



JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

“SOLAR BASED VACCUM FLOOR CLEANER”

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Abstract:

Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. Domestic robots are entering the homes and people's daily lives, but it is yet a relatively new and immature market. However, a growth is predicted and the adoption of domestic robots is evolving. Several robotic vacuum cleaners are available on the market but only few ones implement wet cleaning of floors. The purpose of this project is to design and implement a Vacuum Robot which has two cleaning modes Autonomous and Manual mode and manual mode is via phone application. Vacuum Cleaner Robot is designed to make cleaning process become easier rather than by using manual vacuum. The main objective of this project is to design and implement a vacuum robot prototype by using Arduino Uno, Sensors, DC motor, motor driver L298N, Ultrasonic Sensor, and Vacuum suction unit and to achieve the goal of this project. Vacuum Robot will have several criteria that are user-friendly

I. INTRODUCTION

Robot is an intelligent device having its own brain fed with computer logic so that it can do the work according to the algorithm designed. Autonomous movement of vehicle is guided by the logic controller designed. Robots plays an important role in every field of life. It is used in industries, in households and in institutes. The robots are just becoming as intelligent as human now a days. Mostly an average human uses 2-3 robots per day in his day-to-day life. Various robotics parts are: - Pneumatic devices Actuators sensors mechanical control devices like valve → Microcontroller – Controlling unit Mechanical control devices are used to control the flow or movement of materials or any other parts present in the device. Actuators are used for controlling a mechanism which ultimately controls a part of the device. Sensors are the sensing devices which transmit a signal and receives the signal and accordingly used to accumulate the various environment information which is ultimately fed to microcontroller for deciding the working of machines. Microcontroller is the brain of robot where program is written and sensors are connected as input and actuators as output. The controlling of the robot is governed by various algorithms like fuzzy controller, machine learning based practices and artificial neural network-based algorithms. Depending upon the environment value received to the controller it eliminates the error and transits from one state to another. Basically, there are two types of controllers, one is continuous controller and another is PID based controller. Continuous controller is more direct and less effective while PID controller is more advanced and varies according to the current state and gives efficient result.

II. PROBLEM STATEMENT:

To maintain Cleanliness daily household chores like Dusting and Sweeping has to be repeated every day. But this physical activity of cleaning can be harmful at times. To counter such problems there are several machines which are designed for ease to humans, breaking down the complex tedious task into simpler one. But these vacuum cleaners are complex, bulky and heavy making it tedious to move and clean. Vacuum cleaners available in market consume hundreds to thousand watts of electricity which in turn increases the electricity bill. The operating electric motor becomes too hot and burnout the vacuum cleaner motor. While in physical activity of

dusting certain particles which when inhaled cause problems in respiratory system of that person which in turn lead to more health issues. Several machines available in market employ specific mechanical and electrical systems to ensure a clean household. Some vacuum cleaners don't offer a reusable dustbin bag. These machines make life and cleaning task more difficult because one has to be physically present for mobility of machine. To reduce such efforts for cleaning our project aims to create a device that is low cost, utilizing local resources to design which serves the purpose of sweeping and dusting from a place.

III. LITERATURE REVIEW

- Traditionally floor is cleaned with the help of dry mop or wet mop using the hand as a potential tool. They have to scrub hard on the surface. By the help of machines also we can get huge efficiency because there is no chance of human error there.
- The aim of this project work is to design and develop process for cleaning the floor having wet and dry surfaces. It is very useful for cleaning the wet as well as dry floors. This floor cleaning machine consisted of moisture cotton mop, swiping brushes, wipers and vacuum cleaner for reducing the cleaning time.
- The study comprehends of automated vacuum cleaner which having components to DC motor operated wheels, roller brush, cleaning mop, the garbage container and obstacle avoidance sensor. A 12V rechargeable battery is used as power supply.

