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Real Time Monitoring of Humidity and Temperature Effects on Pv Cells with Data Logger System

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Abstract: ***Today the world is focused in harnessing non-conventional sources of energy to cater the energy needs of the world's growing population. Solar energy is one such renewable energy source with great potential to be the present and future energy source. Solar cells or PV cells are used to harness sun's energy and change it into electricity. These solar cells work on the principle of photovoltaic, conversion of sunlight into electricity. Solar cells working is affected by various atmospheric factors like temperature, humidity, windspeed etc. This project uses a data logger chip embedded with the mobile phone to monitor the solar voltages continuously, the output of the pv panels can be saved and analyzed to determine optimum working conditions of the solar panel. The temperature factor affects the flow of electric current by the variation in the velocity of electrons flow. Humidity is also another governing factor that effect the working conditions of pv cell. Water vapour and air are at the same temperature in the atmosphere. The more the water vapour held in the air the temperature is affected. The warm air holds more water than cool air, thus affecting the efficiency of pv cells. Solar cells provide maximum efficiency ie optimum output power under certain atmospheric conditions like temperature and humidity and this is the designing aspect of pv cells.***
Keywords: pv cells, humidity, temperature, data logger, energy

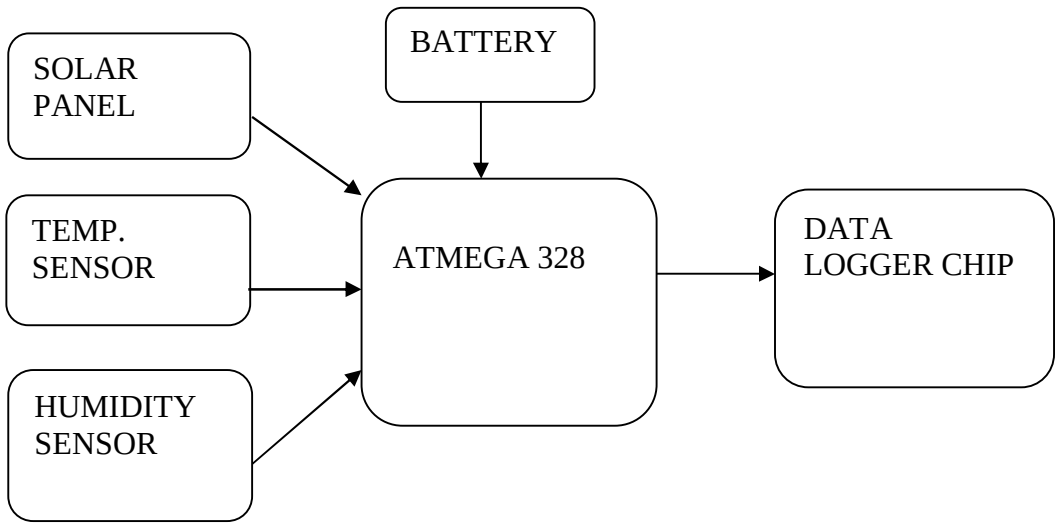
I. INTRODUCTION

Solar energy is one of the most abundant forms of energy present on Earth whose efficient utilization can reduce the burden of the fossil fuels. Solar energy is pollution free thus it has no negative effect on the solar system.

Photovoltaic cells or solar cells are used to convert sun's heat and light into electricity. Solar cells work on the principle of photoelectric effect. The photovoltaic cells are made of semiconductor materials like Silicion. These semiconductor materials emit electrons when hit by the solar light consisting of protons. These free electrons when captured result into electricity.

Climate changes affect the working of Solar panels be it atmospheric temperature, humidity, wind speed etc. The designing aspect of solar panels thus play a great role in providing optimum output power and also provide ways to improve the factors dependent efficiency of solar panels. Thus this project helps in the analysis of the atmospheric factors like temperature and humidity. The project uses humidity and temperature sensor, atmega 328 and data logger chip for analysis purpose.

Block Diagram



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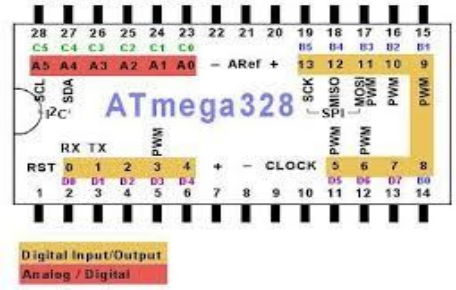
II. TECHNICAL DESCRPITION

ATMEGA 328 is a single-chip microcontroller created by Atmel in the megaAVR family. It is the main controlling unit of the system. ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed.

