

Multi-Tasking Auto Cleaner

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Abstract – In present scenario automation getting attention, for that robot purposely used to do task reliably. It reduces human interference. Cleaning is an important factor for betterment of the nation. Assorted robots are available in market but in this system extra arrangement is given in which dry & wet cleaning is provided in single model. In multi-tasking auto cleaner the main purpose is to provide efficient and flexible cleaning within short time duration. Different types of automatic cleaning robots are used for many applications to reduce human efforts. our system consist an assembly of mechanical, electrical, electronic related controlling components like Arduino, sensors, motor drives etc.

Key Words: Arduino, Mopping, L298N driver IC, Servo Motor, IR Sensor, Creo4.0

1. INTRODUCTION

Robotics is an inter-disciplinary branch of engineering and science that included the various branches. Robots are efficient, precise and can work continuously without getting tired. In every possible field robots can done the task reliably, it can be utilized for cleaning also.

The present scenario is that industries want to works on fully automated mode. It can be fulfil in sector of cleaning environment. Multi-tasking auto cleaner is design and implemented for eco- friendly use.

It utilised for a dry and wet cleaning simultaneously. In this system it consist an additional features that is Brushes, Rolling Mob with water storage tank, Vacuum Cleaner. It can be operated in dual mode automatically & manually.

Automatic operation is done by Arduino using Ultra-sonic sensors which detects barrier. UV Sensor are placed on the servo motor to detect obstacle in 180o. The wheels are assist to two geared dc motors which controlled by L298N driver IC for changing the direction according to the control inputs given to it. The main purpose of this prototype is for multi-tasking and this system is modified for cleaning.

1.1 LITERATURE REVIEW

In Cleaning the technology gets upgraded as per human requirement, the changing trend & advance level of technology is also necessary. It is increased per year 3 – 5%. In 2017 this technology ratio got increased by 23 %. Multi-Tasking auto Cleaner is design to work properly with

different mechanism. We focused on modifying method of floor cleaning system.

1.2 PROBLEM STATEMENT

Most of the people are not getting time because of their working schedule, so they don't have time for cleaning floors. Traditional cleaners consume more electricity for their operation just because of these reasons demand of auto cleaning system rises. To overcome this situations multi-tasking auto cleaner is provided & simultaneously electricity consumption reduces by making this system on DC operated.

2. SYSTEM METHODOLOGY

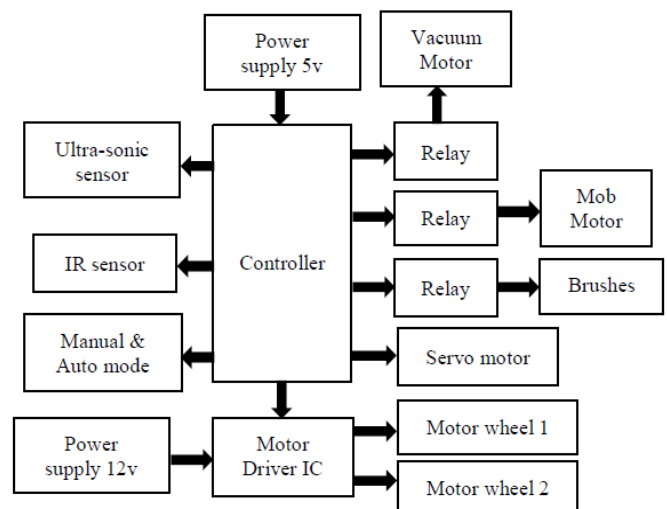


Fig -1: Block Diagram of Multi-Tasking Auto Cleaner.

2.1 VACUUM CLEANER

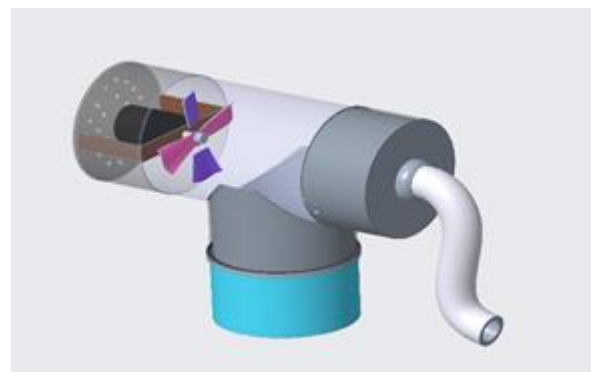


Fig -2: Vacuum Cleaner.

Vacuum cleaner is designed in compact size. For better result of suction & avoid the breakdown of blades fan is newly designed by steel blades. Vacuum cleaner is used for the dry type cleaning. The major part of vacuum cleaner is that the pressure here is below atmospheric pressure. In this Vacuum cleaner dust particles stored in dustbin. Size of dustbin can adjustable as required.

The components of vacuum cleaner are DC motor, fan, filter, dust collecting chamber, suction pipe etc. High speed motors are used since it has high speed at no load. It is light in weight which balanced torque to weight ratio at high speed. High speed motor is used to make centrifugal force for suction and collect the dust in dust chamber.