IV. METHODOLOGY

First it checks if it's on manual mode. If yes, then it checks the keypad. On keypad it checks if any key is pushed, i.e., Left, Right or Center. If yes, then the data is displayed accordingly on the LCD screen, i.e., our mobile phone which we are using as a remote to control the robot manually. The data is transmitted to the bot. Then it checks if any hurdle is detected. If yes then the signal is displayed and the robot is informed to stop and it goes back to manual mode. If no hurdle is detected, the robot checks for the data signal received. If the data signal is received, then it starts decoding the data and is displayed on the LCD. If the data signal is not received then it goes back and checks for the data signal transmitted

V. WORKING

In this system the ultrasonic sensors are used to sense the obstacles. Ultrasonic sensors emit sound scopes with frequency lying in ultrasonic spectrum (20KHZ), which is inaudible to human ears. The sound waves hit the obstacle and bounces back to detectors. The ultrasonic sensor is used for detecting objects/obstacles and move the direction of the robot. GSM module is used by the blind person to contact to mobile numbers stored in the microcontroller in case of any emergency. Using GSM technology robot movement will be controlled. And using ultrasonic obstacle avoidance will be done. Here an Arduino Uno is used as the microcontroller. Circuit consists of a GSM module, an ultrasonic Sensor, two L293D driver ICs, two motors, a cleaner and an LCD Display. The ultrasonic sensor triggers and echo pins are connected PWM of Arduino respectively. The virtual terminal represents the GSM Module. The RXD and TXD of GSM module is connected to TXD and RXD of Arduino. Motor driver IC (L293D) for driving the two motors is connected in such a way that the IN1 & IN2 for driving motor 1 and motor 2 are connected L293D is connected to motor 1 and OUT3 & OUT4 are connected to motor 2 LCD is interfaced in such a way that RS, E, D4-D7 of LCD is connected.

VI. BLOCK DIAGRAM

COMPONENTS

HARDWARE REQUIREMENTS

- STM 32
- H-Bridge
- DC MOTOR
- Ultrasonic Sensor
- RELAY
- Wi-Fi Module

SOFTWARE REQUIREMENTS

- Embedded C
- Arduino Suite

VII. COMPONENTS DESCRIPTION

• Power supply unit:

This section needs two voltages viz., +12 V & +5 V, as working voltages. Hence specially designed power supply is constructed to get regulated power supplies.

• Drivers:

This section is used to drive the relay where the output is complemented of input which is applied to the drive but current will be amplified.

• Relays:

It is a electromagnetic device which is used to drive the load connected across the relay and the o/p of relay can be connected to controller or load for further processing.

•DC Motor:

A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the centre of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

• GSM:

GSM, which stands for Global System for Mobile communications, reigns as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for Cell phone towers in nearby area.

The origins of GSM can be traced back to 1982 when the Group Special Mobile (GSM) was created by the European Conference of Postal and Telecommunications Administrations (CEPT) for the purpose of designing a pan-European mobile technology.

• ULTRASONIC SENSOR:

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats or dolphins do. It offers excellent range accuracy and stable readings in an easy-to-use package. Its operation is not affected by sunlight or black material like Sharp rangefinders are (although acoustically soft materials like cloth can be difficult to detect). Similar in performance to the SRF005 but with the low-price of a Sharp infrared sensor.

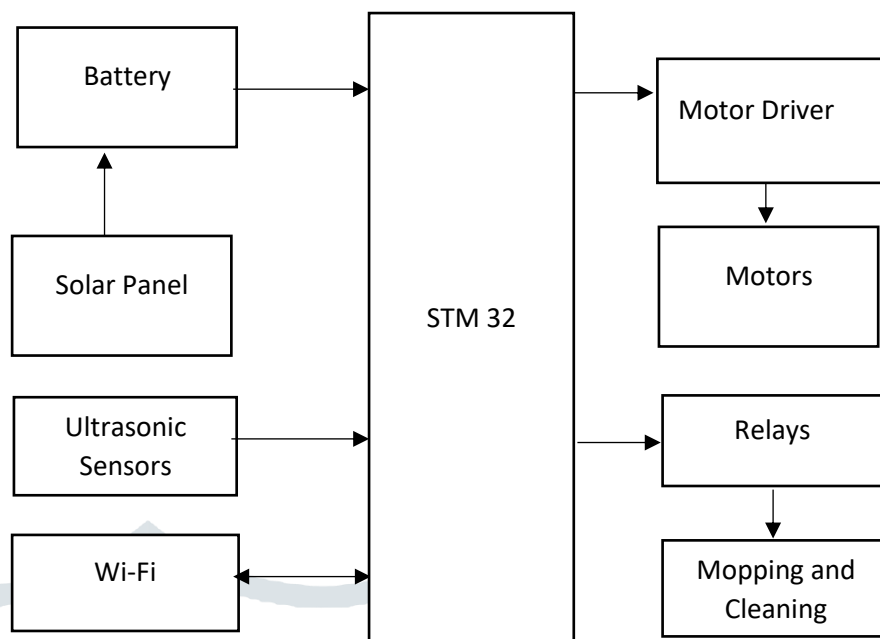


fig:1

• **Solar panel:**

Solar energy begins with the sun. Solar panels (also known as "PV panels") are used to convert light from the sun, which is composed of particles of energy called "photons", into electricity that can be used to power electrical loads. Solar panels can be used for a wide variety of applications including remote power systems for cabins, telecommunications equipment, remote sensing, and of course for the production of electricity by residential and commercial solar electric systems.

