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AN REVIWE ON SOLAER TREE SYSTEM

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Abstract:-

Solar energy is rapidly gaining notoriety as an important means of expanding renewable energy resources. As such, it is vital that those in engineering fields understand the technologies associated with this area. Our project will include the design and construction of a microcontroller-based solar panel tracking system with look like a Solar Tree. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. This system builds upon topics learned in this course. A working system will ultimately be demonstrated to validate the design. Problems and possible improvements will also be presented. Dual axis makes it more efficient and reliable.

Introduction:-

Renewable energy solutions are becoming increasingly popular. A photovoltaic (solar) system is one example. Maximizing power output from a solar system is desirable to increase efficiency. In order to maximize power output from the solar panels, one needs to keep the panels aligned with the sun. As such, a means of tracking the sun is required. This is a far more cost effective solution than purchasing additional solar panels. It has been estimated that the yield from solar panels can be increased by 30 to 60 percent by utilizing a tracking system instead of a stationary array. This project develops an automatic tracking system that will keep the solar panels aligned with the sun in order to maximize efficiency.

This project report begins with presenting background theory in light sensors, Op amp and DC motors as they applied to the project built by someone else. The report continues with specific design methodologies for Sensor Op amp, RTC, DC motors and drivers, microcontroller selection, voltage Regulation, physical construction, and a software/system operation explanation. LDR based solar tracking systems generally fails in cloudy conditions, so we improve by introducing Real Time Clock based methodology. The project concludes with a discussion of design results and future work.

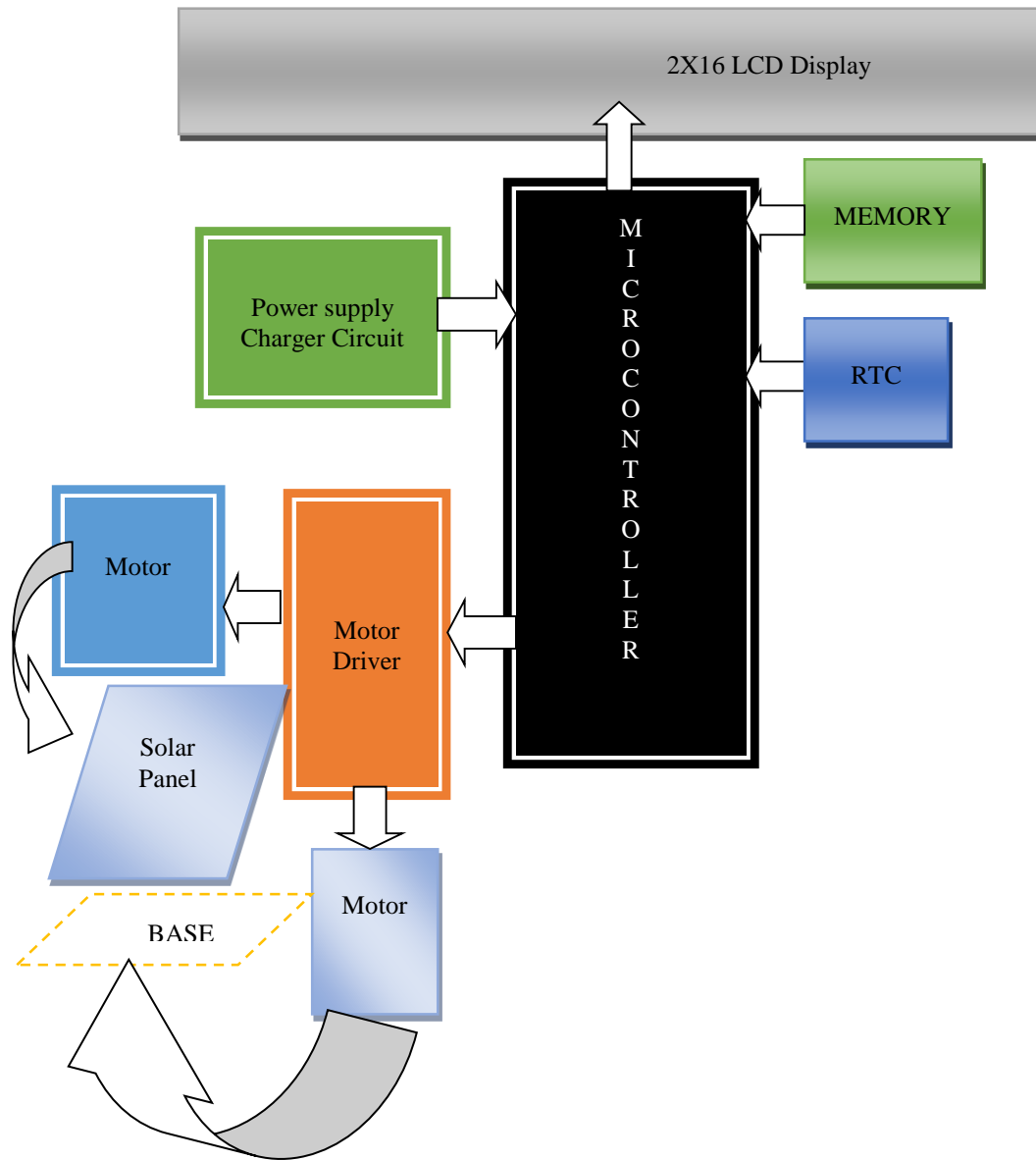
Project Design Methodology Previous Version:-

