AUTONOMOUS HOOVER BASED ON ARDUINO

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A B S T R A C T

The project aims to design an innovative automatic hoover. Target Operation is a household autonomous Hoover despite authentic control of the final robot. This paper gives out the effect of the enlargement of an autonomous mobile robot, designed as claimed by some new notion established in this field throughout the last decade. These principles can be set up in other work based on the positive approach, artificial life, and other bottom-up methodologies. These ideas have been applied to the complete robot design, spanning from the shape of the robot to the sensors, from the electronics to the software structure.

Keywords-: Arduino UNO, Ultra Sonic Sensor, Servo motor, Arduino Motor Shield, Gear Motor.

Introduction: - The domestic autonomous vacuum cleaner that cleans your home while you are outdoors doing some shopping, is an old wish and it may stay so for some time. Many companies and Research institutions have tried to develop such a robot, with only a few results. The lack of results is common to a large range of applications in autonomous mobile robotics and it is due to the complexity of the task and the limitations of the actual technology. Autonomous", in this case, does not simply mean that the robot has batteries, good computational power, and good behavioral rules, but much more. To move around, a path or doing a job like cleaning seems very simple for us and many animals. The difference between robots and animals is that animals use their brain to solve a problem, and we start to understand the complexity of these simple tasks when we analyze the complexity of the brain In the last decade, new approaches have tried to bring artificial intelligence" (AI) and the computer science community back to the real world to get better results in the field of autonomous mobile robotics. This field needs smart systems that are well adapted to their environment through their shapes, sensors, actuators, and behaviors. The embodiment of the system is important and brings a new and complex dimension to the problem of artificial intelligence.

This paper introduces AUTONOMOUS HOOVER which works on Arduino. Modern households are becoming more automated thereby delivering convenience and reducing time spent on house chores. While vacuum cleaners have made home cleaning easier, they are largely noisy and bulky for everyday use. It is therefore important to improve the technology of vacuum cleaning to reduce these deficiencies.

Here, we report the development of a compact and efficient vacuum cleaner robot for potential office and home use. The developed robot is rectangular-shaped, equipped with

vacuuming and cleaning technology, and controlled by Arduino ATMEGA microcontroller. It sucks the dirt and cleans the floor and two sweepers which are driven by a 5 V DC motor. The robot navigates via four motor shield-controlled rear wheels and a fan which is attached inside the bottle that sucks the dirt. An Arduino, placed detects apart, detects obstacles and subsequently helps the robot to navigate. The total current consumed is ~1102 mA. When fully charged, a 2200 mAh-capacity battery works continuously for two hours and cleans the floor efficiently. With this capability, the device will be deployed for office and home use thereby making cleaning a fully autonomous duty. Robot vacuum cleaners are amazing pieces of technology. These cordless, battery-operated devices can complete their mission autonomously by moving along the floor, detecting obstacles and surface variations. Not only must they provide powerful suction quietly and efficiently, they need to be equipped with various sensors and enough computational power to handle complex algorithms.

I. LITERATURE REVIEW

In the area of robotics, there are many automatic as well as manual-based cleaning robots. They have many different and unique features which are easy to use.

According to the survey, automatic hoovers are more suitable than manual-based machines. The automatic hoover is intelligently programmed that distribute the function of cleaning e.Dry and wet cleaning. The wheeled robots are autonomous.

They are independently planned to perform tasks to control all over tasks.

1) Robotic Vacuum Cleaner

1) **Hess, Jürgen, Maximilian Beinhofer, Daniel Kuhner, Philipp Ruchti, and Wolfram Burgard. "Poisson-driven dirt maps for efficient robot cleaning." In 2013 IEEE International Conference on Robotics and Automation, pp. 2245-2250. IEEE, 2013.**

This paper addresses the robot which is controlled by the Android application through Bluetooth module [10]. The application sends the information to the microcontroller to have control over the robot. The distance of the obstacles is detected using the ultrasonic sensors and the distance is displayed on LCD as well as on application. Here man controls

the overall operation indirectly. B. Bluetooth Based Automatic Floor.

2) **Irawan, Yuda, Muhardi, Muhardi, Ordila, Rian, AND Diandra, Roni. "Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor" Journal of Robotics and Control (JRC). (July 2021)**

This paper discusses information regarding several parts, namely an Ultrasonic Sensor, Motor Shield L298, Arduino Uno microcontroller, Servo, and DC motor.

