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Concept and Development of Sun Tracking Floating Solar Unit for Small Water Bodies

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Abstract: *The analysis of the performance of photovoltaic (PV) installations mounted on a floating platform is to be performed. Different design solutions for increasing the efficiency and cost effectiveness of floating photovoltaic (FPV) plants are been discussed. Specifically, FPV solutions that exploit the advantages of additional features such as tracking, cooling and concentration will be presented. The results of experimental tests to be conducted and they will show considerable increase in efficiency due to the positive tracking and cooling effects. Deployment of photovoltaic systems on water bodies unlocks enormous areas in populated regions. Also, their utilization will create the possibility to increase the share of photovoltaics systems related to the energy transition. There is little information regarding the available data for floating photovoltaic systems (FPVS). The positive effect of water on cooling the photovoltaic modules shall be considered, also. This study will be performed by utilizing experimental data from a field test located in a region having hot semi-arid climate*

Keywords: Solar Unit

I. INTRODUCTION

The issues of land shortage and the growing public concern regarding the natural land conservation represents an incentive to find alternative locations for installing Floating Photovoltaic (FPV) systems. FPV systems avoid the utilization of considerable land areas, which is a main characteristic of ground mounted photovoltaic systems. Also, they avoid the escalation of the land price and improve the main performance parameters of the system. Taking a look at the present scenario it is evident that conventional sources of energy such as coal, natural gas, oil, etc. are at the edge of extinction. Being in mortal combat with time itself to fulfil every demand for energy the demand for these resources for energy has escalated to its zenith. The conventional use of energies due to the burning of fossil fuels like coal, oil and natural gas, the whole environment is getting polluted. The present project, therefore, is orchestrated with components like LDR module, DC Motor, Photovoltaic array etc. according to which while the functioning of, unlike other use of the conventional energies, would not emit any pollution and in turn act as a reservoir of energy taken from the Sun itself. In the world of pollution, this system is an eco-friendly alternative, hence a valuable asset. When the ocean of pollution is encumbering every corner of life, this system would be able to create ripples of hope in the midst of this bustling civilization. The survivability of this system lies upon its workability. In the trend of comparison with other mind- boggling systems, it could be a trailblazer.

1.1 Objectives

- Design optimization of floating solar farm.
- Development of floating solar prototype.
- Avoiding land cost.
- Concept and development of sun training floating solar unit for small water bodies.
- Preservation of underwater eco-system.

II. LITERATURE SURVEY

"A Review Paper on Solar Tracking System for Photovoltaic Power Plan" by Bhagwan Deen Verma
According to this paper the use of solar trackers will certainly increase the efficiency of SPV systems but proper care is required while installing solar trackers with these systems. Problems such as failure of solar tracker also need equal

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attention while installing them. Whether to install active or passive solar trackers is also a question which needs to be explored further. This study also tried to analyze all the important factors which are required for the optimization of solar trackers.

"Review on sun tracking technology in solar PV system" by Anshul Awasthi, Akash Kumar Shukla, Murali Manohar
According to this paper advancements in the work of the solar tracking systems in the world and it emphasizes on the performance analysis of dual axis solar tracking systems equipped with different designs and techniques which have been evolved in recent years. Some conclusions drawn are stated below–
Dual axis solar tracking systems generally prove to be more efficient than single axis and fixed counterparts. These systems also demand maintenance due to the presence of rotating components.
These systems contain more complex design and control mechanism.
The performance of the solar system depends on many physical factors and so does the choice of use of tracking.

Floating solar photovoltaic systems by IEEE
In this paper, some of the floating PV plants installed in India are reviewed. Feasibility of installing 1 MW floating PV plant each at Kota barrage and Kishore Sagar Lake in Kota, Rajasthan are also presented. Energy that could be produced by the two plants along with amount of water saved from evaporation and reduction in CO_2 emissions are also calculated in this paper. 1 MW floating plant at Kota barrage could produce 18,38,519 kWh energy per year and could save 37 million liters of water and can reduce about 1,714 tons of CO_2 emissions annually. 1 MW floating plant at Kishore Sagar Lake could produce 18,58,959 kWh electrical energy per year and could save 37 million liters of water and can reduce about 1,733 tons of CO_2 emissions annually

A Review on Floating Solar Photovoltaic Power Plants by Sujay Patil Desai
The review presented in this paper shows the timeline of concepts and floating solar PV projects that have been established to date. These systems were either constructed for research purposes or for commercial use. All grid connected systems are kept afloat using pontoons or floats with panels rigidly connected to these floats.