The project consists of reading of Sensor values in every sec, comparing them, and then positioning a motor to align with the greatest value that corresponds to the sun's position. That concept works fine with clear weather conditions, but in cloudy conditions the sensors starts false sensing and whole tracking system fails. For reliability of such a system sensor alignment and software treatment required which is very crucial.

The project consists of RTC (Real Time Clock) which is very reliable and not affected by weather conditions. We know that sun rises from the East Direction and starts moving towards the West direction with respect to time. So we need to move the solar panel with respect to time. We employed RTC for this task.

Apart from this RTC, Microcontroller, LCD, Memory and Motor drivers ICs are used. Hardware design and software part are described below.

Block Diagram



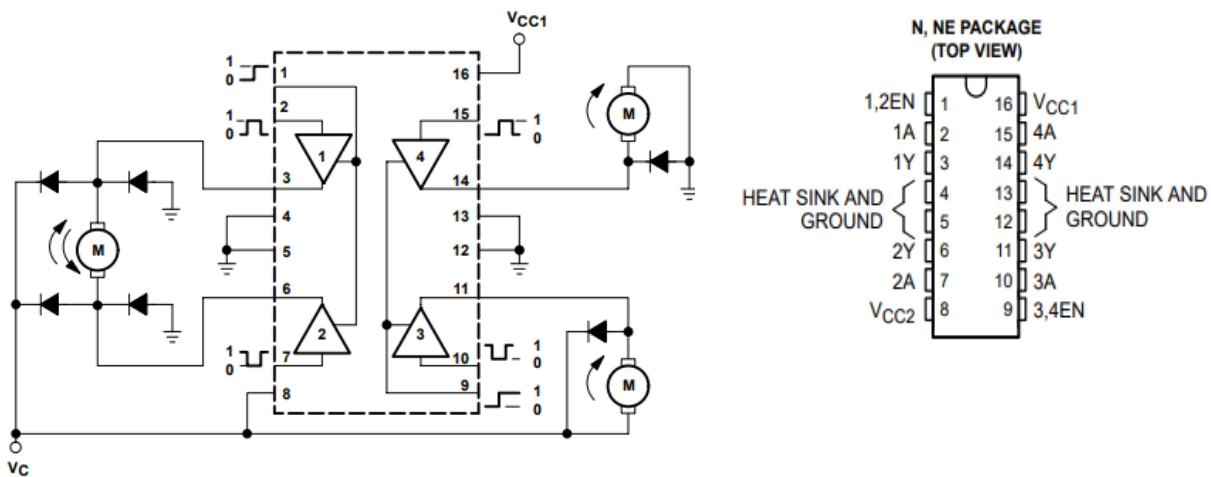
Micro-controller board:

It is a low power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash Programmable and Erasable Read Only Memory (ROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the MCS-51. Instruction set and pin out. The on chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, it provides a highly flexible and cost effective solution so many embedded control applications.



