

Vacuum Cleaning Robot

Prof.R.B.Pandhre¹, Mr. N.V.Kharche², Mr.A.P.Jadhao³, Ms.R.D.Mankar⁴, Ms.Sk Saleem Sk Gulab⁵

Department of Electrical Engineering^{1,2,3,4,5}, faculty of Electrical Engineering¹

Students of Electrical Engineering^{2,3,4,5}

Email: profpandhare@gmail.com¹, kharchenina@gmail.com², avi.jadhao12@gmail.com³,
radhamankar1995@gmail.com⁴, saleemmyself91@gmail.com⁵

ABSTRACT

In this paper, we implemented a human-friendly cleaning robot system for the domestic ubiquitous environment. Though conventional automatic cleaning robots already exist, these robots do not work in sync with humans. These robots' cleaning operations often obstruct a person in the home. Therefore, a robot that does not interfere with human activity in the home is required. What indicates human activity most in the home is the usage status of home appliances such as electrical appliances, doors, and lights. In our system, a robot can identify where humans are active by receiving the usage status of home appliances via a network. The usage status of home appliances changes the robot's running pattern and consequently the robot avoids humans and cleans without causing obstruction. We conduct an operational experiment of our prototype system in a room in which some sensors are installed to create an experimental environment. We then measure the execution time of the prototype system. From the results of experiments, it is found that a cleaning robot system which works through interaction with equipment in the home and does not disturb humans can become a reality.

Keywords—cleaning robot; obstacle avoidance: rectangular path algorithm; sensors;

1. INTRODUCTION

In the present era, people live a very busy life. People in cities have long and irregular working schedules. For career oriented and working women it becomes challenging to handle home and office work together. For saving the time the requirement was of House Cleaning Robot, which is an automatic system that works and cleans on its own without human control/intervention. The idea of cleaning robot is not a new idea but it is very vast. An implication on cleaning robot was done by using various techniques such as by using Rasp-berry Pi, Arduino also by using the 8051 microcontroller. Every implication was having advantages and limitations too. On the basis and study of those limitations new inventions were carried out. Here in this project we are using PIC controller. The innovation in this project is obstacle avoidance. Here we are using sensors to detect the obstacles. The cleaning robot uses a microcontroller to detect obstacles and manipulates its direction as per the input from sensors mounted in front; right and left of the robot and the distance will be rerouted automatically.

2. LITERATURE REVIEW

Cleaning robot is not a new concept in these days. Even each design gives efficient results. Each design has some different manufacturing process; accordingly same advantages and disadvantages too related to specific designs. But all these designs are not human friendly. By

reviewing different papers and technique of implementation used for each design we have started working on our design of cleaning robot which is based on PIC controller and working on Bluetooth model. The papers studied for literature review are as follows:-

1. "A Technological Survey On Cleaning Robot"[1]

Based on Arduino. A large contact sensing material sensors are mounted on the front half of the unit. An omnidirectional infrared sensor at its top front centre. The algorithm used is spiral algorithm. Spiral filling paths cover the area starting from the outside and going towards the centre.

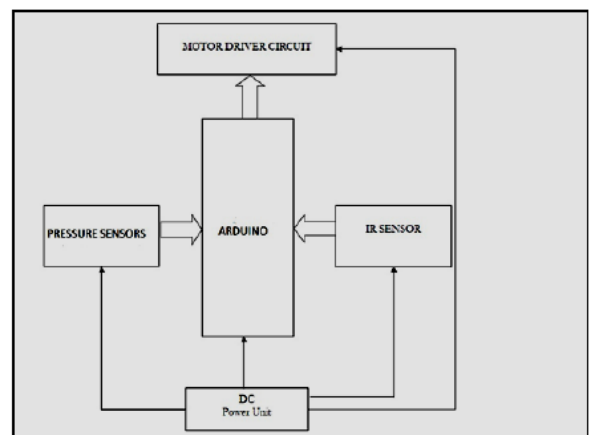


Fig 1 : Block Diagram of Cleaning Robot Using Arduino.[1]

2. “Design And Development Of Floor Cleaning Robot”[2]

Based on AT89S52 Microcontroller. RF modules are used for wireless communication between Robot and Human. Robot follows spiral algorithm. UV sensors are used for obstacle detection.

