump design separates pump fluids from potentially sensitive internal pump parts
- Internal pump parts often within oil, suspended and isolated, to promote pump longevity
- Suitable for abrasive, corrosive solutions
- Suitable for discharge pressure up to 1,200bar
- Have good dry running characteristics.
- Can be used to make artificial hearts.
- Are used to make air pumps for the filters on small fish tank
- Can be up to 97% efficient.

2.3 IR Sensor

This IR motion sensor relay switch circuit is designed for use with all kinds of medium-power automobile/domestic 12V DC loads. It is a simple solid-state relay (SSR) switch, controlled by a standard passive infrared (PIR) motion sensor module. A PIR sensor is an electronic device that can measure IR light radiating from objects in its field-of-view. Apparent motion is detected when an IR source with one temperature (such as a human being) passes in front of an IR source with another temperature (such as a wall). The PIR sensor module, centred on a PIR sensor, has elements made of crystalline material that generates an electric charge when exposed to IR radiation.

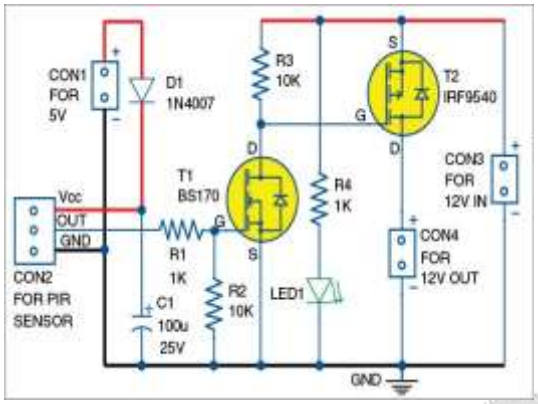


figure-2 IR sensor circuit diagram

2.4 Silicone Tube:

They are typically colourless, oils or rubber-like substances. Silicones are used in sealants, adhesives, lubricants, medicine, cooking utensils, and thermal and electrical insulation. Some common forms include silicone oil, silicone grease, silicone rubber, silicone resin, and silicone caulk.

A general formula for silicones is $(R_2SiO)_x$, where R can be any one of a variety of organic groups. Polysiloxanes are polymers whose backbones consist of alternating atoms of silicon and oxygen.

Silicone doesn't breed bacteria but any dirt or dried blood, or anything else that gets on the silicone cup (bacteria from other locations) provides a layer of non-silicone from which to grow on. Mostly it's because bacteria originating from outside the device will find its way onto the cup.

Silicone rubber is used in automotive applications, many cooking, baking, and food storage products, apparel including undergarments, sportswear, and footwear, electronics, to home repair and hardware, and a host of unseen applications.

2.5 Relay Switch

Relays are the switches which aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit. When the relay contact is open (NO), the relay isn't energizing with the open contact.

A relay is nothing more than a remote switch that uses an electromagnet to close a set of contact points. Relays are often used in circuits to reduce the current that flows through the primary control switch. A relatively low amperage switch, timer, or sensor can be used to turn a much higher capacity relay on and off.

The main difference between Relay and Switch is that the Relay is an electrically operated switch and Switch is an electrical component that can break an electrical circuit. ... Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays.

3 SOLAR TRACKING SYSTEM

3.1 Solar Tracking

In recent decades there is increase in demand for reliable and clean form of electricity derived from renewable energy sources. One such example is solar power. The system will tend to maximize the amount of power absorbed by Photo Voltaic systems. It has been found that making the use of a Dual axis tracking system, over a fixed system, can increase the power output by 40% - 60%. Solar energy systems have emerged as a possible source of renewable energy over the past two or three decades, and are now utilized for a variety of household and industrial applications. Such systems are based on a solar collector, it designed to collect the sun’s energy and to convert it into either electrical power or thermal energy. In general, the power developed in such applications depends upon the amount of solar energy captured by the collector, and thus the difficulty of developing tracking schemes capable

of following the trajectory of the sun throughout the course of the day on a year-round basis has received significant coverage in this system.