Motor Driver IC (L293D): -

The Device is a high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors.



LCD Display:-

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.



A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD, each character is displayed in 5x7-pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

Power Supply: Initial stage of every electronic circuit is power supply system that provides required power to drive the whole system. The specification of power supply depends on the power requirement and this requirement is determined by its rating. For our project we require + 5 Volt and 12Volt.

Main Component Description:-

AT89S52/ W78e052DDG MICROCONTROLLER

The AT89S52/ W78e052DDG is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-

Standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer.

By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator,

And clock circuitry. In addition, the AT89S52 is designed with static logic for operation

Down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

Working:-

As shown in the block diagram we have provided one drivers IC L293D along with microcontroller AT89S52. We have used 10-RPM two-gear motor. So to rotate the motor in clockwise and anticlockwise direction L293D employed here. To operate the whole circuit with a solar energy we have provided one charger circuit in this project itself. With the help of the given charger circuit, we can charge 12-volt battery. Preset is also provided to adjust the output voltage. As depend on RTC solar panel move with the respective direction. As motor rotate and according to that solar panel rotate in same direction as motor. This is how project works. We have employ RTC which continuously show the real time on LCD. All the steps of rotation are stored in memory provided over there. Keypad is also provided to set the date and time.

So according to the daily and seasonal changes solar plate changes the direction and we get maximum efficiency due to the perpendicular fall of sun light.

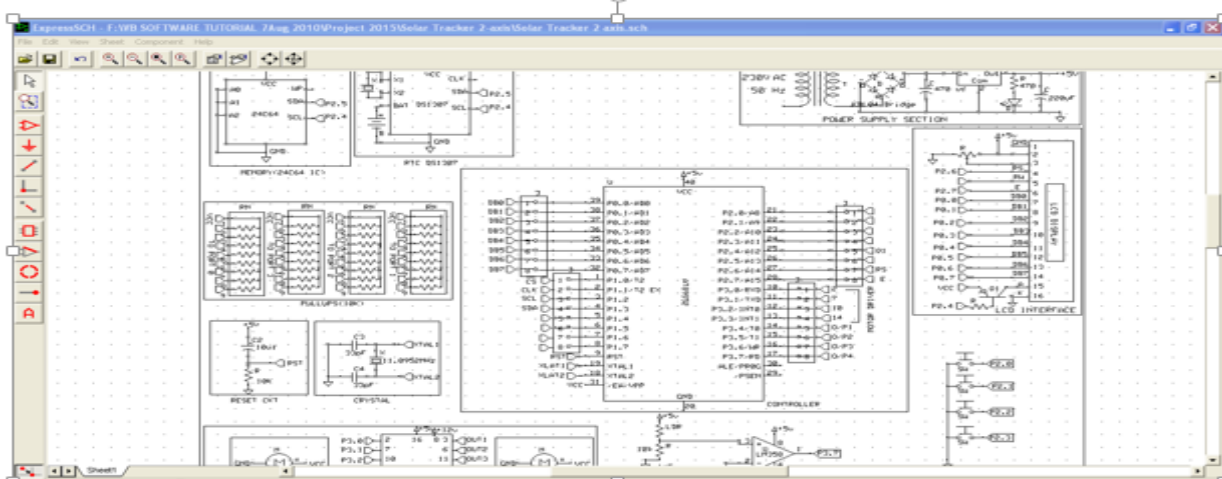
Express SCH

Express SCH software used for Circuit designing.

Steps for Designing:

- 1.Begin a new schematic by running Express SCH. You can launch Express SCH from your desktop by clicking on the icon.
- 2.Select New from the File menu. Then start designing a schematic diagram.
- 3.Take component from Components and Symbols manager as per required and it by using wire.
- 4.In this way, we can make schematic diagram.

