

Roller Based Interior Wall Painting Robot

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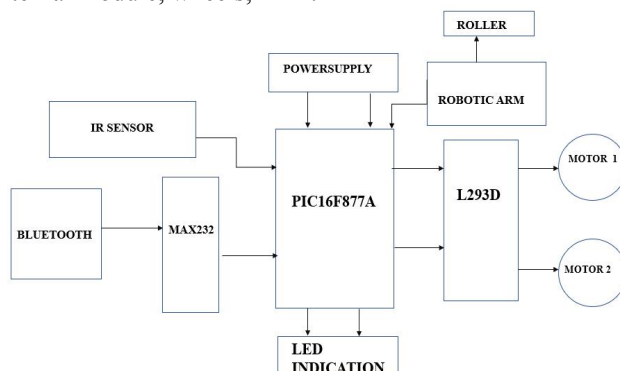
Abstract—This paper describes the development of an autonomous robot for painting the interior walls of buildings. The robot consists of a painting arm with an end effector roller that scans the walls vertically and a mobile platform to give horizontal feed to paint the whole area of the wall. Ultrasonic sensors are attached to the mobile platform and used to maintain a certain distance from the facing wall and to avoid collision with side walls. When settled on adjusted distance from the wall, the controller starts the painting process autonomously. Simplicity, relatively low weight and short painting time were considered in our design. Different modules constituting the robot have been separately tested then integrated. Experiments have shown successfulness of the robot in its intended tasks.

I. INTRODUCTION

Wall painting is a repetitive, time consuming, exhausting and hazardous process which makes it an ideal case for automation. There is a need for a mobile robot that can move to paint interior walls of residential buildings. In this paper, the design of an automatic wall painting machine is described consisting of a robotic arm that scans the walls vertically and is fitted on a mobile robot base to give the lateral feed motion to cover the desired painting area. The design objective is to satisfy the criteria of simplicity, low cost, light weight and fast painting time. Ultrasonic sensors are fitted in front of the arm and the mobile base to adjust the motion of machine. A control system is used to guide the arm motion and plan the mobile base motion.

II. BLOCK DIAGRAM

The block diagram gives a clear idea about important parts of the wall painting robot. Here the important parts are micro controller, power supply, IR sensor, motor, driver IC, roller, external module, wheels, LED.



Micro controller is the brain of the system which will control the complete system in response to the external, module and sensor controller through receiver. Battery is the power supply for the system. Four motors are used to motion of automatic wall painting robot. The roller part is arranged above the wheels.

Components

The main parts used in this robot is PIC (16F877A), L293D motor drivers- can drive two motors, DC motors. The process is carried out using the robotic arm. The motor parts in the arm enable the robot to rotate in the desired directions, microcontroller programming is done to drive the motor, and roller is used to paint the desired location.

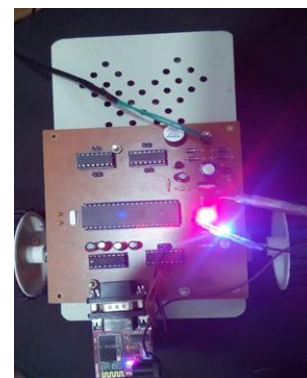
A. Robot Arm

The robot arm has the capability to paint the wall by holding the roller or brush. In order to paint the wall, roller or brush has to slide up and down. 2 DOF arm is used.



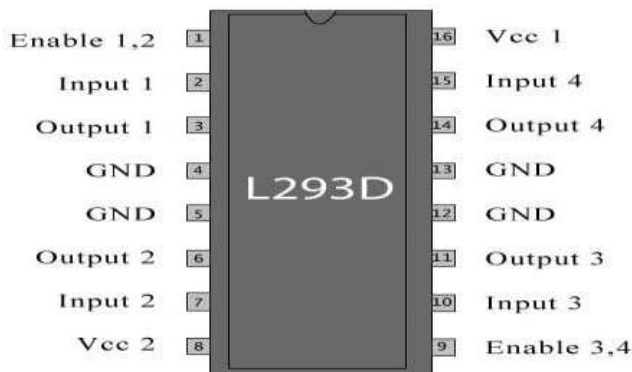
B. Base structure

The base part consists of four geared motors to drive the wheels; so that it can rotate all around the required directions. L293D DC motor driver is used to run the DC motors. it can drive two motors. The robotic arm part is fixed above the base frame.