3.2 Optimum Fixed Tilt Angle of PV Panels

Solar Angle:
The solar radiation reaching a per square meter in the outer atmosphere is 1367 W/m². However, some of the sun lights falling on the earth are absorbed and reflected back by the atmosphere and the clouds. Some angles form between the sunlight falling on the earth and the surfaces. The position of the sun at different periods is determined by the solar angles. Moreover, solar angles are used to track the movement of the sun in a day. The rotation of the sun varies depending on the latitude and longitude of the location Therefore, the solar angles will be different for the locations at different latitude and longitude during the same period. So, the solar angles must be known to
Determine the position of the sun. Latitude, Declination and Hour Angles The latitude angle(Ø)is the angle forming according to the equator center. The north of the equator is positive and the south of the equator is negative and it varies between ,-90º ≤Ø≤90
The longitude and the latitude angles are used to define the any location on the surface of the earth. Example-Turkey is located at 36º-42º north latitude and at 26º-45ºeast longitude

Declination angle (δ) is the angle between the sun lights and equator plane. Declination angle occur due to 23.45-degree angle between earth's rotational angle and the orbital plane. It is positive at north and varies between -23.45º ≤ δ ≤ 23.45º. Declination angle is at its highest point on 21th June (23.45º) while it is at its lowest point (-23.45º) on 22nd December in winter. Sun lights fall on the equator with steep angle twice a year. This condition is called as equinox. Vernal equinox is on 20 March and autumnal equinox is on 23 September. Daytime and night time durations are equal on equinox dates and the declination angle is 0. where n represents the day of the year.

Zenith, Elevation and Azimuth Angles:
Zenith angle (θz) is the angle between the line to the sun and the vertical axis. The basic solar angles existed on the earth's surface are shown below.

- Zenith angle is 90º during sunrise and sunset whereas it is 0º at noon. Zenith angle is calculated depending on the other angles. $\cos\theta_z = \cos\delta.\cos\phi.\cos\omega + \sin\delta.\sin\phi$
- Solar elevation angle (α) is the angle between the line to the sun and the horizontal plane. This angle is the complement of the zenith angle 90º. Elevation angle is calculated by the following equation.90 α θ = − z
- Solar azimuth angle (γs) is the angle between the north or south position of the sun and the direct solar radiation. This angle is assumed to be (-) from south to east and to be (+) from south to west. (γs) is 180º at noon. Azimuth angle is calculated by the following equation.
-
- Incidence and Tilt Angles
  Incidence angle (θ) is the angle between the radiation falling on the surface directly and the normal of that surface. If incidence angle is steep to the sun lights, it is (θ=0º). On the other hand if this angle is parallel to the sun lights, it is (θ=90º). The incidence and tilt angles are shown below.

- Tilt angle (β) is the angle between the panels and the horizontal plane. This angle is south oriented in the Northern Hemisphere and north oriented in the Southern Hemisphere. Tilt angle varies between 0º ≤ β ≤ 180º. When a plane is rotated about horizontal east-west axis with a single daily adjustment, the tilt angle of the surface will be fixed for each day and is calculated by the following equation.

$$\gamma_s = \cos^{-1}\left[\left(\sin(\alpha).\sin(\phi) - \sin(\delta)\right)/\cos(\alpha).\cos(\phi)\right]$$

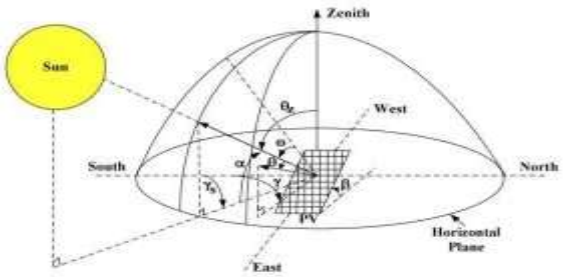


figure-3 Zenith and Azimuth angle.

3.3 Efficiency Based On Tilt Angle

Latitude	Full year angle	Avg. insolation on panel	% of optimum
0° (Quito)	0.0	6.5	72%
5° (Bogotá)	4.4	6.5	72%
10° (Caracas)	8.7	6.5	72%
15° (Dakar)	13.1	6.4	72%
20° (Mérida)	17.4	6.3	72%
25° (Key West, Taipei)	22.1	6.2	72%
30° (Houston, Cairo)	25.9	6.1	71%
35° (Albuquerque, Tokyo)	29.7	6.0	71%
40° (Denver, Madrid)	33.5	5.7	71%
45° (Minneapolis, Milano)	37.3	5.4	71%
50° (Winnipeg, Prague)	41.1	5.1	70%

Table -1 Efficient angle at different cities.

