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AUTONOMOUS LEANING ROBOT BY USING IoT

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***Abstract*—** Cleaning the dust from the floor is one of the daily tasks that must be completed. This is a common practice not only at home, but also at companies and shopping malls. Due to the fact that dust-cleaning operations take a long time, other activities are sometimes disregarded. To eradicate this problem, we came up with this project based on cleaning mechanism, our robot can reach out to places where human access is not possible. Taking the advantage of advancements achieved in mechanical technology innovation have made human life much easier and more pleasant.

Today's clinics are becoming more sophisticated and automated. Homegrown robots are making their way into people's homes and daily lives, although the sector is still in its infancy. Regardless, a shift is expected, and the adoption of indigenous robots is moving forward. There are a few mechanical vacuum cleaners on the market, but only a handful of them can clean wet floors. Using a remote mechanical cleaning framework, this robot makes floor cleaning simple and rapid. This remote framework includes a transmitter app that sees a surge in demand for an android portable app that allows the robot to follow directions supplied by the client via the transmitter app. The floor cleaner robot is designed to make cleaning interactions easier than they would be if done manually. The main purpose of this project is to design and build a cleaning robot model using NodeMCU.

Keywords: NodeMCU, Moping, Servo, Robot, Automation.

I. INTRODUCTION

Cleaning is an important task that must be done meticulously in each location. This is simple at times and difficult at other times. We occasionally assign individuals for the purpose of cleaning and pay cash, and cleaning is occasionally required in areas where the presence of living beings is harmful, so we cannot relegate living beings in each location. Cleaning is occasionally required in regions where the presence of live beings is unsafe, thus we cannot allocate living beings in every place. Some locations have extensive floor areas, necessitating the use of more than one person to clean them, necessitating the use of a technique to mitigate these issues. A robot has emerged as a result of scientific progress, but it is still controlled by humans. More innovations are required to prevent exceeding the faculty limit. Automation is a novel solution to this situation. So, using the web of things and Arduino programming, we created a self-governing floor cleaning robot [5]. So, using the internet of things and NodeMCU programming, we created an autonomous floor cleaning robot. Because the ultrasonic sensor serves as the robot's eyes, it is the most critical component for autonomous floor cleaning robots. An ultrasonic sensor can be used to turn a robot by sensing an impediment or a wall. NodeMCU programming is used to set the robot's sensing distance range. In this range, the robot detects an obstruction and reverses direction. Today's households are growing smarter and more automated. People benefit from home automation because it provides ease and frees up time. Domestic robots are making their way into people's homes and daily lives, although the market is still young and undeveloped.

II. LITERATURE SURVEY

Y.-W. Bai and M.-F. Hsueh, "Using an adaptive iterative learning algorithm for planning of the path of an autonomous robotic vacuum cleaner," in Proc. IEEE Global Conference on Consumer Electronics, Tokyo, Japan, pp. 401-405, Oct. 2012. In this paper we propose the design of an autonomous robotic vacuum cleaner by using three-dimensional vector coordinates to guide its path. Our design is fully adapted to planning an effective mode for completing the cleaning task in an unknown environment. In addition we propose a dynamic return path for recharging, including the relative coordinates of the record starting point and the current position. The cleaner calculates the

distance from the location of the base and then plans the return path.

F. Vaussard, J. Fink, V. Bauwens, P. Retornaz, D. Hamel, P.Dillenbourg, and F. Mondada, "Lessons learned from robotic vacuum cleaners entering the home ecosystem," Robotics Auton. Syst., vol. 62,no. 3, pp. 376-391, Mar. 2014. We took a holistic approach to addressing these topics by combining two studies in order to build a common ground. In the first of these studies, we analyzed a sample of seven robots to identify the influence of key technologies, such as the navigation system, on technical performance. In the second study, we conducted an ethnographic study within nine households to identify users' needs. This innovative approach enables us to recommend a number of concrete improvements aimed at fulfilling users' needs by leveraging current technologies to reach new possibilities.

H-.J. Kim, H-.J. Lee, S. Chung, and C.-S. Kim, "User-centered approach to path planning of cleaning robots: analysing user's cleaning behavior," in Proc. ACM/IEEE International Conference on Human robot interaction, Washington D.C., USA, pp. 373-380, Mar. 2007. Current research on robot navigation is focused on clear recognition of the map and optimal path planning. The human cleaning path is, however, not optimal regarding time but optimal to the cleaning purpose. We have analyzed in this paper the cleaning behaviors in home environments and understood the user's path planning behaviors through usage tests of various vacuuming robots. We discovered that the actual user cleans with methods unique to specific areas of the house rather than following an optimal cleaning path.

III. SYSTEM DESIGN

In this proposed wireless robot begins by initiating a straightforward switch. It all the while begins cleaning and wiping the floor. It follows per set way beginning from one finish of the room lastly finishes the whole room cleaning. In the wake of arriving at the opposite finish of the room, robot alters its course and follows the way opposite to the past way. Robot changes the way in the event that it experiences a hindrance. It can likewise be constrained by cell phone utilizing a WI-FI.