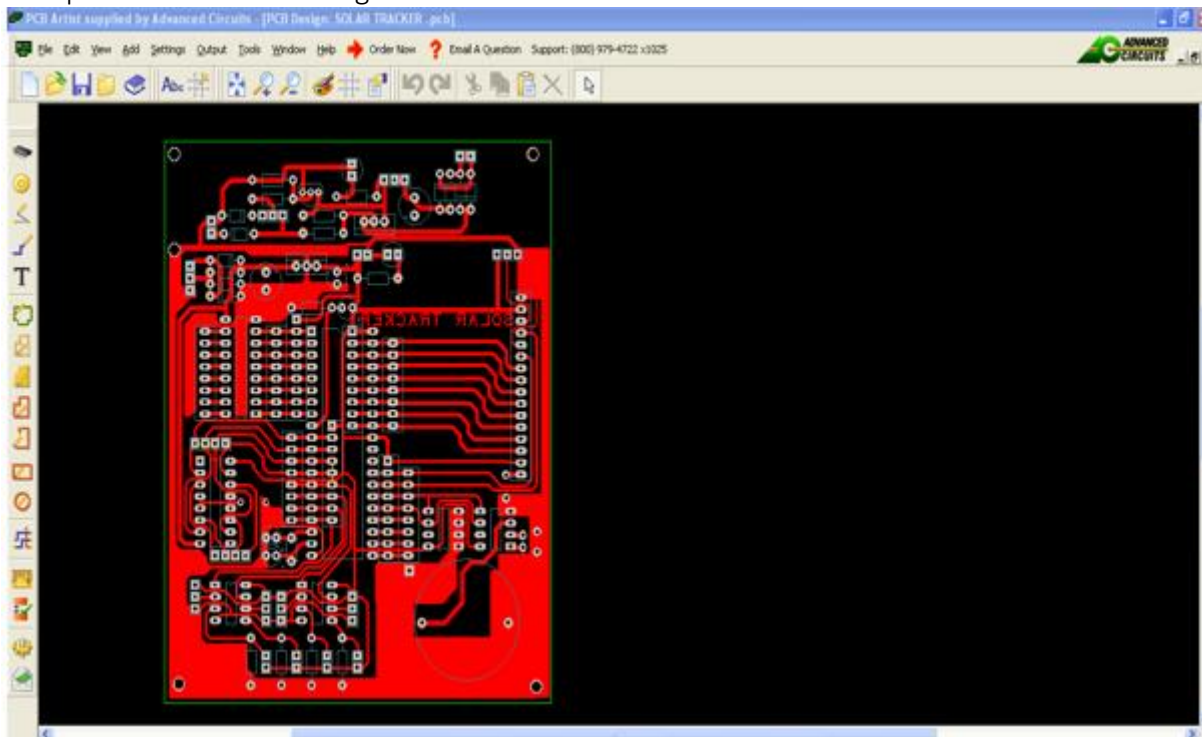
PCB Artist



INTRODUCTION TO PCB ARTIST

Printed Circuit Boards Basics

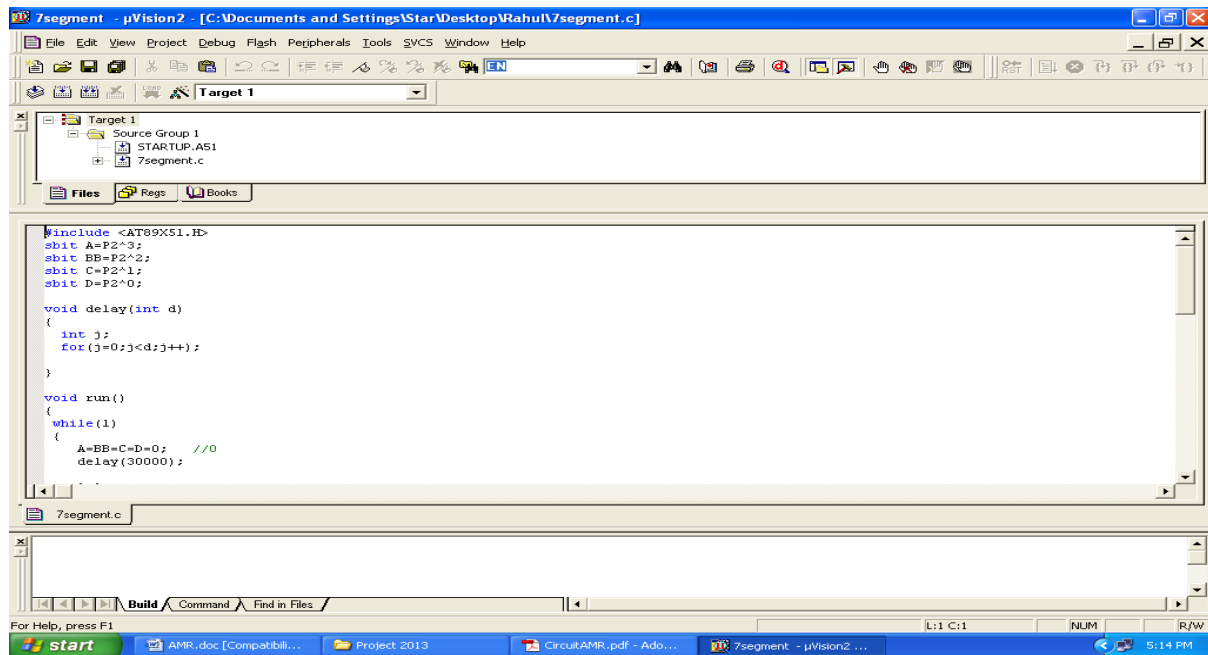
PCB's are the backbone of any electronic devices, and therefore knowledge of PCB layout tools can be a vital skill. Both analog and digital circuits used in PCBs depending on the application, and with different types of circuits, the designer must take into account certain design considerations. More Advance circuits like RF circuits or Power circuits take more thought in the layout and design because the circuit is more sensitive to component placement and the lengths of the connections between them.



The process for PCB design is to first create a list of parts you will use in the circuit, and then take the footprint of the component from libraries available. After taking footprint, you have to connect that component by track. Then finally place all the components' in this manner and connect them physically how you want them to be fabricated on the board.

Keil uvision:-

The μ Vision IDE from Keil combines project management, make facilities, source code editing, program debugging, and complete simulation in one powerful environment. The μ Vision development platform is easy-to-use and helping you quickly



Advantages:-

The main reason to use a solar tracker is to reduce the cost of the energy you want to capture. A tracker produces more power over a longer time than a stationary array with the same number of modules. This additional output or “gain” can be quantified as a percentage of the output of the stationary array. Gain varies significantly with latitude, climate, and the type of tracker you choose—as well as the orientation of a stationary installation in the same location. (The energy required to move the tracker is insignificant in these calculations). Climate is the most important factor. The more sun and less cloud, moisture, haze, dust, and smoke, the greater the gain provided by