	Northern hemisphere	Southern hemisphere
Adjust to summer angle on	April 18	October 18
Adjust to autumn angle on	August 22	February 21
Adjust to winter angle on	October 5	April 6
Adjust to spring angle on	March 5	September 4

Table-2 Efficient time to change angle.

	Fixed	Adj. 2 seasons	Adj. 4 seasons	2-axis tracker
% of optimum	71.1%	75.2%	75.7%	100%

Table-3 Efficiency based on Tilt.

3.3 Arduino, Rain sensor, Temperature sensor

Aurdino

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing).

Rain sensor

The module is based on the LM393 op amp. It includes the electronics module and a printed circuit board that

"collects" the rain drops. As rain drops are collected on the circuit board, they create paths of parallel resistance that

are measured via the op amp.

The sensor is a resistive dipole that shows less resistance when wet and more resistance when dry rain drop on board it increases the Resistance so we get high voltage according to V=IR.

Temperature sensor

In general, a temperature sensor is a device which is designed specifically to measure the hotness or coldness of an object. LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). With LM35, the temperature can be measured more accurately than with a thermistor.

3.4 Dual axis Tracking

Dual axis trackers have two degrees of freedom that acts as axes of rotation. The axes are typically normal to one another. Dual axis trackers allow for optimum solar energy levels due to their ability to follow the sun horizontally and vertically. Here we have divided sun position into five areas those are EAST, WEST, NORTH, SOUTH, CENTER. It has been found that making the use of a Dual axis tracking system, over a fixed system, can increase the power output by 40% - 60% it designed to collect the sun's energy and to convert it into either electrical power or thermal energy. In general, the power developed in such applications depends upon the amount of solar energy captured by the collector, and thus the difficulty of developing tracking schemes capable of following the trajectory of the sun throughout the course of the day on a year-round basis has received significant coverage in this system

TRACKING PRINCIPLE:

Many other methods have been proposed and used to trace the position of the sun. The simplest of all uses an LDR – a Light Dependent Resistor use to detect light intensity changes on the surface of the resistor. The proper and efficient use of LDR reduces the overall cost as well. The resistivity of LDR decreases significantly with increasing illumination. Figure shows the general resistivity vs. illumination plot of an LDR.

