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POWER UTILIZATION FOR TRAIN COMPARTMENTS USING MICRO WINDMILL AND SOLAR SYSTEM TRACKING

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Abstract— In train, electrical system is working on battery based electrical network. The charging to the battery is vital task in the electrical system. Normally there is charging generator is available but not enough to meet this requirement. So here we are going to generate non-conventional power from solar and micro wind generation. They are also equipped with tracking system based on the light intensity and wind direction. Solar panel and wind mill are tracked by using sensor like LDR and limit switches respectively. But the energy generated from solar and wind is much less than the production by fossil fuels, however, electricity generation by utilizing PV cells and wind turbine increased rapidly in recent years. This paper presents the Solar-Wind hybrid Power system that harnesses the renewable energies in Sun and Wind to generate electricity.

Keywords— PV cells, wind turbines, LDR, Limit switches, solar panel, Hybrid power system

I.   INTRODUCTION

Now a day's major percentage of the electricity generation is contributed by generation through Coal, Diesel, Hydro, Nuclear sources of energy. The use of such fuel as a primary source of power generation produce very dangerous situation in environment. Hybrid solar & micro wind turbines consist of the small solar panel & micro wind size wind turbine as compare to the large centralized wind turbine. Working principle of the Wind turbines is to convert the kinetic energy of the wind firstly first into rotational kinetic energy in the turbine and then this rotational energy has been converted to the electrical energy via the generator or alternator that can be supplied, via the national grid, for any purpose. The energy which available in the wind and solar for conversion   primarily depends on the wind velocity, swept area of the turbine & solar radiation.   When planning to establish a wind farm or solar farm it's very important to know the probable/expected power and energy output of solar. The main function of solar energy is that it obtain energy from both the sources with the help of PV panels and & wind energy. Renewable energy from wind and solar photovoltaic are the most ecological type of energy to use. They are based on the clean and efficient modern technology, which offers a glimmer of hope for a future based on sustainable and pollution free technology. The importance of using renewable energy system, including solar photovoltaic

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(PV) and wind has been attracted much these days, because electric demand is growing rapidly all over the world.

II.   SYSTEM DESCRIPTION

The proposed systemm consists of hardware .Hardware consists of five main components namely Microcontroller, traction motor, sensor, comparator and relay circuit.   In solar tracking system, here two LDR in series with 10Kohm resistor set up in a board. This board was located with solar panel to collect data for the solar tracking. Here circuit is a voltage divider, once the LDR behavior is known (lower resistance with higher light incidence) ,the LDR with higher light incidence shows the higher voltage.The voltage is compared with reference voltage in the comparator LM324. The micro-controller   IC 89C51 is programmed in such a way that ,the solar tracking system operates by the comparison of voltages that from solar array. The compared voltage levels are given as input to the PIC micro-controller. Motor is used to drive the solar tracker to the best angle of exposure of light.In micro windmill, there are 2 limit switches employed in the system. When the wind velocity is greater than 600km/hr limit switch1 closes and micro-controller send the signal to relay 3 and vice versa operation in the limit switch2. Depending on the input from two relays, wind tracking motor   changes . The voltage obtained from the hybrid source will be stored in the 12V battery and utilized for compartment needs.

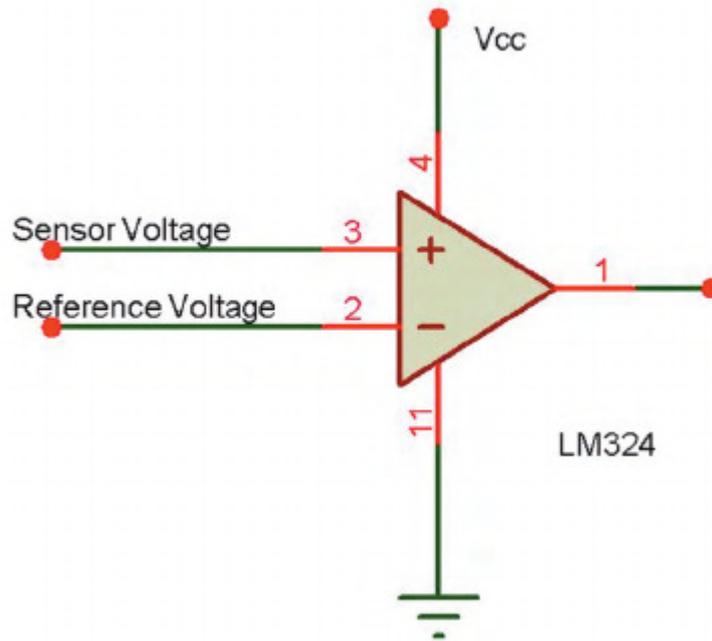## III.   HARDWARE ARCHITECTURE

The project is built on Microcontroller IC 89C51 and has LDR and limit switch module for interface, user input and a relay circuit to drive appliances ON or OFF, interfaced to it. A tracking motor orient a solar tracker that orients a payload toward the Sun. Payloads are usually solar panels.