The self-sufficient cleaner robot comprises of low force devouring electronic segments and it can work at exceptionally low force. Electronic parts are the regulator board NodeMCU, voltage controller IC and engine driver circuit. filtration framework which works under the guideline of constrained vortex stream same as in the event of radiating siphon. Radiating power will be made and a wide range of flotsam and jetsam will be sucked in through pipe. The benefit of utilizing this robot will saves time, it will be a lot of valuable for individuals with versatility issues to clean the house with no troubles. It is a straightforward and minimal effort robot [5]. The Block Diagram Basically, robotic cleaners are distinguished on their cleaning expertise like floor mopping, dry vacuum cleaning etc. Centrifugal force will be created and all types of debris will be sucked in through pipe. The advantage of using this robot will saves time, it will be very much useful for people with mobility issues to clean the house without any difficulties. It is a simple and low-cost robot. Floor cleaning robot is developed to make floor cleaning process easier. This can be used in power plant like nuclear power plants because in that places the harmful radiations are placed and cause serious health problems. To avoiding this, we can send a robot to perform the whole operation. In colleges and other places where large floor area is present, we can use floor cleaning robot to clean that areas. In industries we required cleaning in large areas as well as small areas and both areas can be clean without need of personnel. By this we can save money and time.

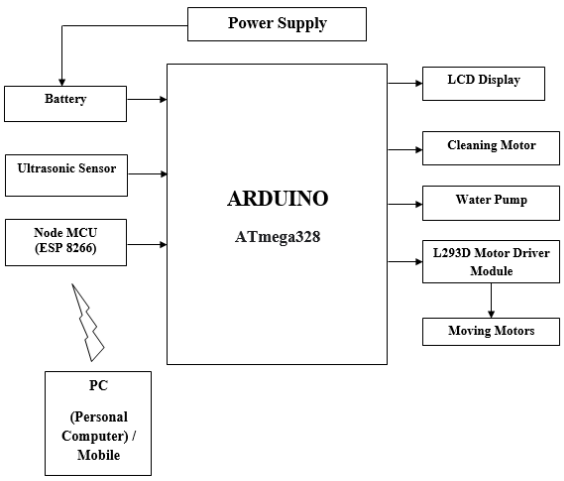

Figure: Block diagram

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The quantity of related contraptions will presently be shown. Select Node MCU from the leaning to get the advanced mobile phone together with Node MCU module on the beneficiary side.

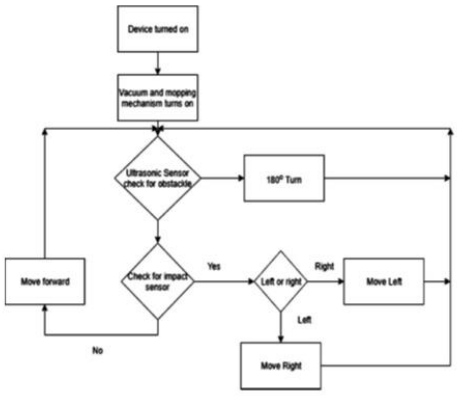

Figure: Flow Chart

V. HARDWARE COMPONENTS

The design of any system consists of Hardware requirements and Software development. Hardware requirement is focused on the components which are used for designing the project and Software development is focused on the coding which is loaded into the hardware.

a) Arduino Uno

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

Figure: Arduino Uno

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the bootloader); Ithas also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Table: Arduino Specifications

FEATURE	SPECIFICATION
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 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) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

b) Liquid Crystal Display

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

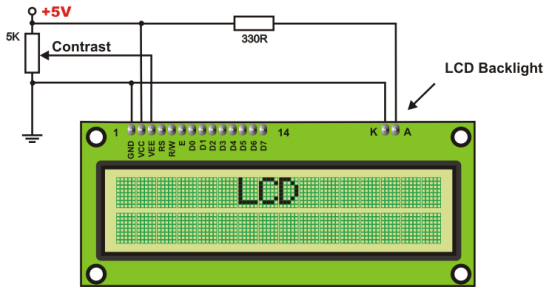

Figure: LCD Display

c) Dc Motor

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which

use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.

Figure: DC Motor

d) ULN Driver

The ULN2003 internally employs high voltage, high current darlington arrays each containing seven open collector darlington pairs with common emitters. Each channel rated at 500mA and can withstand peak currents of 600mA. Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout. ULN2003A is of 5V TTL, CMOS. These versatile devices are useful for driving a wide range of loads including solenoids, relays DC motors, LED displays filament lamps, thermal printheads and high power buffers. The ULN2003A are supplied in 16 pin plastic DIP packages with a copper leadframe to reduce thermal resistance.

Figure: ULN Driver

e) ESP – 8266 Node MCU

Espressif systems designed the ESP8266 Wi-Fi module to support both the TCP/IP capability and the microcontroller access to any Wi-Fi network. It provides the solutions to meet the requirements of industries of IoT such as cost, power, performance, and design.

It can work as either a slave or a standalone application. If the ESP8266 Wi-Fi runs as a slave to a microcontroller host, then it can be used as a Wi-Fi adaptor to any type of microcontroller using UART or SPI. If the module is used as a standalone application, then it provides the functions of the microcontroller and Wi-Fi network.

