

Vol 4 Issue 4 May 2014

ISSN No : 2230-7850

International Multidisciplinary
Research Journal

*Indian Streams
Research Journal*

Executive Editor
Ashok Yakkaldevi

Editor-in-Chief
H.N.Jagtap

Welcome to ISRJ

RNI MAHMUL/2011/38595

ISSN No.2230-7850

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial board. Readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

International Advisory Board

Flávio de São Pedro Filho Federal University of Rondonia, Brazil	Mohammad Hailat Dept. of Mathematical Sciences, University of South Carolina Aiken	Hasan Baktir English Language and Literature Department, Kayseri
Kamani Perera Regional Center For Strategic Studies, Sri Lanka	Abdullah Sabbagh Engineering Studies, Sydney	Ghayoor Abbas Chotana Dept of Chemistry, Lahore University of Management Sciences[PK]
Janaki Sinnasamy Librarian, University of Malaya	Catalina Neculai University of Coventry, UK	Anna Maria Constantinovici AL. I. Cuza University, Romania
Romona Mihaila Spiru Haret University, Romania	Ecaterina Patrascu Spiru Haret University, Bucharest	Horia Patrascu Spiru Haret University, Bucharest,Romania
Delia Serbescu Spiru Haret University, Bucharest, Romania	Loredana Bosca Spiru Haret University, Romania	Ilie Pinte,ea, Spiru Haret University, Romania
Anurag Misra DBS College, Kanpur	Fabricio Moraes de Almeida Federal University of Rondonia, Brazil	Xiaohua Yang PhD, USA
Titus PopPhD, Partium Christian University, Oradea,Romania	George - Calin SERITAN Faculty of Philosophy and Socio-Political Sciences AL. I. Cuza University, IasiMore

Editorial Board

Pratap Vyamktrao Naikwade ASP College Devrukh,Ratnagiri,MS India	Iresh Swami Ex - VC. Solapur University, Solapur	Rajendra Shendge Director, B.C.U.D. Solapur University, Solapur
R. R. Patil Head Geology Department Solapur University,Solapur	N.S. Dhaygude Ex. Prin. Dayanand College, Solapur	R. R. Yalikal Director Managment Institute, Solapur
Rama Bhosale Prin. and Jt. Director Higher Education, Panvel	Narendra Kadu Jt. Director Higher Education, Pune	Umesh Rajderkar Head Humanities & Social Science YCMOU,Nashik
Salve R. N. Department of Sociology, Shivaji University,Kolhapur	K. M. Bhandarkar Praful Patel College of Education, Gondia	S. R. Pandya Head Education Dept. Mumbai University, Mumbai
Govind P. Shinde Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai	Sonal Singh Vikram University, Ujjain	Alka Darshan Shrivastava Shaskiya Snatkottar Mahavidyalaya, Dhar
Chakane Sanjay Dnyaneshwar Arts, Science & Commerce College, Indapur, Pune	G. P. Patankar S. D. M. Degree College, Honavar, Karnataka	Rahul Shriram Sudke Devi Ahilya Vishwavidyalaya, Indore
Awadhesh Kumar Shirotriya Secretary,Play India Play,Meerut(U.P.)	Maj. S. Bakhtiar Choudhary Director,Hyderabad AP India.	S.KANNAN Annamalai University,TN
	S.Parvathi Devi Ph.D.-University of Allahabad	Satish Kumar Kalhotra Maulana Azad National Urdu University
	Sonal Singh, Vikram University, Ujjain	

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net



SOLAR PANEL CLEANING BOT

**Harinder Singh¹, J. V. Seshagiri¹, K. Murali Krishna¹,
Ch. Srisailam² and M. Narender Kumar³**

¹Students of GNITC ,

²Asst. Prof, EEE GNITC

³Vice Principle, GNIT

Dept. of Electrical and Electronics Engineering , Guru Nanak Institutions Technical Campus Hyderabad, India.

Abstract:- The Solar Power is the most abundantly available energy available on the Earth and depletion of current non-renewable sources has led to the need for efficient harnessing of this source. The Solar Panels used for the purpose are open to the environment and hence would frequently get obscured by dust and other impurities. The current methods used are risky and uneconomic hence the proposition of a “Solar Panel Cleaning Bot” is made. This doesn't require human intervention and is economic and is studied in the following paper.

Keywords: Introduction, Proposition, Design, Results, Future Scope.