3.1. Light Dependent Resistor

A photo resistor or light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuit.   A photo resistor is made of a high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several mega ohms (MΩ), in the light, photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photo resistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band.

3.2 Comparator LM324

LM324 operation amplifier can be worked as comparator. It consists of 4 independent operational amplifiers on a single chip. Here we make use two amplifiers. The supply voltage ranges between 3.0 to 3.4V.The output of two comparators are connected to p1.0 and p1.1 of microcontroller

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The two inputs are from the output of LDR sensors and two resistors are used to set the voltage reference to obtain the digital output. It has internally frequency compensation for unity gain LM324 is a high gain electronic voltage amplifier.
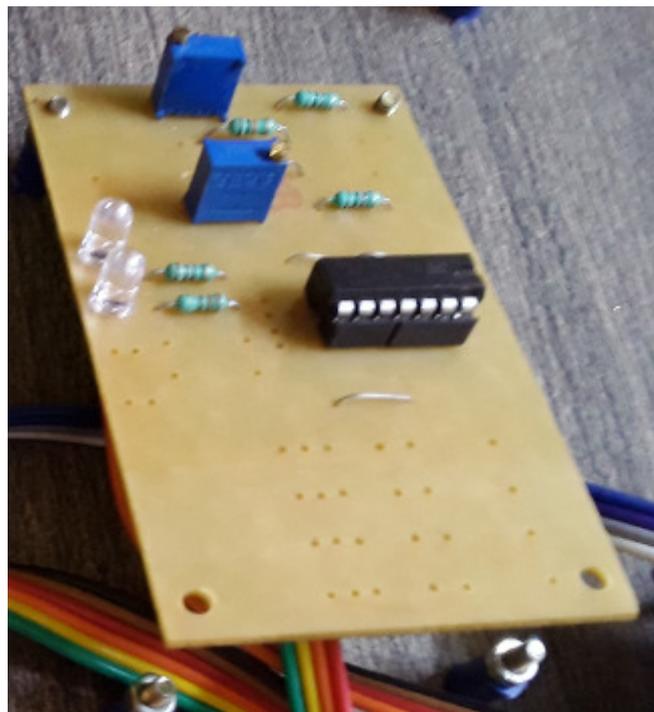

Figure of comparator

3.3. Microcontroller IC89C51

The heart of the IC 89C51 which is CISC type microcontroller. We can use this controller for any type of application.one of the main advantage is, it is easy to write and erase as many times as possible because it is a flash memory. It has 32 pins of input and output pins in total of 40 pins. The inputs from limit switch are connected to 1,2,3,4 pin respectively. Relay circuit are connected to

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21,22,23,24 pins. Here Microcontroller IC89C51 is programmed in such a way when For every pressing of separate codes are received for different operation, then microcontroller sense the input pin status and send the latch signal to output. The output is taken to the relay.

<div align="center">FEATURES OF MICROCONTROLLER IC89C51</div>

CPU	8 bit PIC
Number of pins	40 pins
Operating voltage	5V
Number of I/O pins	32 pins
Program memory type	Flash
Program memmory	4K bytes
RAM bytes	128 bytes
Communication peripherals	USART programmable serial ports
CPU speed	2MHz
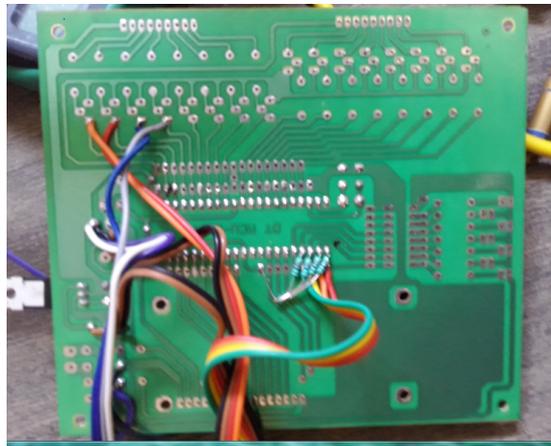
3.4 Relay driver circuit

 The relay driver circuit consists of relay, transistor BC547, resistor 1K ohm, LED. The relay driver circuit provide necessary current to energize the relay coil. NPN transistor BC547 is used to control the relay .A diode is connected across the relay to protect the transistor from damage due to back emf. Microcontroller have a internal pull up resistor up to 10K ohm it is not sufficient to drive the transistor hence external pull up resistor is inserted. When controller is turned ON initially controller set in reset state and all pins are in high which results in turning on the every time hence another transistor is connected between microcontroller and transistor to avoid damage to relay.