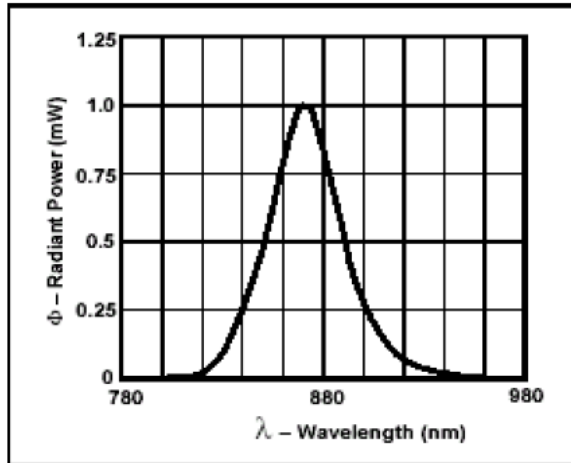


Fig 2 : Radiant Power vs Wavelength of IR sensor [2]

3. “Building A Mobile Robot For A Floor Cleaning Operation In Domestic Environment”[3]

The mechanical design of a cleaning machine for domestic use must be ergonomic and small enough to move around typical obstacles in a household room, and must be lightweight for easily transportation in case of unexpected problems. Therefore, several different problems have to be solved: the safety, the efficiency of the cleaning element, the configuration of the driving elements, the sensors selection and placement and the battery recharge operation.

4. “Straight Line Path Following In Cleaning Robot Using Lateral Ultrasonic Sensors”[4]

The methodology used in this paper is robot follows the straight-line parallel path. The sensors used are ultrasonic sensors. The procedure has been tested in a limited set of cases in unstructured scenarios and some problems have been detected in the presence of rounded objects and some desk chairs.

Problem Description

To find out and design an autonomous robot that will help people at home who are very busy for daily or weekly cleaning, especially for families with children. In particular for the elderly who live by themselves or in old age homes and do not have the strength or ability to clean. Robotic vacuum cleaners available in the market are expensive and inefficient in terms of cleaning time and cleanness. The goal is to design the robot with infrared sensors,

bristle brushes on every side to improve the cited cleaning performance problems using PIC controller.

Proposed Design

In this phase, the requirement is to specify the details of the proposed design should have.

- What is the total Power Requirement?
- What types of sensors are used?
- How it can be controlled?

Fabrication of Robot

It is designed to move the robot in forward, right, left and reverse direction. The controller and vacuum cleaner attached to the robotic arm are processed locally.

Programming Required

Following the fabrication process stage, it is required to program the PIC controller in C language. The programming also involves the design of interface of various secondary components required.

Power Scheme

The robot would be operated by using carrier mounted batteries and power two power supplies. Two batteries are connected in series to supply to DC motors driving the wheels. 12V supply is converted to 5V (for circuitry) voltage regulator.

3.BLOCK DIAGRAM OF THE MODEL

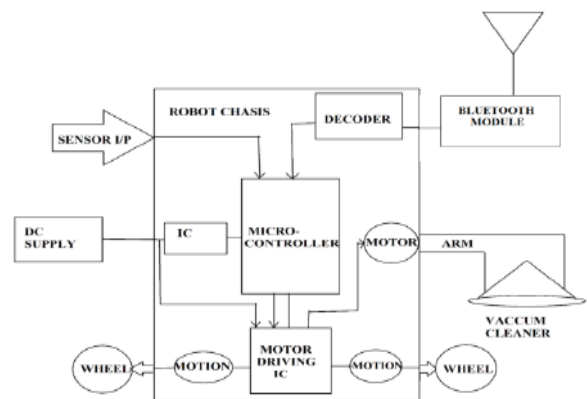


Fig 3 : Block Diagram of the model

The block diagram is shown gives pictorial representation of proposed robot. It shows how the components must be connected to fulfill the desired task. It describes the circuitry and clarifies the idea of the robot chassis. It shows the main structure of cleaning robot which consists of power sources, dc motors, rotating

brushes, vacuum cleaner. The heart of the robot is microcontroller. Microcontroller reads data from sensors and accordingly action has been taken. It is given dc supply as an input, an IC is used to smooth dc input to the microcontroller. As per the inputs received from sensors, microcontroller drives dc motors and hence the arm by which cleaning operation will be done successfully

4. CONCLUSIONS

In This paper, rectangular algorithm with low-cost sensors is presented for efficient cleaning purpose. The results presented in this work have been obtained using only one robot manually build and thus no generalization can be directly assumed for an hypothetical industrial massive production. However, the results for this particular realization shows the good accuracy of the designed ultrasonic driver that has been tested and used for lateral positioning error correction and map building. A, prototype of the rotating brush device is made manually to ensure the cleaning effect of the proposed system.

REFERENCES

- [1] Abhishek Pandey , Anirudh Kaushik , Amit Kumar Jha “A Technological survey on Autonomous Home Cleaning Robot”, April 2014
- [2] Marneet Kaur , Preeti Abrol “Development of floor cleaner robot (automatic and manual)”, July 2014
- [3] J. Palacin , J.A. Salse , X. Clua “Building a Mobile Robot for a Floor-Cleaning operation in Domestic Enviornments ”, May 2003
- [4] J. Palacin , X. Lasa , S. Marco “Straight Line Path Following in Cleaning Robots Using Lateral Ultrasonic Sensors” , May 2003
- [5] Zhangjun Song , Huifen Liu , Jianwer Zhang , Liwer Wang , Ying Hu “A Localization Algorithm for Low-Cost Cleaning Robots Based on Kalman Filter” , July 2010