3) **"Design and Manufacturing of Automatic Classroom Vacuum Cleaning Robot" by Aniket A Somwanshi; Sanjay B Matekar. Publisher - International Journal of Engineering Research & Technology (IJERT). (October 2019)**

Robot an electromechanical device automates the work process in many areas like industrial power plants, military applications, domestic work, agricultural applications, etc.

4) **"Design and Development of Automatic Cleaning and Mopping Robot" by P.S. Aditya; R. Tejas; V. Sai Varun; B. N. Prashanth. IOP Conference. (2019)**

This paper reports "how to minimize the cost of your robot". The design procedure for creating the cleaning robot is what they discussed at the start of the paper.
After this, we can choose the right electronic equipment

5) **"Vision-Based Dirt Detection and Adaptive Tiling Scheme for Selective Area Coverage" by Balakrishnan Ramalingam; Prabakaran Veerajagadheswar; Muhammad Ilyas; Mohan Rajesh Elara; Arunmozhi Manimuthu. Publisher-Hindawi. (December 2018)**

This paper discusses information regarding a visual dirt detection algorithm and an adaptive tiling-based area coverage scheme for a reconfigurable morphology robot. A three-layer filtering framework was used for Visual dirt detection, which includes edge detection, periodic pattern detection filter, and noise filtering.

6) **"Development of a vacuum cleaner robot" by T.B. Asafa; T.M. Afonja; E.A. Olaniyan; H.O. Alade. Publisher-Mechanical Engineering Department, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Nigeria. (December 2018)**

This paper helped us in this regard, as it talks about the model design, restrictions, and cleaning area along with the design and circuit layout interaction furthermore Performance evaluation of the prototype was easy thanks to this paper.
The basics of building an automated robot for cleaning have multiple blocks namely Navigation, Collision detection, vacuuming, and many more, each type of block and their interactions must be in sync for the robot to work properly without any error.

7) **"Lessons Learned from Robotic Vacuum Cleaners Entering in the Home Ecosystem" by F Vaussarda; J Fink; V Bauwens; P Retornaz; D Hamel; P Dilllenbourg; F Mondada. Publisher – Research Gate. (October 2014)**

This paper emphasizes how to deal with the faults of previous robotic vacuum cleaners, learn from them, and overcome these faults effectively by making necessary changes in the design of the robot.

8) **Journal of Innovation in Digital Ecosystems Volume 3, Issue 1, June 2016, Pages 37-43**

The path planning of cleaner robot for coverage region using Genetic Algorithms; June Journal of Innovation in Digital Ecosystems Volume 3, Issue 1, June 2016. Using genetic algorithms (GA), which provide an effective route to clean all accessible regions in the room environment.

9) **Dogo Rangsang Research Journal UGC Care Group 1 Journal Vol-12 Issue-06 No. 01 June 2022.**

Navigation using a random walk algorithm through which it could reach and clean every part of the area.

10) **Turkish Journal of Engineering – 2022; Design and implementation of a cost-effective vacuum cleaner robot Anıl Eren, Hatice Dogan Turkish Journal of Engineering – 2022; 6(2)**

Component Placement and Electrical System Layout, Random walk, and snake algorithms have been used as the navigation algorithm.

A. Methodology

The robot is designed keeping in mind the following modules of operation:

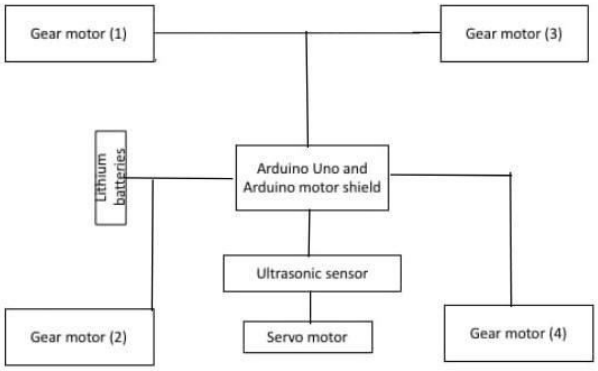
- Cleaning mechanism directional control with automatic obstacle avoidance.
- In-time monitoring.