Table.1 Specification of Vacuum Motor

Parameters	Value
Operating Voltage	6v-12v
Current Rating	3A
Torque	770 g-cm
Speed in RPM	12000

2.1.1 BRUSHES

The brushes in robot are used to collect the dust particles from the floor which is sucked by vacuum cleaner. These Brushes are made up by plastic material. It can be operated in 360 angles with help of motor. The motor used for it are having 30 rpm speed & 6volt supply.

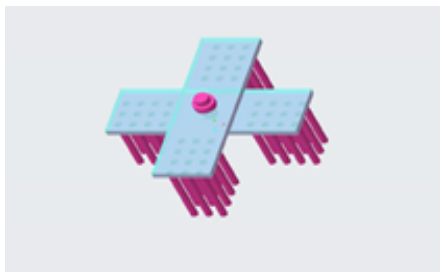


Fig -3: Brushes.

2.2 ROLLING MOB

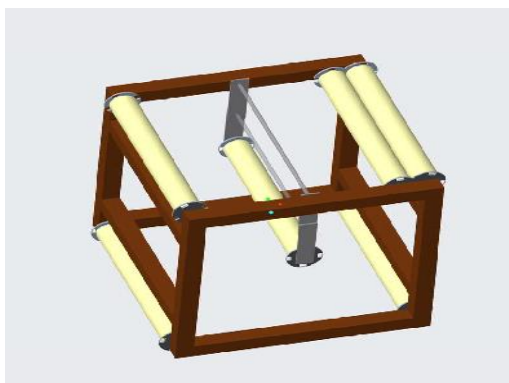


Fig 4: Rolling Mob.

The rolling mob is newly designed. It is easy to operate without any human interference. This system is suitable for cleaning the larger area. In this mechanism cloth replacement is less.

Rolling mob is used for wet cleaning of floor. Cloth is passes through water storage tank with the help of rollers. Motor is coupled to bearing which is placed inside the roller. All rollers are rotate simultaneously due to arrangement of rubber belt on roller. The cotton cloth is mounted over the rubber belt. It operates automatically by giving supply to the motor.

2.3 MICROCONTROLLER (Arduino)

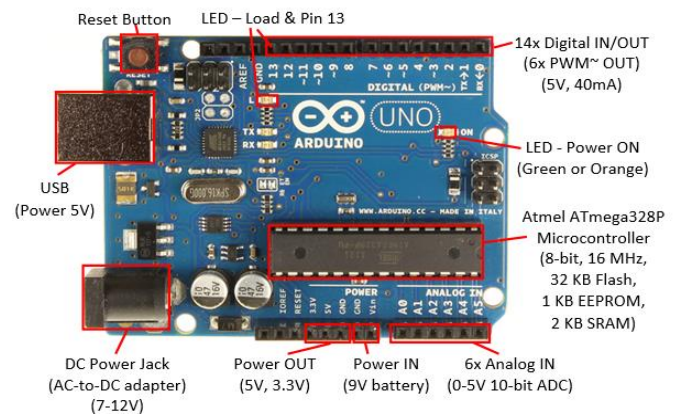


Fig -5: Arduino UNO.

The objective of control circuit is to give an automatic motion of the system. It is also makes all the parts to operate in proper sequence and for correct interval. It is powerful single board computer. It plays important role in automation; it acts as the brain of the system. It read the signal from sensors and processes data & controls the movement of system by giving signal to driver circuit.

The Arduino is based on AT mega 328 datasheet. It is operated on 5V, with the 32 I/O pin it also having 1Kbyte internal memory, 512 byte EEPROM, 16Kbyte flash memory. Arduino is open source platform to use hardware and software.

a) L298N MOTOR DRIVER



Fig -6: L298N Driver IC.

The L298N driver is integrated circuit of high voltage, high current, and dual bridge driver design to accept standard TTL logic levels and drive DC motor. An additional supply input is provided so that the logic works. H-bridge is used for driving the motors in both direction that is clockwise and anti-clockwise, and it also control the speed of motor.

Arduino cannot run motors directly, since motor requires higher current rating. Therefore driver IC is interfaced with Arduino controller which maintained the current of motor. The L298N driver IC having a 4 inputs pin 5, 7 on left and 10, 12 on right. By regulating this rotation of motor can be control by input logic provided to input pins Logic HIGH & Logic LOW.

b) MOTION CONTROL OF ROBOT

There are four wheels in this system in which two are motor wheels and two are mono wheel. This scheme is selected to reduce the no. of motors for wheels and for smooth operation in zigzag path. Big wheels with good rubber grip suitable for our system.

Table.2 Motion Control of Robot

Robot Movement	Left Motor	Right Motor
Straight	Straight	Straight
Avoid left edge	Stop	Reverse
Avoid right edge	Reverse	Stop
Backward	Reverse	Reverse
Right-rotating 180	Straight	Stop
Left-rotating 180	Stop	Straight

c) ULTRASONIC SENSOR



Fig -7: Ultrasonic Sensor.