1. INTRODUCTION

Solar photovoltaic (PV) applications consist of solar cells for conversion of energy from Sun radiation into electricity. There are one or more panels, a battery, a charge control and the load in such kind of a system. Solar PV panels are normally placed in open under Sun and wired to an inverter, which converts the DC energy received from solar panels into AC energy which is usually required at home. There are many types of solar PV cells available, mainly mono-crystalline silicon cells, multi crystalline silicon cells, thick film silicon, and amorphous silicon. The application of solar based systems is now more exhaustive, with the solar photovoltaic industry's combined global revenue of US\$37 billion in 2008 [1]. Photovoltaic array installations can now be found anywhere around the world like solar farms/ parks for very high ratings. These solar parks can be expected to provide life up to 20 – 25 years, and thus from such panels we need to maximize the power generating potential during daily service. The accumulation of dust particles and debris on the surface of photovoltaic (PV) panels negatively affects the performance the same way as if on a cloudy day and obscure the panels reducing efficiency. This is especially problematic in arid, dusty environments. Thus there is a need for an automated cleaning solution to this problem which can service large ground based solar arrays up to an operating park of 22,000 panels.

The impact of dust deposition can be clearly understood from following graph [2]. For different sizes of dust the solar power starts reducing and bends toward left side clearly indicating the loss of power. The Solar Panels can convert only 25% of the radiant energy and deposition of dust on the panels further drops this efficiency.

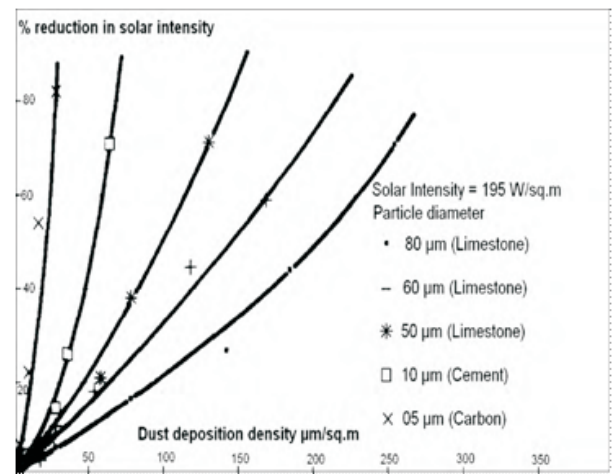


Fig 1 Solar intensity reduction in response to dust deposition

NASA uses solar cells to power many of its satellites, spacecraft, and extraterrestrial rovers there is no cleaning method in place for its extraterrestrial craft. The Mars rover in particular has to operate in harsh dusty climates. NASA has researched the decreased efficiency due to dust and buildup in relation to number of days on Mars. For a 30 day mission they account for 52.2% power loss, over 2 years they account for 89% power loss. NASA also recently announced that an unexpected Martian wind partially cleaned dust off of the Martian rover's solar panels and significantly boosted the panels' electrical output.

II PROPOSITION

The above mentioned problem can be easily solved by just simple cleaning of panels on daily basis. Solar energy generated now is on very high scale and human intervention is uneconomic and difficult. The panel cleaning is already done with the help of water tank loaded trucks for large farms and at home people clean these panels at their own. Another idea has taken form-“Solar Panel Cleaning Bot”. This bot doesn't require a human intervention and are economic. The Bot will have an arm, rotatable and connected to brush through a geared motor and stick arrangement.

III DESIGN

The design of the Bot is made around the following block diagram.

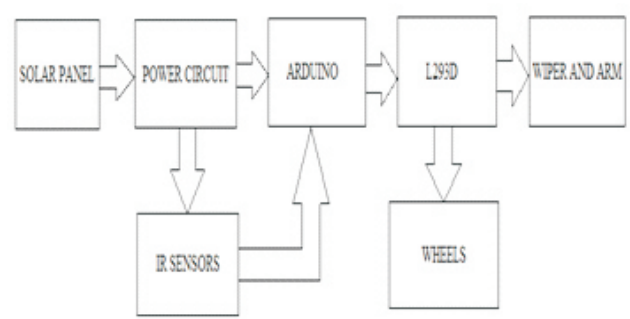


Fig 2 Block diagram

IC 7805

7805IC is a voltage regulator IC and is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit usually has fluctuations and may not give the fixed voltage output. A voltage regulator IC maintains the output voltage at a constant fixed value. The xx in 78xx is nothing but the fixed output voltage that it is designed to provide. Likewise 7805 provides +5V regulated power supply.

IR SENSOR

A light sensor, as its name suggests, is a device that is used to detect light. There are many different types of light sensors, each of which works in a slightly different way. A photocell or photoresistor, for example, is a small sensor that changes its resistance when light shines on it; they are used in many consumer products to determine the intensity of light. A charged coupled device (CCD) transports electrically charged signals, and is used as a light sensor in digital cameras and night-vision devices. Photomultipliers detect light and multiply it.