4 PROPOSED PRODUCT

3D-Modelling

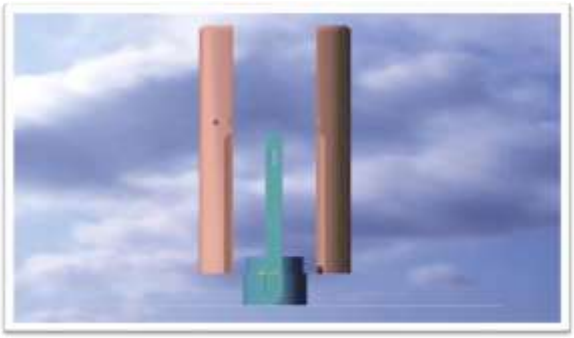
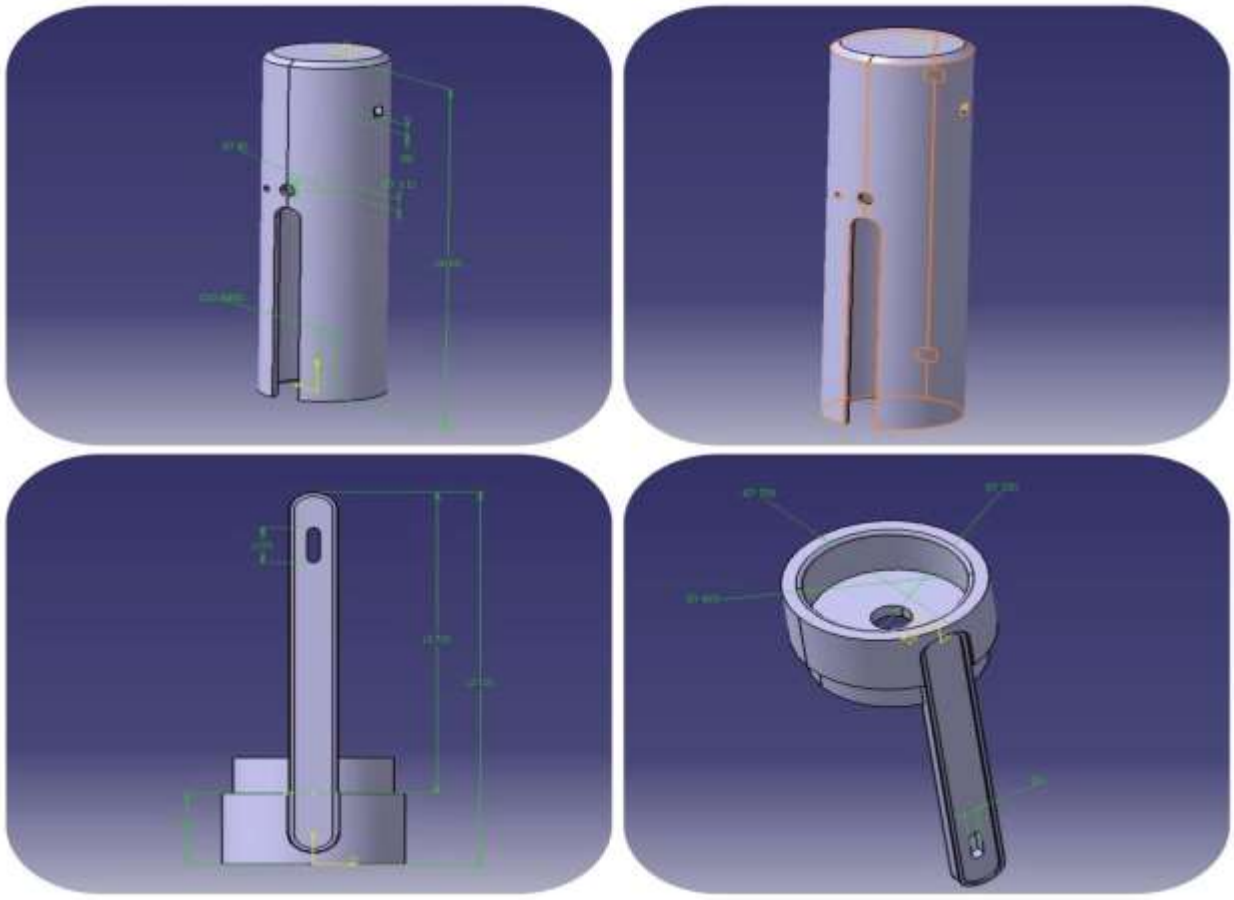


Figure-4.1

Consider the outer structure into 3 main parts, part A, part B, and part C, in these part A and part B are similar to each which looks like the opposite replica of each other also with switching holes and LED holes drilled on only one part. The part C in the bottom part which is to be seated on the drinking water can also that is the key structure to combine the part A and part B into a final shape of cylinder.Figure-4.2



The entire outer structural model is made out of PLA- Polylatic acid, this comes under thermo plastics which is used to create external structures in 3d printing. this PLA's melting point is of 173 degree Celsius and the glass transition temperature is at 60 degree Celsius and these types of plastics are

biodegradable only under certain conditions. this type of plastic is best suits for prototype model of structure keeping this as a key structure many other regular plastic mould can be made.