The ESP8266 Wi-Fi module is highly integrated with RF balun, power modules, RF transmitter and receiver, analog transmitter and receiver, amplifiers, filters, digital baseband, power modules, external circuitry, and other necessary components.

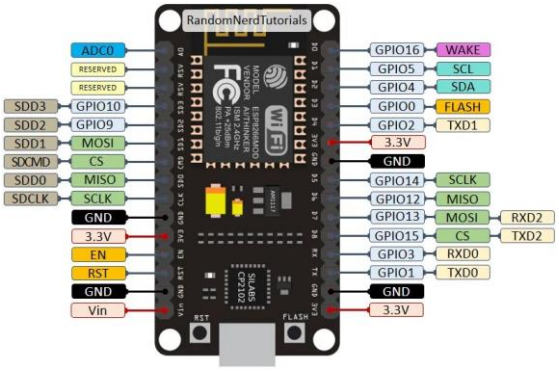

Figure: ESP-8266 (Node MCU) Module

Thing Speak Server

Thing Speak is IoT Cloud platform where you can send sensor data to the cloud. You can also analyze and visualize your data with MATLAB or other software, including making your own applications. The Thing Speak service is operated by MathWorks. In order to sign up for Thing Speak, you must create a new MathWorks Account or log in to your existing MathWorks Account. Thing Speak is free for small non-commercial projects. Thing Speak includes a Web Service (REST API) that lets you collect and store sensor data in the cloud and develop Internet of Things applications. It works with Arduino, Raspberry Pi and MATLAB (premade libraries and APIs exists) But it should work with all kind of Programming Languages, since it uses a REST API and HTTP.

Ultrasonic Module HC-SR04

The ultrasonic sensor works on the principle of SONAR and RADAR system which is used to determine the distance to an object.

An ultrasonic sensor generates high-frequency sound (ultrasound) waves. When this ultrasound hits the object, it reflects as echo which is sensed by the receiver as shown in below figure.

Figure: Ultrasonic sensors

BATTERY

A rechargeable battery, storage battery, or accumulator is a type of electrical battery. It comprises one or more electrochemical cells, and is a type of energy accumulator. It is known as a secondary cell because its electrochemical reactions are electrically reversible. Rechargeable batteries come in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network. Several different combinations of chemicals are commonly used,including: leadacid, nickel cadmium (NiCd), nickelmetalhydride (NiMH), lithium ion(Li-ion), and lithium ion polymer (Li-ion polymer).

Figure: Lead Acid Battery

V. RESULTS

Floor cleaning robot is developed to make floor cleaning process easier. This can be used in power plant like nuclear power plants because in that places the harmful radiations are placed and cause serious health problems. To avoiding this, we can send a robot to perform the whole operation. In colleges and other places where large floor area is present, we can use floor cleaning robot to clean that areas. In industries we required cleaning in large areas as well as small areas and both areas can be clean without need of personnel. By this we can save money and time.

A hardware prototype has been developed with the idea of making floor cleaning process easy, fast and comfortable, android mobile application for giving commands. The testing of the robot showed that it can achieve almost all the functionalities which were planned to implement originally. CLEAR can be used in autonomous and manual modes as per user's will. During its autonomous mode, this robot can be scheduled with a proper date and time. When that time comes this product automatically starts and cleans the whole room and counter check pattern[6]. When this robot completes the whole path it automatically cleans itself in the station from where it started cleaning. Moreover, manual mode is to save the energy of the robot and to clean the particular place. Customers are provided with the user friendly interface to operate the robot without any difficulty. Floor Cleaner Robot is intended to cause cleaning interaction to become simpler as opposed to by utilizing manual. The fundamental goal of this venture is to plan and actualize a story cleaning robot (which are utilized in emergency clinics) model by utilizing NodeMCU.

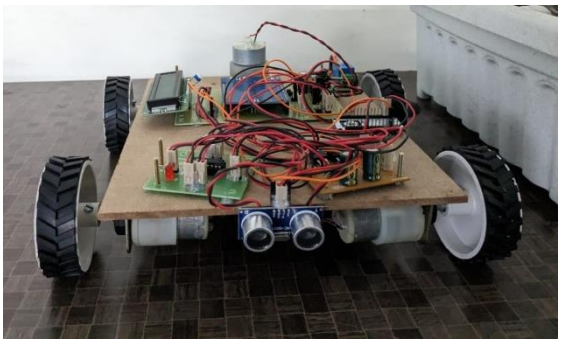

Figure: Hardware Prototype

CONCLUSION

In this paper, There are so many cleaning and wiping robots present in the market however just some of them are moderate and monetary. There are exceptionally less robots that incorporate both cleaning and wiping. With this work, we attempted to diminish the expense of the robot and make it more viable with the Indian Users and the Industries. To additional improve the route execution of the robot, input sensors, for example,

optical encoders can be incorporated. Cleaner brushes can be added to vacuum cleaning system to expand the proficiency of residue gathering. Lithium polymer batteries can be utilized to decrease the heaviness of the robot which can additionally prompt the decrease of force utilization.

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