M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
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ISO 9001:2015 & ISO 14001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

on

SMART VACCUM CLEANER

Submitted in partial fulfilment of requirements for the award of the

Degree of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

Under the guidance of

Mrs.A.SRIDEVI

Submitted By

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M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639 113

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M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

BONAFIDE CERTIFICATE

Certified that this project report **"SMART VACCUM CLEANER"** is thebonafide work of **"AARTHY A (927621BEC002), ABINAYASRI N (927621BEC004),DHARSHINI N (927621BEC042),HARINI S (927621BEC061),"** who carried out the project work under my supervision in the academic year 2021-2022.

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Vision and Mission of the Institute and Department

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

- Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

Department of Electronics and Communication Engineering

Vision

- To empower the Electronics and Communication Engineering students with Emerging Technologies, Professionalism, Innovative Research and Social Responsibility.

Mission

- Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.
- Inculcate the students in problem solving and lifelong learning ability.
- Provide entrepreneurial skills and leadership qualities.
- Render the technical knowledge and industrial skills of faculties.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

- **PEO1:** Graduates will have a successful career in academia or industry associated with electronics and communication engineering.
- **PEO2:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of electronics and communication engineering.
- **PEO3:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

PROGRAM OUTCOMES(PO'S)

- **PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- **PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations .
- **PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

- **PO7: Environment and sustainability:**Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- **PO8: Ethics :**Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- **PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- **PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- **PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- **PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSO'S)

- **PSO1**: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.
- **PSO2**: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrialexpectations**.**

MAPPING OF PROJET WITH POs AND PSO

Abstract	Matching with POs,PSOs
AUTONOMOUS SYSTEM, UL TRASONIC SENSOR,OBSTACLES	PO1,PO3,PO6,PO7,PO9,PSO1,PSO2,PSO3

ABSTRACT

In the current hectic schedule, cleaning houses and surrounding environment is more arduous. At present, there are vacuum cleaners which humans to handle it. Thus, there is a dire need to implement vacuum cleaner which works without human intervention. An efficient method to clean the desired area has been implemented through this project. By using this vacuum cleaner, hazardous places can be cleaned which thereby reduce risks to mankind. This is achieved by implementing an autonomous system. Here, RC car which is embedded with a vacuum cleane require r is used. This system has an ultrasonic sensor attached to it, that helps in avoiding large obstacles such as tables, chairs, walls etc. By measuring the distance via this sensor, the car takes the direction where the distance between obstacle and car is more, hence avoiding the collision with the obstacles. The vacuum cleaner is designed with a CPU fan and a pipe is attached to the mouth of the bottle. The entire system is run by batteries.

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CHAPTER-1

1.INTRODUCTION

In today life, time management is considered as one of the most important factors. A very notable household chore is floor cleaning which is often considered as difficult and boring job. In most cases, cleaners are hired to do the task rather than the household residents do it. The discomfort posed by this recurrent chore necessitated development of a vacuum cleaner that could assist human with such a task. A vacuum cleaner is an electromechanical appliance commonly used for cleaning floors, furniture, rugs and carpets by suction. An electric motor inside the appliance turns a fan which creates a partial vacuum and causes outside air to rush into the evacuated space. This forces any dirt or dust near the nozzle into a bag inside the machine or attached to the outside. The demand to reduce manpower level has led to the design and development of automatic control systems, which enables unattended operations of the machinery. The current automatic integrated systems cover all aspects of Automatic vacuum cleaner operations. Current vacuum cleaners, although efficient, are rather bulky and therefore require large manpower for proper functioning. The former vacuum cleaners use to generate suction and gathered dust with a rotating brush, the latter worked with a belt driven by hand-cranked fan making it awkward to operate. In the late 1990s and early 2000s, more efficient sweepers equipped with limited suction power were developed. Depending on the design target, robotics vacuum cleaners are appropriate for offices, hotels, hospitals and homes. However, most cheap cleaners need a better cleaning pattern algorithm for efficient functioning while the smart ones are rather costly, and thus beyond the reach of most homes. These challenges were carefully considered while designing the vacuum cleaner.