Aurdino code

```
#include <Servo.h>
//Initialize variables
int mode = 0;
int buttonState = 0;
int prevButtonState = 0;
int topLeftLight = 0;
int topRightLight = 0;
int bottomLeftLight = 0;
int bottomRightLight = 0;
int LeftLight = 0;
int RightLight = 0;
int TopLight = 0;
int BottomLight = 0;
//Declare two servos
Servo servo_9;
Servo servo_10;

void setup()
{
  pinMode(7, INPUT);    //Mode Button
  pinMode(12, OUTPUT);  //Led indicator for manual mode
  pinMode(11, OUTPUT);  //Led indicator for auto mode
  pinMode(A0, INPUT);   //Potentiometer for right-left movement
  pinMode(A1, INPUT);   //Potentiometer for up-down movement
  pinMode(A2, INPUT);   //Light sensor up - left
  pinMode(A3, INPUT);   //Light sensor up - right
  pinMode(A4, INPUT);   //Light sensor bottom - left
  pinMode(A5, INPUT);   //Light sensor bottom - right
  servo_9.attach(9);    //Servo motor right - left movement
  servo_10.attach(10);  //Servo motor up - down movement
}

void loop()
{
  buttonState = digitalRead(7);
  if (buttonState != prevButtonState) {
    if (buttonState == HIGH) {
      //Change mode and ligh up the correct indicator
      if (mode == 1) {
        mode = 0;
        digitalWrite(12, HIGH);
        digitalWrite(11, LOW);
      } else {
        mode = 1;
        digitalWrite(11, HIGH);
```

```
        digitalWrite(12, LOW);
      }
    }
  }
  prevButtonState = buttonState;
  delay(50); // Wait for 50 millisecond(s)
  if (mode == 0) {
    //If mode is manual map the pot values to degrees of rotation
    servo_9.write(map(analogRead(A0), 0, 1023, 0, 180));
    servo_10.write(map(analogRead(A1), 0, 1023, 0, 180));
  } else {
    //if mode is auto map the sensor values to 0-100 ligh intensity.
    //Every light sensor has different sensitivity and must be first tested
    //for it's high and low values
    topLeftLight = map(analogRead(A2),50,980,0,100);
    topRightLight = map(analogRead(A3),200,990,0,100);
    bottomLeftLight = map(analogRead(A4),170,970,0,100);
    bottomRightLight = map(analogRead(A5),250,1000,0,100);
    //Calculate the average light conditions
    TopLight = ((topRightLight + topLeftLight) / 2);
    BottomLight = ((bottomRightLight + bottomLeftLight) / 2);
    LeftLight = ((topLeftLight + bottomLeftLight) / 2);
    RightLight = ((topRightLight + bottomRightLight) / 2);
    //Rotate the servos if needed
    if (abs((RightLight - LeftLight)) > 4) {    //Change position only if light difference is bigger then 4%
      if (RightLight < LeftLight) {
        if (servo_9.read() < 180) {
          servo_9.write((servo_9.read() + 1));
        }
      }
      if (RightLight > LeftLight) {
        if (servo_9.read() > 0) {
          servo_9.write((servo_9.read() - 1));
        }
      }
    }
    if (abs((TopLight - BottomLight)) > 4) {  //Change position only if light difference is bigger then 4%
      if (TopLight < BottomLight) {
        if (servo_10.read() < 180) {
          servo_10.write((servo_10.read() - 1));
        }
      }
      if (TopLight > BottomLight) {
        if (servo_10.read() > 0) {
          servo_10.write((servo_10.read() + 1));
        }
      }
    }
  }
}
```

Rain sensor code

```
const int sensorMin = 0;
const int sensorMax = 1024;
void setup()
{
    Serial.begin(9600);
}
void loop()
{
    int sensorReading = analogRead(A0);
    int range = map(sensorReading,
    sensorMin, sensorMax, 0, 3);

    switch (range)
    {
        case 0:
          Serial.println("RAINING");
          break;
        case 1:
          Serial.println("RAIN WARNING");
          break;
        case 2:
          Serial.println("NOTRAINING");
          break;
     }delay(1000); }
```

Temperature sensor code

```
float temp;
int tempPin = 0;
```

```
void setup() {
  Serial.begin(9600);
}

void loop() {
  temp = analogRead(tempPin);
  // read analog volt from sensor and save to variable temp
  temp = temp * 0.48828125;
  // convert the analog volt to its temperature equivalent
  Serial.print("TEMPERATURE = ");
  Serial.print(temp); // display temperature value
  Serial.print("*C");
  Serial.println();
  delay(1000); // update sensor reading each one second
}
```

5 CONCLUSION

After completion of the proposed product in 3-d structure and in circuit preparation we created the product we had planned. We came to acknowledge a lot factors and disturbances which was an obstruction for the solar energy production for the battery to charge for the smart drinking water to work.

We still obtained an efficiency of 80% of what we actually planned in theory, the water dispenser worked for a continuously for 70 mins which is for 5 cans of 20 liter water. We in theory calculated for 7 cans of 20-liter water in 90 mins time. The battery employed in this for the motor operation 12v, 1.3amp lithium-ion battery which is rechargeable in about 40mins in 230v, whereas when charged using solar energy through solar panel it takes more than four times that time for about 180mins to get fully charged. The execution of auto cutoff after full charge operates in time perfectly after each charge.

Figure-5.1 complete image of smart drinking water dispenser with solar tracker.