• **H Bridge:**

We can better control our motor by using transistors or Field Effect Transistors (FETs). Most of what we have discussed about the relays H-Bridge is true of these circuits. You don't need diodes that were across the relay coils now. You should use diodes across your transistors though. See the following diagram showing how they are connected.

These solid-state circuits provide power and ground connections to the motor, as did the relay circuits. The high side drivers need to be current "sources" which is what PNP transistors and P-channel FETs are good at. The low side drivers need to be current "sinks" which is what NPN transistors and N-channel FETs are good at.

• **Embedded C:**

Use of embedded processors in passenger cars, mobile phones, medical equipment, aerospace systems and defense systems are widespread, and even everyday domestic appliances such as dish washers, televisions, washing machines and video recorders now include at least one such device.

Because most embedded projects have severe cost constraints, they tend to use low-cost processors like the 8051 family of devices considered in this book. These popular chips have very limited resources available most such devices have around 256 bytes (not megabytes!) of RAM, and the available processor power is around 1000 times less than that of a desktop processor. As a result, developing embedded software presents significant new challenges, even for experienced desktop programmers. If you have some programming experience - in C, C++ or Java - then this book and its accompanying CD will help make your move to the embedded world as quick and painless as possible.

• **Arduino Suite:**

The Arduino is a single-board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models feature a USB interface, 6 analog input pins, as well as 14 digital I/O pins which allow the user to attach various extension boards. Introduced in 2005, at the Interaction Design Institute Ivrea, in Ivrea, Italy, it was designed to give students an inexpensive and easy way to program interactive objects. It comes with a simple Integrated Development Environment (IDE) that runs on regular personal computers and allows writing programs for Arduino using a combination of simple Java and C or C++.

VII.ADVANTAGES

- Used to control & clean house hold appliances
- In industries and factories for remote sensing & cleaning
- Using 3g technology we can spy a place
- Long distance remote sensing
- Can be implemented in avionics to switch auto pilot from ground station by sending a particular frequency

VIII.DISADVANTAGES:

- Operators must be trained
- Inclination levels may be an issue

IX.APPLICATIONS:

- It can be used in domestic and industrial cleaning.
- Cleans without Human Interference.

X.EXPECTED RESULT:

When the robot is turned on it's in the manual mode where the user can connect the robot to his phone via bluetooth and control the robot as his choice. By changing the state of the mode selection switch robot is pushed to the automatic mode and move in a 'S' path. Based on the type of cleaning required i.e., dry or wet cleaning the suction unit or dripping unit can be turned on or off. It was observed that the robot was quite efficient in its cleaning, around 80% of efficiency was achieved.

XI.ACKNOWLEDGEMENT:

We would like to extend our sincere thanks to Principal & HOD of EEE, RYMEC institution, we would like to express our deepest appreciation for our guide Mr. Ravikumar H M for encouraging our project proposal for paper publishing, we would also like to extend our deepest gratitude to friends, & family members for useful discussions.

XII.CONCLUSION:

The Solar Panel Cleaning System project aimed to bring a better solution for maintaining solar efficiency. The main scope was to develop a machine that can clean a solar panel by a proper control system. This project is a developed Designing the control system required learning Raspberry Pi configurations, python coding and its interference with the electrical components. Using soldering boards to implement the designed circuit, hardware wiring, relays and machinery were new experiences. This being said, the project fulfilled the desired design with the planned control and mechanism. The DC motors were controlled by both relays and drivers to accomplish speed and directions control. Also, control code for the DC motors and the water pump were written then implemented in the system. Finally, the MPPT charge controller was connected to the off-grid system. However, the prototype to expand on a new and increasing market. The project team hit many obstacles along the way. Prototype was not completed because of the challenges and the limitations that were mentioned earlier.

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