3.5 Tracking motor

Trackers are used to minimize the angle of incidence between the incoming sunlight and a photovoltaic panel. This increases the amount of energy produced from a fixed amount of installed power generating capacity. A Permanent magnet DC motor is used for both solar and micro wind mill as it relatively efficient , easily controllable and can last for long time up to 5000 hour continuous duty. It also have wide speed range. .

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IV.   SOFTWARE ARCHITECTURE

The simulation circuit was designed using professional software version 6.0. The components were picked from simulink, library and connected appropriately. The switches represent the sensor outputs connected to pin 7 & 8 of microcontroller. The output from pin 5&6 re connected to input ports, pin 10& 12 of motor driver which controls the direction of motor movement through the output port pin 13 &14. The compiled program was transferred to the microcontroller after the design completion by right clicking and selecting the program file. Closing and opening the switches causes the motor to change the direction which increasing and decreasing the voltage assumed from the panel given different value of power and voltage on the LCD.

V.   HARDWARE
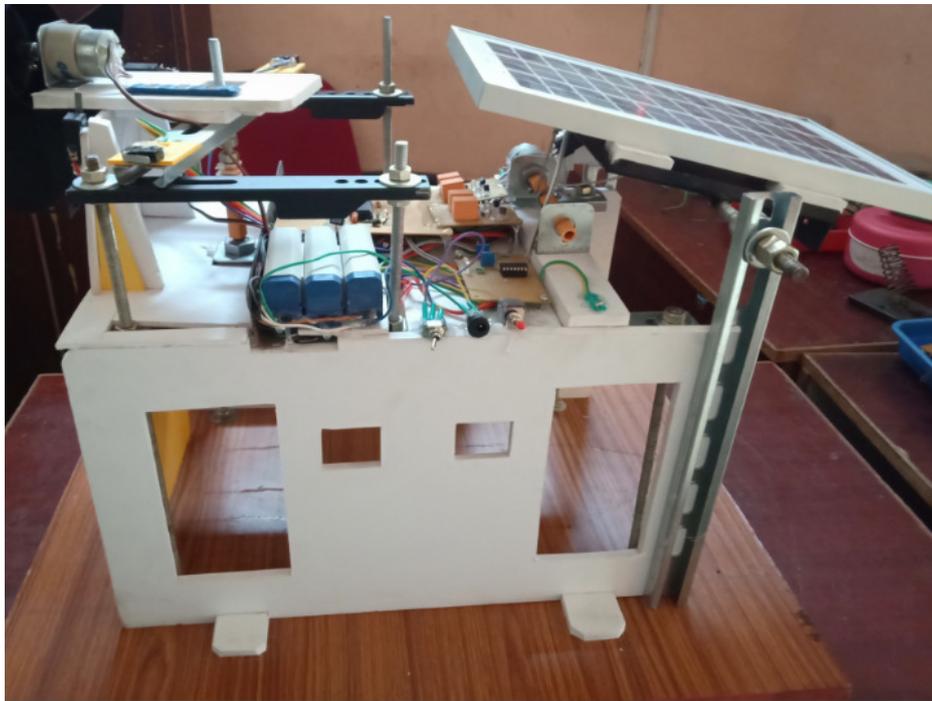
VI.   CONCLUSION

By combining the two intermittent sources of wind and solar the system power transfer efficiency and reliability can be improved significantly. Wind energy is probably the solution for our energy demands. It has great potential and is easy to manage. All you have to do is build the turbine and everything else is going to be free. With only 1 turbine, you can power over 200 homes. Every wind turbine lasts for about 20-25 years. As long as the wind blows, wind turbines can harness the wind to create power. Wind power only makes up a tiny percent of electricity that is produced. Unlike coal, wind turbines don't create greenhouse gases and are completely renewable source. Many people believe that the wind energy could soon be our main source of energy. Though wind turbines can cause complaints and fatalities of wildlife, it could be the energy solution we have been looking for.

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