L293D IC

L293D is a Motor driver or Motor Driver IC which allows DC motor to run on any direction. L293D is a 16-pin IC which has ability to control a set of two DC motors at same time in any direction. It means that we can control two DC motors with a single IC, unlike ULN Driver. It's a Dual H-bridge Motor Driver integrated circuit (IC). The L293d can drive small and big motors as well.

It can be found in any electronic shop very easily and it costs around 70 Rupees (INR) or even less. You can find the necessary pin diagram as follows.

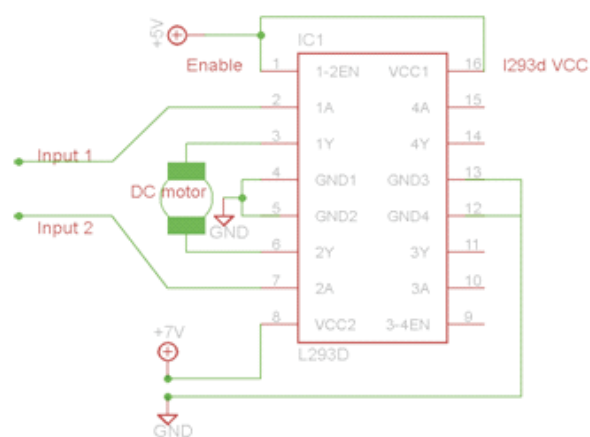


Fig 3 L293D Motor Driver IC

ARDUINO

Arduino is a single-board microcontroller, used to make the application of interactive objects or environments more available. It has an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The on-board microcontroller is pre-programmed with a boot loader that will help upload of programs into our microcontroller very easy with no chip needed. Arduino boards can be purchased pre-assembled or as do-it-yourself kits.

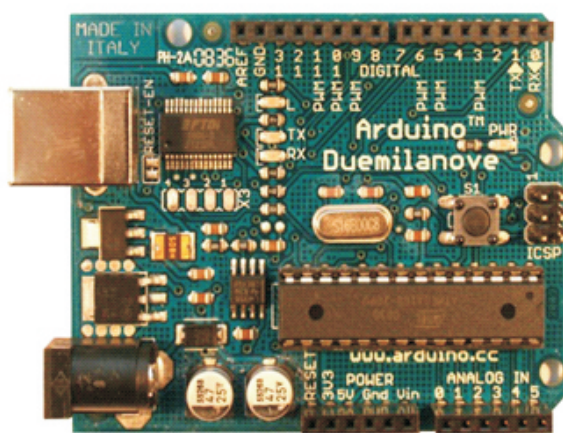


Fig 4 Arduino Board

LM358 IC

It is a Dual Op-Amp IC with high gain, frequency compensated operational amplifier with single power source. This can power our motors utilizing the signals from Arduino.

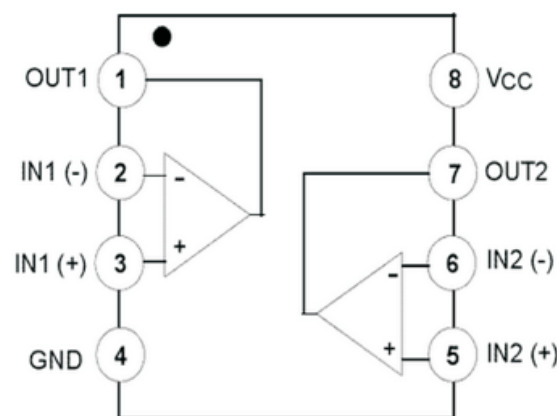


Fig 5 LM358 IC Pin Diagram

DC GEAR MOTOR

Geared DC motors can be defined as an extension of DC motor. A geared DC Motor has a gear assembly attached to the motor and the speed of motor is counted in terms of RPM. The gear assembly helps in making the torque and the speed variations with inverse relation. Utilizing the right combination of gears in this motor, its speed can be decreased to any desirable level. The concept of decreasing the speed and increasing the torque by using different gear combinations is called gear reduction. This motor will help to run our bot's four wheels, arm and wiper.

The heart of the Bot is Arduino Duemilanove. This controls every motion of the Bot and takes input from the four IR sensors pairs connected at front bottom the bot. The IR sensors are placed to apply line follower technique and are supposed to provide the outputs at its receiver sensor based on following track.

