SOLACE : A DUAL-AXIS SOLAR TRACKER WITH WEATHER MONITORING STATION

GROUP NO. 6 : MECHANICAL ENGINEERING (Section-A)

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PROJECT GOALS & OBJECTIVES

- To optimize the performance of a solar PV system through continuous tracking of the position of the sun and simultaneously adjusting the orientation of the panels to ensure maximum capture of solar radiation.
- To monitor weather conditions such as temperature, humidity and rainfall which ensures longevity of the system thereby significantly reducing maintenance costs
- To creates awareness and promote sustainability by encouraging the use of solar energy

WORKING PRINCIPLE & OPERATING MECHANISM

- Based on principle of maximum power point tracking (MPPT)
- Solar radiation is detected by LDRs which relays analog signals to the Arduino which is then converted to digital signals and processed by the Arduino program.
- The processed data controls servo motors that adjust the direction of the solar panel.
- The DHT11 sensor and rainfall sensor are connected to the Arduino using the I2C module for data communication which can be then visualized via an Arduino algorithm and Matplotlib.

CHALLENGES FACED BY CONVENTIONAL PANELS

- Limited efficiency leading to reduced energy output
- Fixed orientation leading to potential shading issues
- Prone to damage under extreme-weather conditions
- Space-consuming which increases installation expenses

METHODOLOGY

- Ideation & Design
- Assembly-Mechanical & Electrical
- Development of Arduino Programs & Algorithms
- Data Logging & Visualization
- Testing & Calibration

HOW DOES THIS PROJECT ADDRESS THESE CHALLENGES?

- Ensures that the incident solar radiation is always perpendicular to the panel thereby increasing output.
- Follows the position of the sun continuously reducing chances of shading or obstacles.
- Real-time weather monitor alerts the user regarding extreme weather thereby triggering shutdown of system.
- Higher energy density than conventional panels.

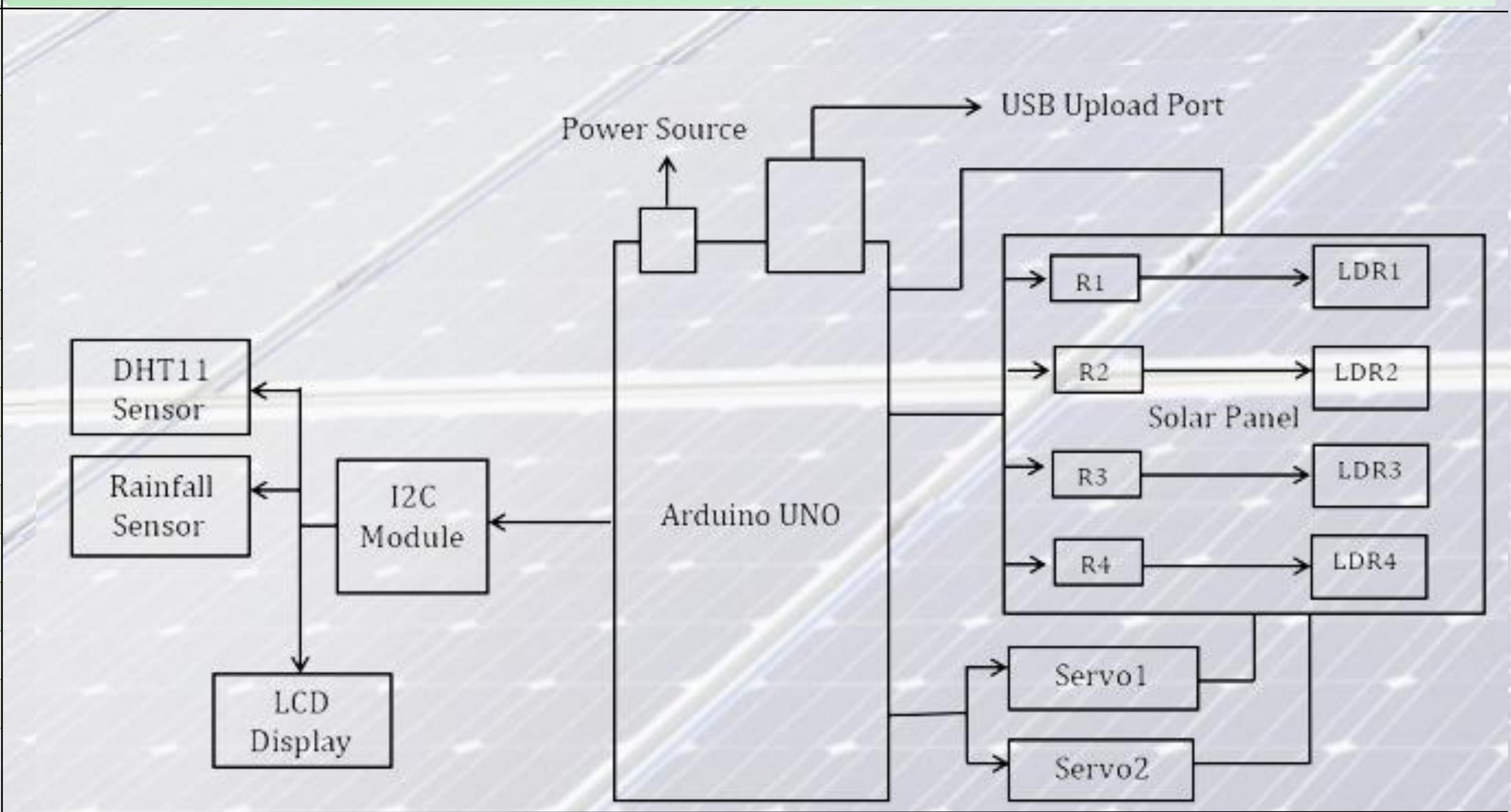
TIMEFRAME OF PROJECT

- Planning and Research: 7-8 days
- Hardware Assembly: 5-6 days
- Program Development: 1 day
- Testing and Debugging: 1 day
- Documentation and Finalization: 2-3 days

BUDGET & COST BREAKDOWN

Items	Quantity	Cost per item (INR)	Total cost (INR)
LDR	4	7.5	30
Arduino UNO R3	1	650	650
10 kΩ Resistor	4	10	40
Servo Motor	2	150	300
Solar Cell	1	120	120
DHT11 sensor	1	110	110
I2C Module	1	125	125
16x2 LCD Screen	1	155	155
Jumper Wires	1 set	250	250
Basic Tools	-	350	350
Foamboard	5	40	200
Other Expenses	-	500	500
Grand Total			**~2830**

SCHEMATIC BLOCK DIAGRAM



CONCLUSION & RESULTS

- Enhancing of overall energy output
- Improving the reliability on solar energy
- Promising a sustainable future
- Higher Return on Investment (ROI)
- Utilizing and allocating energy resources optimally
- Adaptability to diverse locations