The cleaning is inspired by the conventional stages of any sweeping operation, which are blended with the design and placed in the operational order of working

stages. It consists of four Gear motors connected with the wheels which are driven by Arduino.

Platform arranged in a rectangular shape to ensure efficient cleaning and collection of dust. The wheels are connected across the four ends of the Plastic lid using the gear motors. The cleaning is made efficient by a bottle joined over the lid and a sucker pipe, that opening starts from the front. This system employs a small bottle that carries a small fan under it which is driven by a 6V motor. This ensures a complete cleaning of the surface.

When the switch is on the Bottle sucks the garbage into it using the pipes.

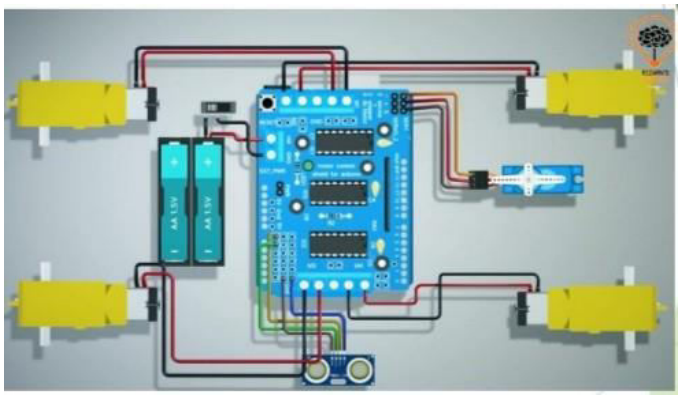


Movement

Direction control 60 rpm geared motors provide the necessary forward and backward motion on the floor, powered by 12V batteries, and the directional control is established using a programmable microcontroller ATmega328P. The ultrasonic sensor is fitted on the edges for obstacle detection.

B. Construction

The waste material Plastic lid is selected for the base since it is lightweight. The thickness of the lid is 4mm. The dimensions were decided according to the design requirements considering the complexity of construction and the overall weight of the setup. The steps carried out are explained as follows. Four 100mm (20 gram) diameter tiers are fixed in symmetry to balance the center of gravity of the Plastic lid. The Arduino UNO and Arduino motor shield is implemented over the lid using a glue stick. The Lithium battery of 5V supplies the power to the motor. And the plastic bottle with a fan sucks the dirt through the pipes connected to the opening of the bottle. The wheels are rotated using 60-rpm motors. This cleans the dust along the path that the vehicle moves rotated using 60 rpm motors. This cleans the dust along the path that the vehicle moves.

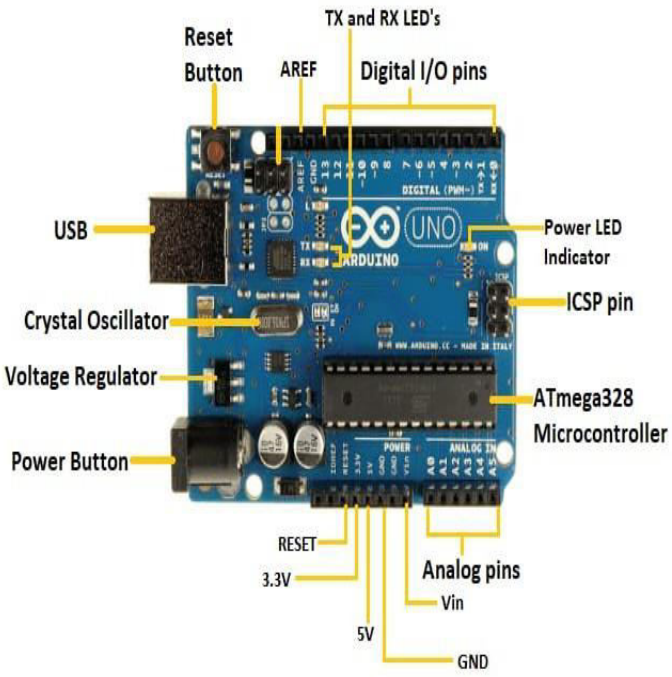


a. Arduino UNO

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again.