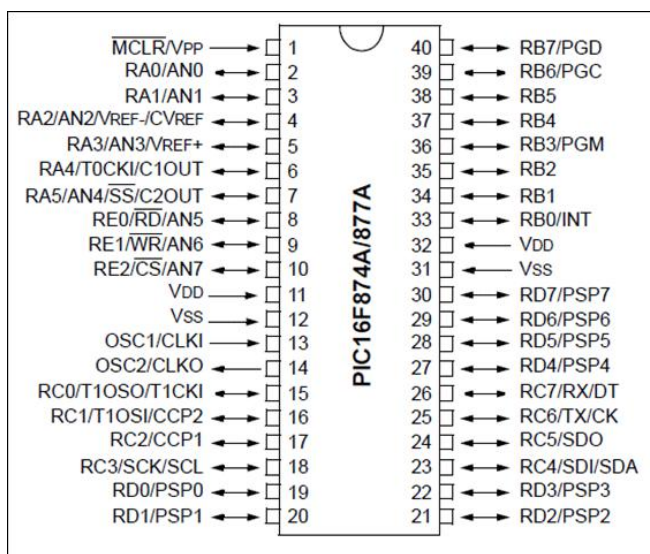
C. L293D Motor Driver IC

L293D drive 2 independent DC motors in both the directions with speed control. The driver greatly simplifies and increases the ease with which you may control motors, relays, etc. from microcontrollers. It can drive motors up to 36V with a total DC current of up to 600mA. It is a 16 pin IC. It works with H-Bridge principle. Prevents back emf.



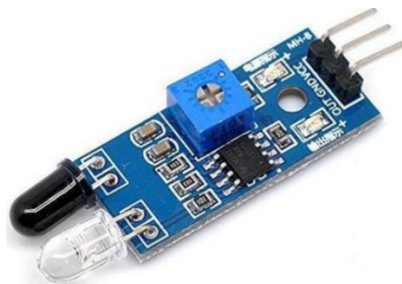
D Micro controller

This project uses PIC16F877A microcontroller from PIC micro controller family. It is a 40 pin IC. 33 pins from this are of I/O pins. That is 5 I/O ports are present.



III. OBSTACLE DETECTION

IR sensor is used to detect wall and obstacle during painting. An IR sensor is an electronic device that emits in order to sense some aspects. It has built in IR transmitter and IR receiver that sends out IR energy and look for reflected IR energy to detect presence of any obstacle in front of sensor module



IV. EXPERIMENTAL RESULT

Here we use an android application for manually controlling the robot if any problem takes place in automatic section. When power is ON the robot move forward from right side of the wall. If robot close to the wall the IR sensor detects before

10cm distance from the wall (set by program). After the detection of the wall the arm rotates left and dip to the paint and face the wall then starts the painting 5 times by up down mechanism. When it completes the process, it moves in reverse direction and turn left and move forward towards the wall. Again, it continues the process till any obstacle or edge is detected by the IR sensor which connected to arm.



V. ADVANTAGES

Our proposed project has better efficiency and higher productivity. It also improves labors safety. Also, very low power consumption rate.

VI. CONCLUSION

With the above-mentioned sections, we have presented a detailed outlook of the robotic wall painter, a roller paint based automatic wall painter with remote input from the user, also can manually control. The prototype was designed with mechanical and electronic models. The system has turned out to be low cost and highly effective automatic painting mechanism.

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