Ultrasonic sensor has transmitter and receiver pair for sending and collecting signal for sensing obstacles. This sensor makes the system automatic, it controls the movement of system to avoid obstacle.

Ultrasonic sensor having 4 pins that is VCC, Trig, Echo, and GND. Power up the sensor by using VCC and GND. Input is applied to Trig pin it starts one cycle of range conversion and sends 8 bursts of sound waves from transmitter. As soon as the signal are transmitted the Echo pin goes to high level and remains in high level until the same sound waves are received by receiver .

$$\text{Distance} = (\text{Echo pulse width high time} * \text{Sound velocity} (340\text{M/S}) / 2).$$

d) SERVO MOTOR



Fig -8: Servo Motor.

A servomotor is a rotary or linear actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relative control. It is used in this system to increased accuracy of sensor to avoid the obstacle.

e) INFRA-RED SENSOR

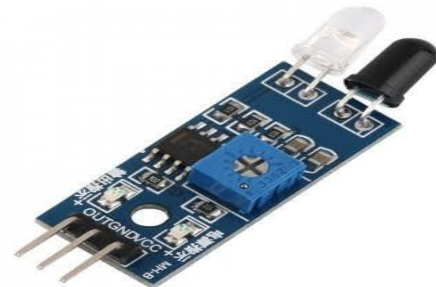


Fig -9: Infrared Sensor

We have use two pairs of IR LED and sensor for the controlling purpose and to eliminate falling down though the staircase. For that two IR sensors are placed at the bottom of robot at two front extreme ends. This sensor measures the ground clearance, if it exceeds than the set value then robot will stop automatically.

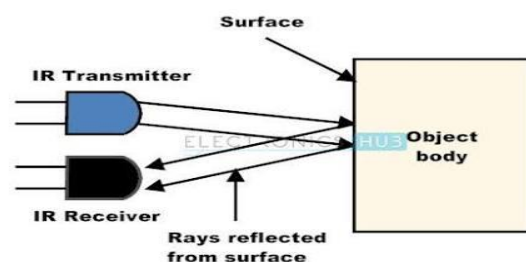


Fig -10: operation of IR sensor

2.4 SOFTWARE DESCRIPTION

In this system the following software are used

2.4.1 Arduino IDE

This software is used for programming purpose. The set of instructions are given in C language to the Arduino for operating robot automatically.

2.4.2 Proteus

The Proteus software is used for interfacing diagrams which can generate schematic captures. It gives the simplest representation of system connections to the operator.

2.4.3 Creo4.0

Creo4.0 is software supporting for design for discrete manufactures and is developed by PTC. It consists of apps, each delivering a distinct set of capabilities for use role within product development. In this robot creo4.0 is used to design the robot in 3D as shown in below 3D model.

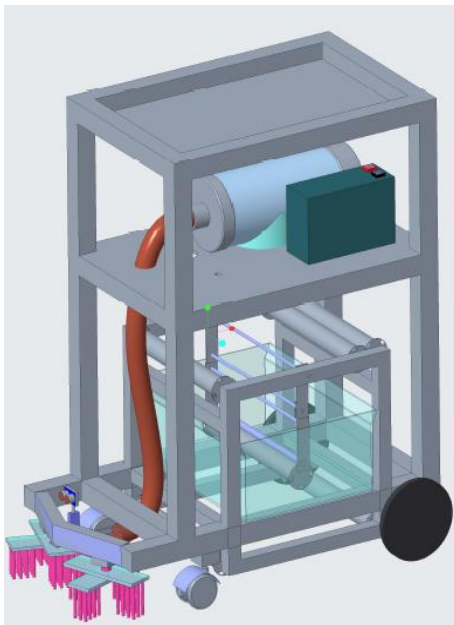


Fig-11: 3D Model of Multi-Tasking Auto Cleaner

3. CONCLUSIONS

Multi-Tasking Auto Cleaner is operated on DC 12v supply rather than AC supply. The charging circuit will consume less power for this system as compared to traditional cleaner, through this electricity issues will be reduced. In this system the three operations are done automatically with one hardware module.

It provides efficient cleaning, save time and reduced human interference. In future development can be possible to make this system on IOT.

REFERENCES

- [1] Robotics-FU, KS Gonzalez. R.C, Lee. C. S. G, Edition 9th Publisher – Tata MCGRAW Hill Publisher.
- [2] Robotics and Industrial Automation- R. K. Rajput Edition 1st, New Delhi, S. Chand Publisher.
- [3] “DESIGN AND FABRICATION OF FLOOR CLEANING MACHINE” Internal Journal of Innovations in Engineering Research and Technology [IJIERT] ISSN: 2394-3696 Volume 4, ISSUE 3, Mar.-2017.
- [4] Study of Multipurpose Road Cleaning Machine International Research journal of Engineering and technology [IRJET] Vol. 04, Issue 2, and Feb-2017. ISSN: 2395-0056 p- ISSN: 2395-0072.
- [5] Automatic Floor Cleaner- International Research journal of Engineering and technology [IRJET] Vol. 04, Issue 4, Apr - 2017 ISSN: 2395-0056 p- ISSN: 2395-0072.