III. METHODOLOGY

The concept of generating electrical power from solar has gained increasing importance in recent times, owing to the surge in power demand. The basic working principle of this project is centered around theLDR sensor, which sense the light and change its resistance accordingly. To implement this, LDR's are adjusted above and solar plate. In this setup, when lights fall on LDR which is connected to Arduino which is accordingly programmed converts the change in resistance of LDR values into equivalent servo motor movement in order to make the LDR output values same. Overall, this solar tracking arrangement provides a sustainable solution to the increasing demand for electrical power, while simultaneously reducing the carbon footprint. By harnessing solar energy and converting it into electrical energy, we can contribute towards a greener and more sustainable future.

3.1 Components Used

- Solar panel
- Servo motors
- Arduino
- LDR
- PVC sheet
- Various load distributing elements

3.2 Working

```
#include <Servo.h>
// Set the pins for the servo motors
```

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```
int servo1Pin = 8;  // First servo motor (x-axis) int servo2Pin = 9; // Second servo motor (y-axis)
//setting directions for moment for open loop servo motor int acw = 100;            // anti clockwise moment of motor
int cw = 80;                  // cloclwise moment of motor int pa = 90;      // pause the moment

// setting directions for moment for closed loop servo motor int n = 0; //initial condition for the closed loop motor
// Set the LDR sensor pins
int LTPin = A0; // First LDR sensor (top)
int RTPin = A1; // Second LDR sensor (bottom) int LBPin = A2; // Third LDR sensor (left)
int RBPin = A3; // Fourth LDR sensor (right)

String ltstring = "LT = "; //string i.e sentence to write. String rtstring = "RT = ";
String lbstring = "LB = "; String rbstring = "RB = ";

// Create servo objects for the motors
Servo servoh;      //initialing the horizontally placed servo motor Servo servov;   //initialing the vertically placed servo
motor

void setup() {
// Set the servo pins as outputs Serial.begin(9600);
pinMode(servo1Pin, OUTPUT);                 //assign motor to pin8 pinMode(servo2Pin, OUTPUT);
//assign motor to pin9 pinMode(LTPin, INPUT);        //input of the ldrs pinMode(RTPin, INPUT);
pinMode(LBPin, INPUT); pinMode(RBPin, INPUT);
// Attach the servos to their pins servoh.attach(servo1Pin); servov.attach(servo2Pin);
}

void loop() {
// Read the LDR sensor values
int UValue = (analogRead(LTPin) / 100); int LValue = (analogRead(RTPin) / 100); int RValue = (analogRead(LBPin) /
100); int DValue = (analogRead(RBPin) / 100);
// creating the strings to take and check output of the ldrs Serial.print(ltstring);
Serial.print(analogRead(LTPin));       Serial.print(rtstring);       Serial.print(analogRead(RTPin));       Serial.print(lbstring);
Serial.print(analogRead(LBPin)); Serial.print(rbstring); Serial.println(analogRead(RBPin));
// control the open loop motor if (UValue > DValue) { servov.write(acw);
} else if (UValue < DValue) { servov.write(cw);
} else if (UValue = DValue) { servov.write(pa);
}
// control the closed loop motor
if (LValue > RValue) { servoh.write(n+=2);
} else if (LValue < RValue) { servoh.write(n-=2);
} else if (LValue = RValue) { servoh.write(n);
}
delay(500);
//delay(1000);
}
```

IV. ADVANTAGES

- Totally Avoiding the cost of land.
- Increased efficiency over traditional solar arrangements
- Decreasing the rate of evaporation in water bodies.

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- Reduction in carbon footprints.

V. DISADVANTAGES

- Challenges in adopting the new technology.
- High initial cost.
- Maintenance is high.

VI. FUTURE SCOPE

This Project can be further employed by using thin film solar panels to achieve higher efficiency

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