

Project V Star Solar Panel Cleaning Robot

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Abstract— The PROJECT V STAR is to design and implement a solar panel cleaning robot which can self charge its battery and clean the dust on the solar panel only during the night time.

Keywords— solar cell, solar panel, micro controller, bristle, LDR sensor module, IR sensor module.

I. INTRODUCTION

After the invention of the solar cell the solar technology reached skies with the implementation of solar panel which use the solar energy to generate electrical energy. The renewable energy usage is growing in all the areas of industries etc; they use huge number of solar panels in the form of an array. In the same time due to the rapid growth in the robotic industry it has taken a place in everyday life and the industry too.

Now the problem with the implementation of solar panels is their maintenance. The cleaning of dust particles on the solar panel is a huge job and a time taking process and requires lot of man power and money. To remove this limitation robotics is a good choice for no man operations, it also economical and autonomous as it requires no man to monitor.

II. METHODOLOGY

After installing the robot on the solar panel array, the power supply is turned on. As the installation is done in day time even after giving the power supply the robot will not start cleaning. Only battery is charged in the day time using a small solar panel which fixed on the top of the robot. After the dawn the robot will sense the dimming of sun light and checks whether it is right or left and starts cleaning the solar panels. If it is on the right side of the solar panel array it will clean moving left, after cleaning the left side it detects the left edge and starts towards moving the right direction. The robot will stop working after the sun rise.

III. INTEGRATION OF H/W & S/W

The body of the robot is made with aluminum bars as the major support which provide strength and yet light weight.

Two wooden boards are fixed to the aluminum bars on which the motors are fixed to rotate the sponge bristle and the base motor which moves the robot in right and left direction.

The wooden boards are fixed to aluminum bars using 5mm screws.



Fig:-1

IV. ELECTRONICS

As Project V Star (solar panel cleaning robot) functions only during the night time.

- The night detection is done using an LDR sensor which varies its output depending upon the light fallen on it.
- The edge detection of the robot is done sig the ir sensor module which are placed on both side to detect right edge and left edge.
- A LM2596 voltage regulator is connected to the battery and the solar panel. The voltage regulator regulates the excess voltage and current that is required for the li-ion battery to get charge.
- A solar panel with the output voltage of 9v 2000mAh is used to charge the li-ion battery.

V. CIRCUITRY

- The operation of the robot is done using a Atmega8 control board, which has three inputs from the sensors and four outputs which drive the motors.
- The first input will from the LDR sensor and the second input from the two IR sensor and the output is given to the motors which are connected to the cleaning bristle and the main motor which drives the robot right and left.
- A dc to dc breakdown converter circuit is used in which the input is given from solar panel and the output is driven to li-ion battery for recharging.