1.2 OBJECTIVE

Objective of this project is to design and develop IOT based smart vacuum cleaner, that will help to make household work convenient and much easier. In this project new type of home intelligent cleaner adopted the ultrasonic sensor , which has the function of the real-time environment perception, is introduced, and this cleaner driven by dc motor has the ability of autonomous working by itself and the functions of the automatic detection and obstacle avoidance. This project adopts open CV technique for floor coverage task, and designs synthesis detection system based on sensor arrays finding method technology according to algorithm characteristics, experimental results for obstacle detection by static finding indicates that the design detection systems improves cleaning robot's environment perception and path search ability greatly. In recent years, robotic cleaners have taken major attention in robotics research due to their effectiveness in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc. asically, robotic cleaners are distinguished on their cleaning expertise like floor mopping, dry vacuum cleaning etc. Some products are based on simple obstacle avoidance using infrared sensors while some utilize laser mapping technique. Each cleaning and operating mechanism of robotic floor cleaners has its own advantages and disadvantages. For example, robots utilizing laser mapping are relatively faster, less time consuming and energy efficient but costly, while obstacle avoidance based robots are relatively time consuming and less energy efficient due to random cleaning but less costly

CHAPTER-2

2.LITERATURE SURVEY

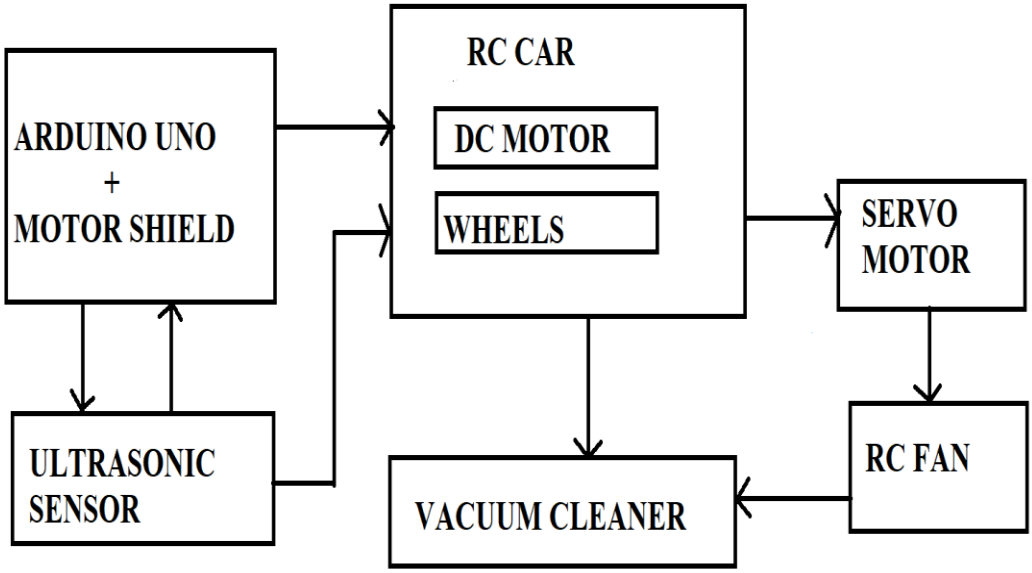
We have done comprehensive study of latest technological trends and efficient systems. We have undertaken extensive literature survey to study automatic vacuum cleaner parameters, such as sensors, raspberry pi module, raspberry pi camera and how to connect raspberry pi with NodeMcu. A well-planned literature survey has ensured availability of information for efficient system performance, technology usage, specialization and management of available resources. IOT based systems are also studied for automatic vacuum cleaner system. Our study includes the current knowledge, findings, as well as theoretical and methodological contributions for development of automatic vacuum cleaner using image processing. It involves concept development, which is a set of activities carried out in the system engineering to collect parameters of operational needs and develop suitable system for implementation. Design of smart vacuum cleaner which are available in the market are using Arduino Uno, Motor, Ultrasonic Sensor, and IR Sensor in order to achieve the goal of cleaning process. Vacuum cleaner Robots have several criteria that are user-friendly. An autonomous vacuum cleaner robot are able to randomly navigate through a room or a house with the minimum human assistance, the following specifications that are found:

- Obstacle avoidance
- Floor avoidance
- Collision Detection
- Dry cleaning
- Wet cleaning
- Status display
- Automatic system

Four motors are used for the purpose like movement of robot, water pump. Relays are used to drive the water pump and cleaner motor. LM293D IC are used to drive wheel motor. All the information are displayed on LCD. These specifications correspond to some of the expected behaviours that will be programmed into the robot. It consists of four dedicated wipers that are attached to the platform.

CHAPTER-3

3.1 BLOCK DIAGRAM

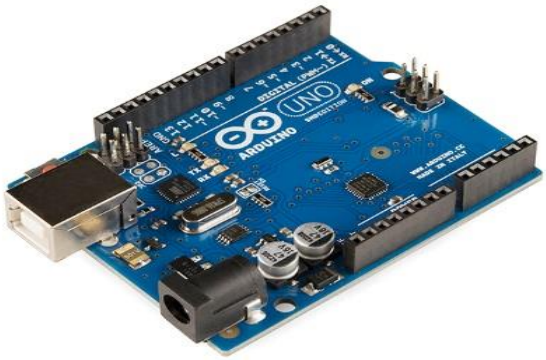


DESCRIPTION OF VARIOUS BLOCKS

Apart from basic engineering knowledge , certain technologies cover Arduino, NODEMCU, IOT, artifical intelligence, control system, sensors , machine learning, raspberry pi module, which is used for the project implementation .

3.2 ARDUNIO UNO

This is a microcontroller which is used for interfacing hardware and software . To do the same, USB cable is required. Once the board is embedded with the code, it can be operated by a battery supply without using any PC or laptop.

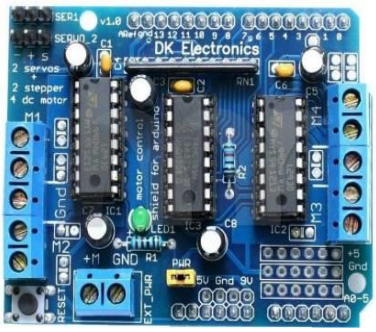


3.4 CPU FAN

This is used in the vacuum cleaner which has a rating of 12 volts. It rotates at maximum of 200 rpm. As the voltage increases, rpm increases until the value reached up to 200.

3.5 MOTOR DRIVER SHIELD

This is used to run different types of motors. The direction and speed of motors depends on the motor shield, as the shield is embedded on Arduino UNO board and the speed and direction can be controlled by coding in Arduino IDE.