The Figure-5.1 shows the entire project which is ready to use as a product. In this you can see the entire 3-d built structure of the water dispenser and the dual axis solar tracker along with its circuits, rain sensor, temperature sensor and the main Arduino. The servo motor for the solar tracker is below the solar panel movable grid.

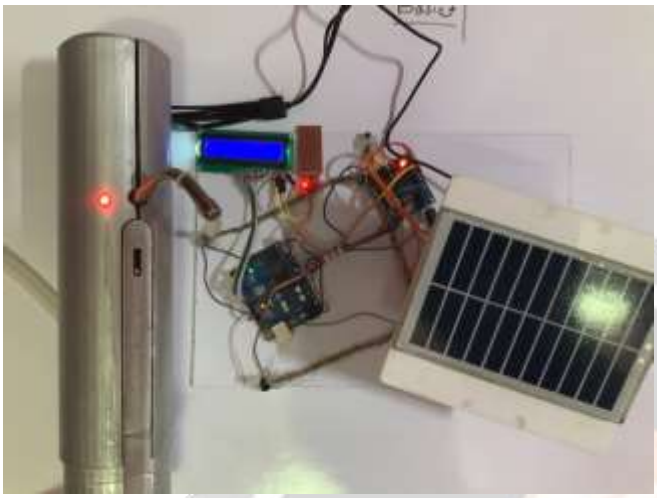


Figure-5.2 charging of smart drinking water dispenser using solar energy.

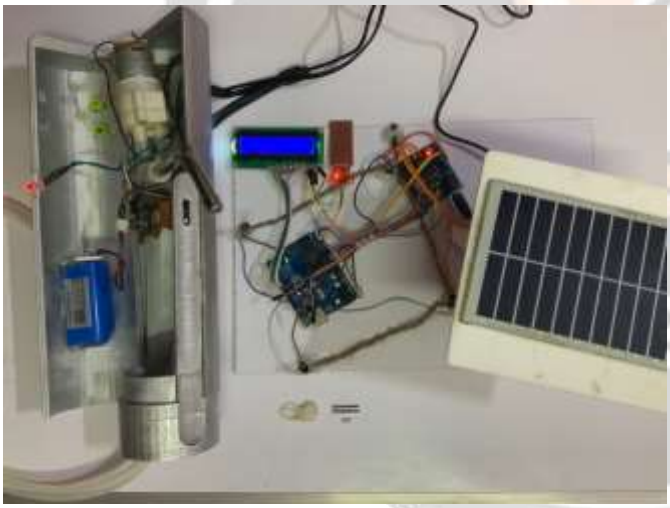


Figure-5.3 inside of smart drinking water dispenser.

The figure 5.2 shows the charging of the smart drinking water dispenser through the dual axis solar tracker. The solar panel which is at the top of the tracker grid turns its directions of axis along the way of higher light. Also the temperature sensor and rain sensor is active at the time of charging and solar tracker display shows its output.

In the figure 5.3 we can see the dissected view of the smart drinking water dispense. Inside which the water dispensing motor, 12v li-ion battery, air sensor, relay circuit along with switch is visible.

Figure-5.4 Smart water dispensing system.

The figure 5.4 shows the ready to go view, in which the dispenser is on top of an 20 liter water can. The IR sensor at the front can be seen. There is also an mesh at the end tip of the stainless steel valve through which the drinking water passes.

Figure-5.5 Dispensing water

The figure -5.5 shows a person collecting a glass of water without any contact. And the smart water dispenser stops pouring water when the glass is removed which is quick and doesn't spill even a drop of water which is perfection. The IR sensor is aligned to a certain zone this it detects the glass which comes under its range.

When the project started as an experimental work we did not know the production cost expenditure, as work went on we corroborated ourselves in the work, the first 3-d structure was a failure due to measurement fault the hardware produced was waste. Then by using professional measurement equipment the structure produced second time was in exact as calculated. Glass which is to be placed in front of IR sensor was not coherent thus acrylic was used in its place. At each stage of process, the experiments altered the project in a better way.

This can be made in large production for at a nominal price for large quantities and can be employed everywhere. This smart drinking water dispenser is to be a technology which will be used in each houses, offices and public places when reaches people properly and this simple concept can be made for every custom requirement if for large tank of water with multiple access point automated with IR sensor and power sourced through solar energy. …

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