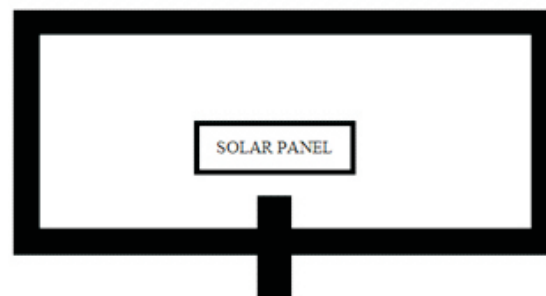


Fig 6 Line follower track

We place two LM358's to take inputs from these sensors (two pairs to each LM358 IC) and their outputs are given to Arduino. The Arduino is pre-programmed to take these outputs at its digital input pins. After analyzing these inputs the Arduino checks with commands in its program and reaches on a conclusion whether to move the bot forward (if IR Sensors are on line) or stop the bot (at the black patch on track laid). If bot is stopped at the black patch the Arduino would go into a loop for cleaning the panels of pre-specified size. The bot is featured with a duster to clean the panel and further changes can be made in accordance with the need like water based cleaning, vaccum cleaning etc. After a delay the bot will be moved out of the black patch and will be back into line following mode. Thus completing the cleaning the panel. The final image of the bot as prepared is shown below for reference.



Fig 7 Solar Panel Cleaning Bot

Likewise a number of panels can be placed along the line and bot will be cleaning these simply by following the line and black patch logic.

IV RESULTS

The panel cleaning bot delivers the best results of cleaning the panels. The efficiency of the panels is restored to its normal level. The track has a black line which has some black patches at some spots. The black line is the one along which we assume the solar panels to be placed. The black patches indicate that the panel is available from this point forth; hence the program would stop the bot and clean the panel with its wiper. This is achievable and would indicate the success of our project. The bot is programmed to wait for fixed period of time once it comes on a black patch and then automatically take the bot forward so it can move out of the black patch and keep following the line to reach the next panel.

V FUTURE SCOPE

A bot of this kind can clean a complete solar farm as and when required. Further exciting features can be added into our bot like de-ionized water cleaning, camera for inspection and climate based cleaning. The major advantage that we acquire is of inspecting the farm with the help of this bot. also this bot in future will become more compact and light with the booming technology and would be further cheap. As these bots can be used by a layman as well their services would be further required at homes when homes will be lightened by Solar Panels. Thus giving a very good scope in future.

REFERENCES

1. “Effects of Dust on Performance of PV Panels” by Shaharin A. Sulaiman, Haizatul H. Hussain, NikSiti H. NikLeh, and Mohd S. I. Razali
2. “Robotic Device for Cleaning Photovoltaic Panel Arrays” by mark Anderson, Ashton Grandy, Jeremy Hastie, Andrew Sweezey, Richard Ranky, Constantinos Mavroidis
3. “Solar Energy- Fundamentals and Applications” by H.P. Garg
4. “Arduino Cookbook” by Michael Margolis
5. “Robot Builders Cookbook” by Owen Bishop
6. “Electronic Devices and Circuit Theory” by Boylestad
7. “How to Solar Power Your Home” by Martha Maeda
8. “Large Scale Solar Power Systems- Construction and Economics” by Peter Gevorkian



Harinder Singh

Students of GNITC , Dept. of Electrical and Electronics Engineering , Guru Nanak Institutions Technical Campus Hyderabad, India.



J. V. Seshagiri
Students of GNITC , Dept. of Electrical and Electronics Engineering , Guru Nanak Institutions Technical Campus Hyderabad, India.



K. Murali Krishna
Students of GNITC , Dept. of Electrical and Electronics Engineering , Guru Nanak Institutions Technical Campus Hyderabad, India.

Publish Research Article International Level Multidisciplinary Research Journal For All Subjects

Dear Sir/Mam,

We invite unpublished Research Paper, Summary of Research Project, Theses, Books and Book Review for publication, you will be pleased to know that our journals are

Associated and Indexed, India

- ★ International Scientific Journal Consortium
- ★ OPEN J-GATE

Associated and Indexed, USA

- Google Scholar
- EBSCO
- DOAJ
- Index Copernicus
- Publication Index
- Academic Journal Database
- Contemporary Research Index
- Academic Paper Database
- Digital Journals Database
- Current Index to Scholarly Journals
- Elite Scientific Journal Archive
- Directory Of Academic Resources
- Scholar Journal Index
- Recent Science Index
- Scientific Resources Database
- Directory Of Research Journal Indexing

Indian Streams Research Journal
258/34 Raviwar Peth Solapur-413005, Maharashtra
Contact-9595359435
E-Mail-ayisrj@yahoo.in/ayisrj2011@gmail.com
Website : www.isrj.net