trackers. At higher latitudes, gain will be increased due to the long arc of the summer sun. In the cloudiest, haziest locations, the gain in annual output from trackers can be in the low 20 percent range. In a generally good area, such as California, annual gains between 30 percent and 40 percent are typical. The gain on any given day may vary from almost zero to nearly 100 percent.

Seasonally in California, gain ranges from 20 to 30 percent in winter (October through March) to between 40 and 55 percent in summer. In general, a tracker adds most to output during the hours when a stationary array produces the least power.

Disadvantages:-

- 1) Some power consumes for the controlling circuit.
- 2) Sensor based system having failure during cloudy season.

Future Scope:-

In future we can employ more number of gear arrangement so that we make step size more and will get more efficiency. We can also implement microcontroller based charges circuit in that case we can controller the charging current so get maximum life of battery. In that we can also incorporate over voltage and under voltage protection circuit with auto cutoff.

Conclusion:-

Gain from trackers is much greater during the long days of summer than in winter. There is strong sun for many additional hours, including the utility's peak use hours (noon to 6 pm). If your system is connected to the grid and your utility has time-of-day metering, the tracker's ability to capture all the afternoon sun can mean money in your pocket. Time-of-day metering means that utilities purchase excess power during peak hours in summer at a significant premium, adding even more value to a tracker system. On off-grid systems, however, a tracker may not add, as much value if a stationary array will produce all the power you need in summer.

References:-

1. Papers/journals/articles
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Web links:-

www.robotis.com

www.asmedl.org/robotics

www.wikipedia.org/wiki/Robotics