BLOCK DIAGRAM

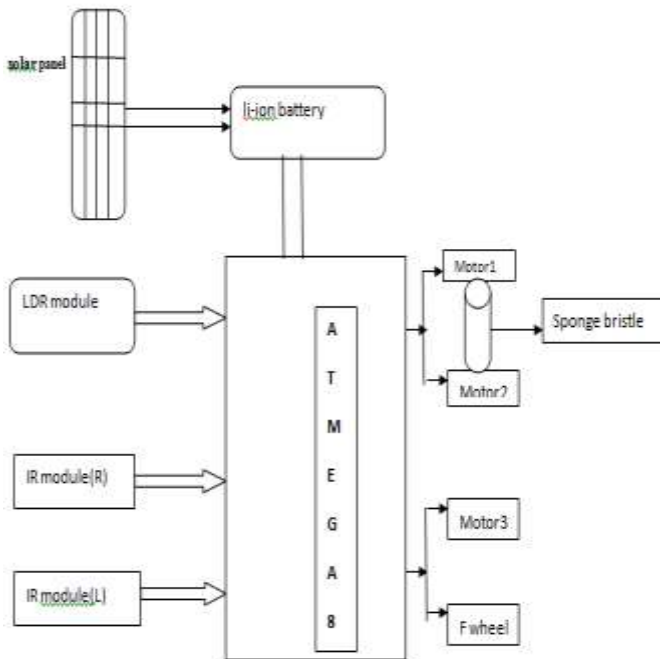


Fig:-2

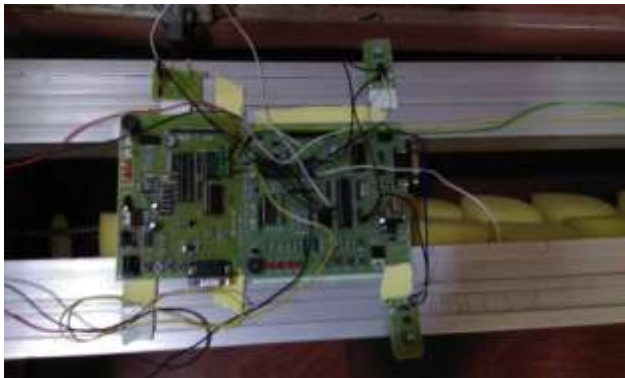


Fig:-3

VI. PROGRAMMING

The entire operation is done through programming. The program flowchart is designed as below.

- After turning the power supply on the program will start executing.
- The controller will check the output from the LDR sensor to check whether it is day or night.
- If the output from the LDR is High the remaining program will not execute and robot wont clean the solar panels.
- If the output from the LDR sensor is low the controller will execute the remaining program as it is night.

- In the above condition after checking the LDR output as low the controller will check the output from the IR sensors.
- If the LDR is low and the output of left IR sensor is low then the robot will move right side of the solar panel and the bristle also rotates right side cleaning the solar panel.
- If the LDR is low and the output the right IR sensor is low then the robot will start moving in left direction and the cleaning roller will also rotate left.

Flow Chart

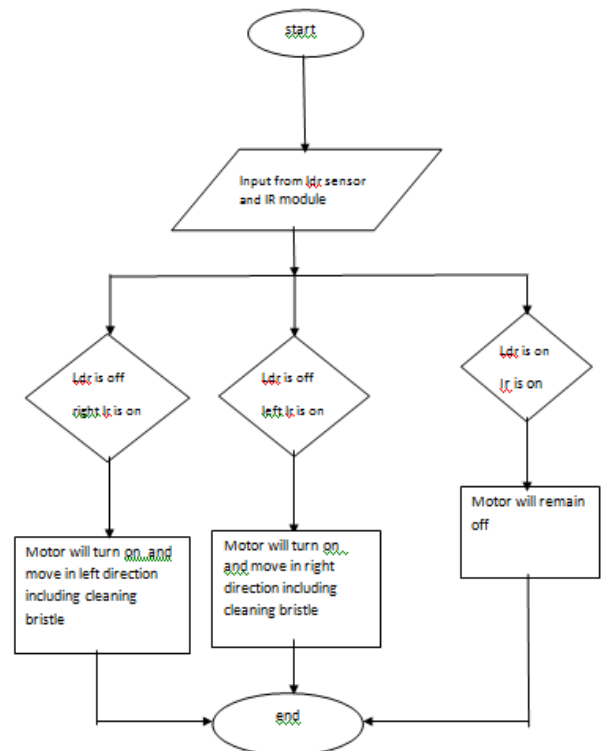


Fig:-4

VII. CONCLUSION

Based on the project done, the design and implementation of a Project V star [solar Panel cleaning robot] is achieved using the above method.

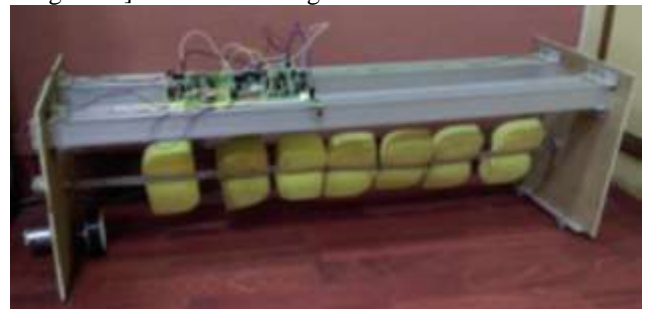


Fig:-5

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