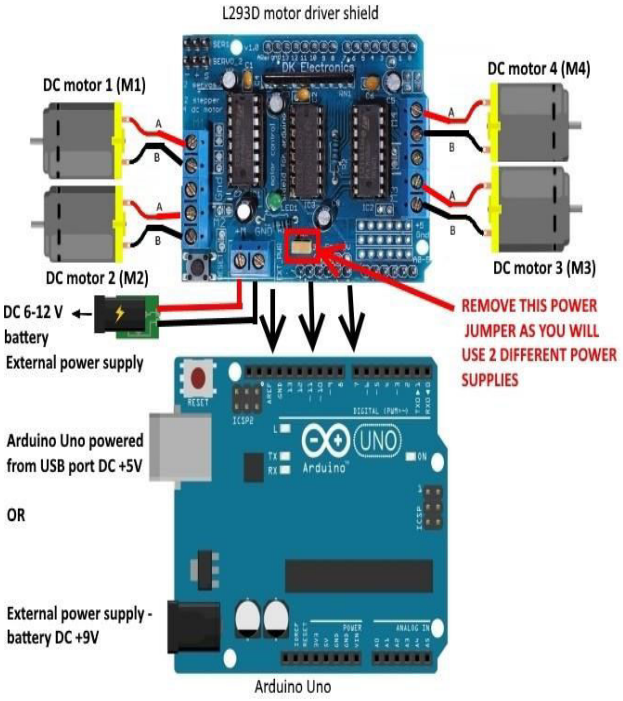
Features: - Arduino is a revolutionary tool in electronics. Its comprehensible hardware and software make it a great tool for learning and building DIY projects. It has also expanded its use in many industries due to its low cost and easy accessibility**.**

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage	7-9V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) (0.5 KB used by bootloader)
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz



b. Arduino Motor Shield

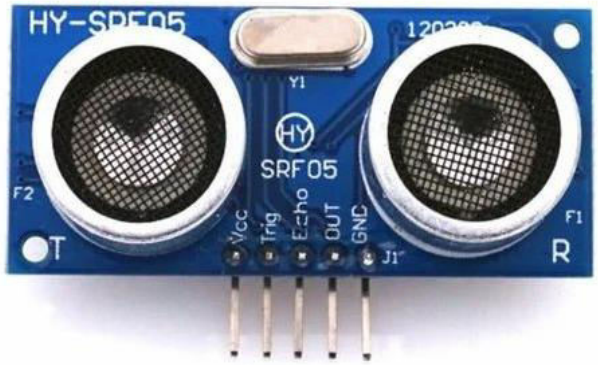
The Arduino Motor Shield is based on the L298 (datasheet), which is a dual full-bridge driver designed to drive inductive loads such as relays, solenoids, DC, and stepping motors. It lets you drive two DC motors with your Arduino board, controlling the speed and direction of each one independently. You can also measure the motor current absorption of each motor, among other features. The shield is TinkerKit compatible, which means you can quickly create projects by plugging TinkerKit modules into the board.



c. Ultra Sonic Sensor

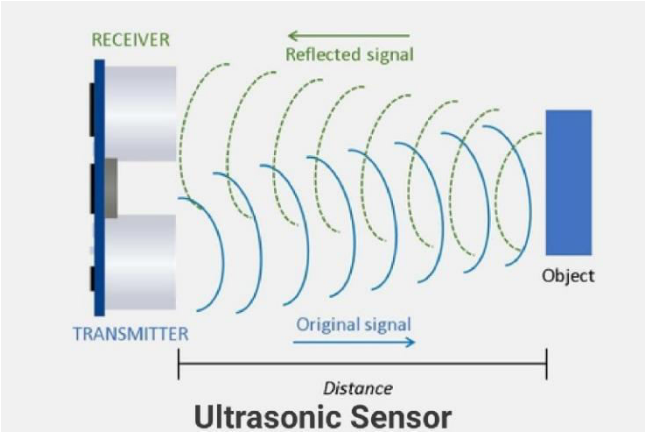
An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e., the sound that humans can hear).

Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has traveled to and from the target).



Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles (though the physical components are still affected by variables such as heat).

Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers (such as vats in chemical factories). Most notably, ultrasonic technology has enabled the medical industry to produce images of internal organs, identify tumors, and ensure the health of babies in the womb.



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