3.6 ULTRASONIC SENSOR

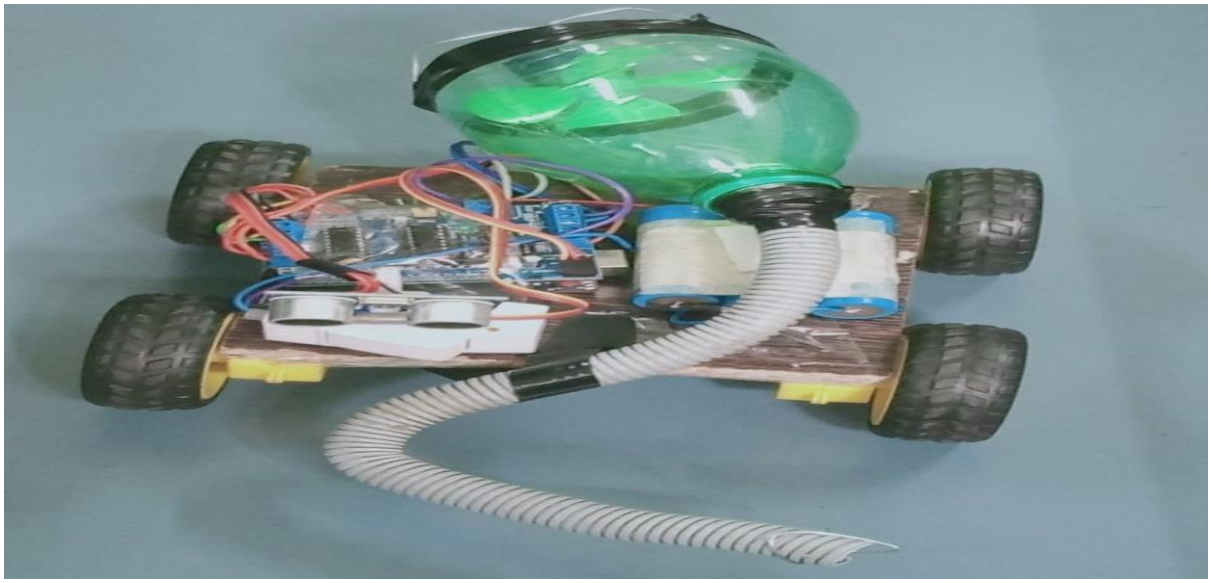
HC-SR04 sensor is used for measuring distance. It uses sound waves to calculate the same. There are 4 pins – Echo, Ground, Trigger and VCC . External controller is triggered by Trigger pin that sends ultrasonic waves whereas echo pin sends ultrasonic waves and duration it takes to travel decides the distance between the car and obstacle. VCC will take up to 5V and gives the voltage so that the sensor can run.

3.7 WHEELS

This are used to move in any specified direction. Wheels are run by a DC Motor with a pre-defined RPM. Wheels rotate in the same direction as DC Motor.

CHAPTER-4

4.RESULT AND DISCUSSION



CHAPTER-5

5.CONCLUSION

Vacuum cleaners are not only effective at cleaning dust and getting rid of allergens, they are also easy to use, they save time and energy. They are equipped with suction motors and filters to pull in dirt and dust.Vacuum cleaners are not only effective at cleaning dust and getting rid of allergens, they are also easy to use, they save time and energy. They are equipped with suction motors and filters to pull in dirt and dust. They can be categorized into hand-held, canister, vertical and robot vacuum cleaners.There are specially designed wet/ dry vacuum cleaners that can easily clean water without any electrocution, creating a mess or damaging the machine. These vacuum cleaners are also relatively inexpensive and also a great addition to cleaning wet surfaces.

5.1 FUTURE SCOPE

In future we hope to make the robot smarter such that when the robot cleans any room, it will save the information about the obstacles and its location and if the user want to clean the room, it will just restore the information and will clean faster.We hope to make the robot to clean the tables such that it can detect edges and it will clean the tables without falling down.

CHAPTER-6

REFERENCE

www.vacuumlab.com: An on-line “Journal of Useful and Practical Vacuum Technology”, published on-line by Phil Danielson. No advertisements, no product selling, just plain old vacuum knowledge. We highly recommend it. It even includes an “Ask Phil” section where you can submit any of those vacuum questions that have puzzled you in the past. We encourage you to challenge Phil! At this point the website is completely free and open to the general public. 1. Robert A. Langley and Paul LaMarche, “Variable Valves/Leaks”, Vacuum Technology & Coating, April 2003, p.24.

2. R. A. Langley, et.al., ”Gas injection system for the Advanced Toroidal Facility”, JVST A7 (1989) 2423. Note: An elastomer seal, with piezoelectric actuator valve is described.

3. R. A. Langley et.al. , “A calibrated Variable Leak for use in ion Source Operation”, JVST A19 (2001) 673. Note: a pinched tube valve, compatible with H Voltage operation, is described.

Reference