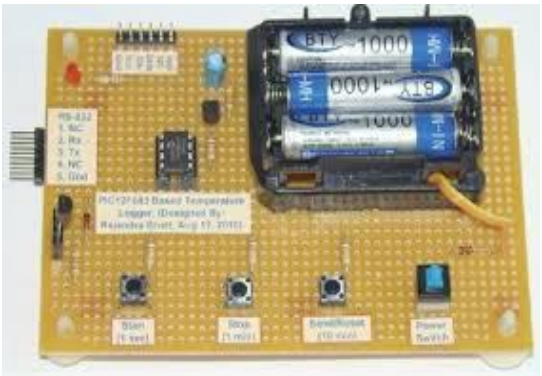


Temperature Sensors measure the amount of heat energy or even coldness that is generated by an object or system, allowing us to sense or detect any physical change to that temperature producing either an analogue or digital output. There are many different types of Temperature Sensor available and all have different characteristics depending upon their actual application.

Temperature and humidity sensors are usually designed in two major variations. In one, the sensor acts as a trigger or a switch when a certain level of temperature or humidity is reached, then the sensor is triggered and a specific circuit is activated. Other more complex versions are used to measure the actual momentary temperature or humidity in the ambient air.

A simple temperature sensor relies on the metallic expansion principles of thermodynamics. As the temperature changes, the metal bends until contact is made or removed from a switching mechanism. This would imply the desired temperature has been reached. More complex temperature sensors, especially for electronic circuits, rely on the voltage drop across a transistor to determine the current temperature. Since the voltage delta of transistor devices is well known as a factor of temperature, it is very easy to determine what the temperature is by measuring base to emitter voltage. Humidity sensors usually also have a way of measuring the temperature in the air since humidity is the relation of moisture in the air to the current air temperature. Humidity sensors typically rely on a capacitor to determine moisture content. The dielectric element between the two capacitive plates can collect water molecules and have the k-value adjusted according to a known pattern. This affects the voltage in a way that can be sensed and reported.

A data logger is a device that records measurements over time. The measurements could be any physical variable like temperature, pressure, voltage, humidity, etc. This project describes how to build a mini logger that records surrounding temperature values.



III. RESULT AND CONSLUSIONS

Temperature and humidity are the governing factors that have been discussed in this paper. The power output of pv cells change with temperature fluctuations. As the temperature increases, the pv cell output voltage decreases. Similarly the humidity also governs the performance of the pv cells. When humidity is high the power output decreases. Sufficiently high humid weather of a region can affect about 0.15-0.30 factor of power output. Thus increases of both factors of atmosphere, temperature and humidity decreases the efficiency of solar panel. Here comes in the designing parameters of pv cells , panels and modules in a manner to lessen the atmospheric variations and for the purpose of providing maximum efficiency.

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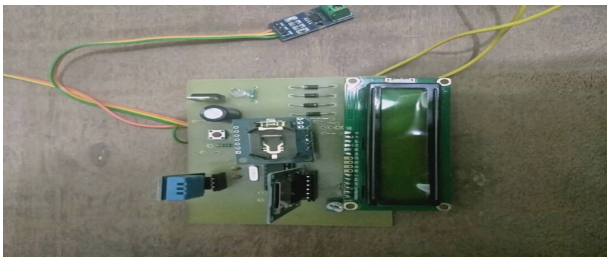
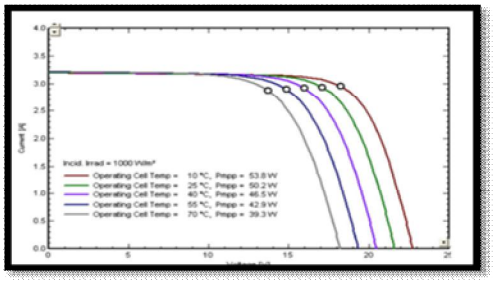
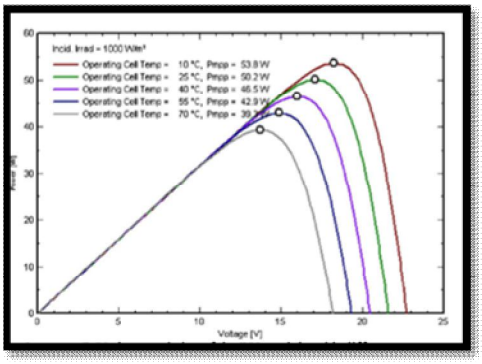


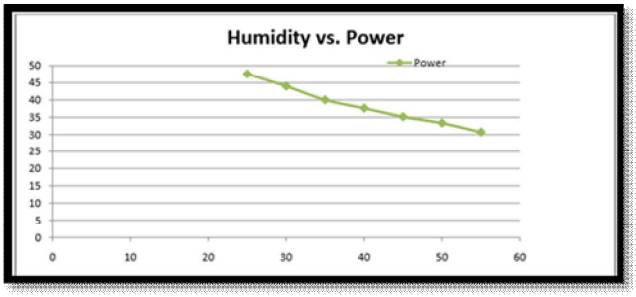
A. *A varied temperature, pv cell O/P Current- Voltage characteristic.*



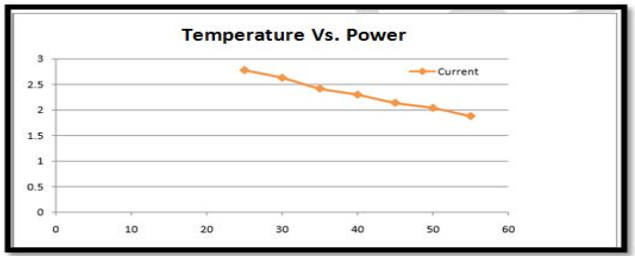
B. *Output Power- Voltage graph*



C. *Relation between humidity and output power*



D. *Relation between temperature and output power*



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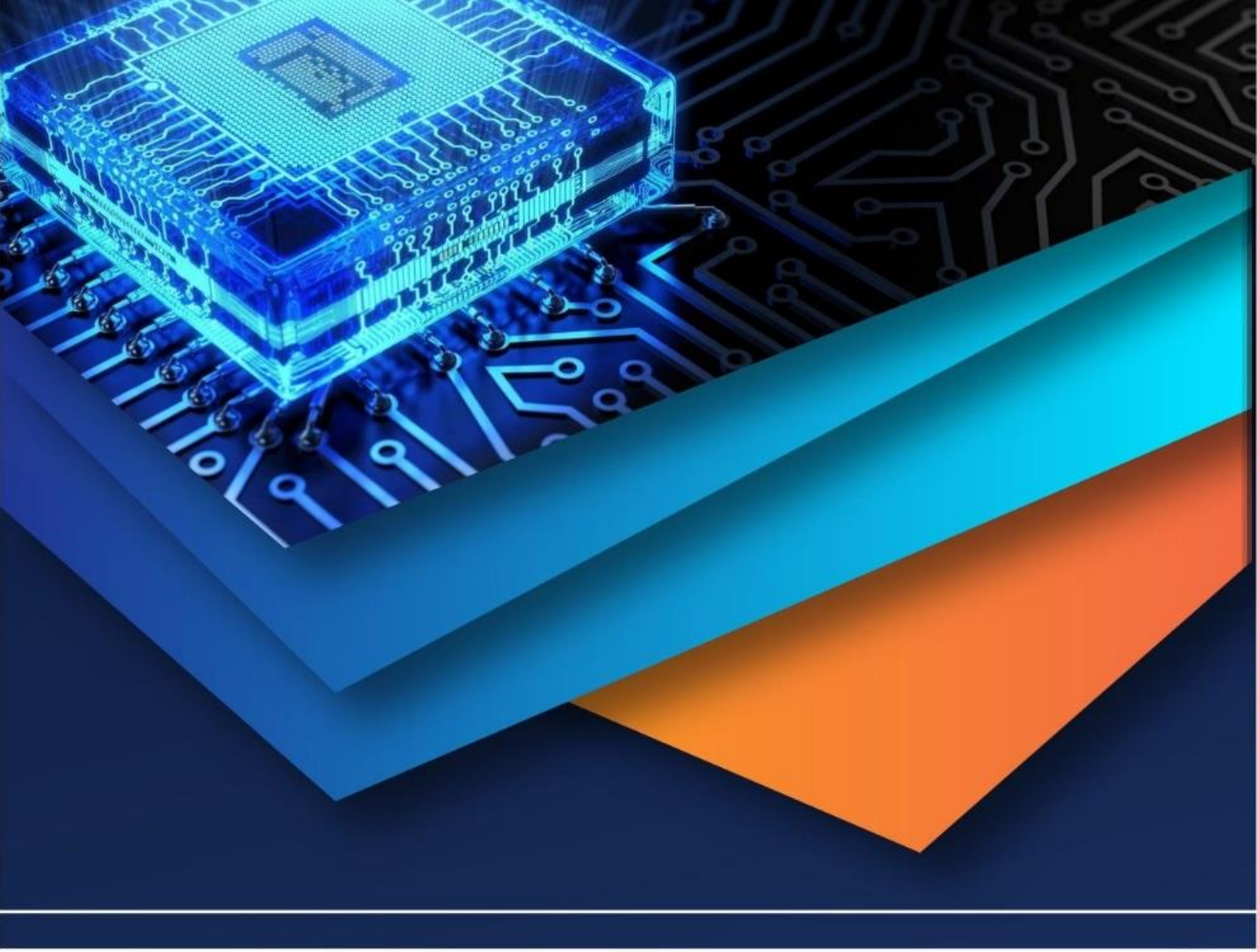

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