

Wall Painting Cleaning and Dampness Detecting Robot

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Abstract—Interior wall painting is a common work in construction which consumes a lot of time and human effort. By replacing human manual operation, robotic painting was introduced to improve the accuracy, efficiency and to reduce the cost. In this paper, we introduce an autonomous wall painting and cleaning robot which can paint the interior walls of a room, using paint sprayer. The cascade lift mechanism assists the paint sprayer to reach the required heights. The wheels with dc motors that are attached to the base of the robot, helps in easy movement of the robot, to move in all six directions. The robot uses ultrasonic sensors to detect the distance and adjust to the walls, and to check whether the sprayer reached the top of the wall. The Raspberry Pi controller controls the ultrasonic sensors, wheels, and all other parts of the robot. As buildings are constructed with materials which have an ability to resist the effects of water for their lifetime, if these materials are irresistible to water then it causes breakage in buildings, these can be avoided by checking temperature using Image Processing and comparing with the normal temperature and thus dampness can be detected.

I. INTRODUCTION

The system proposed below, is expected to solve the major challenge that a paint robot may face on how to implement a design on a given wall. Also, the techniques employed by the system are expected to provide much better paint finishing when working on walls with varying roughness. The system has two degrees of freedom, along the z-axis and either the x or the y-axis. The system is expected to improve the overall cost factors of the painting job. On the contrary, the time factor of the paint application when compared to the humans working on the same depends greatly on the type of paint operation to be performed. If the paint is too applied just as a single paint over the complete wall, the system is expected to perform faster when compared to the human labor, but as far as, implementing complex designs are concerned, the time factor is expected to be higher because of the various curve planning, along which the paint operation is to be performed. The dampness of the wall is detected using Image Processing technique and the masking technique is used to color the wall with required colors.

II. OBJECTIVES

1. To design a prototype of wall painting robot.
2. To design robot to paint on specified area of the wall with no barrier using a mounted spray gun.
3. To make simple machine structure to enable easy mounting as well as for safety.

III. LITERATURE SURVEY

A. Automated Exterior Wall Painting Robot Using Raspberry Pi

In this paper the proposed system is programmed to move around. To paint wall efficiently the exterior wall painting robot has been developed also to paint uniformly to reduce cost of the wall which takes only cost of manufacturing. This robot is used to save humans from injuries that have been caused during painting of higher position in apartments.

B. Vision Based Wall Following Framework: Cleaning Application

The author has designed a robot to detect obstacles and helps in cleaning the wall surface that has been frequently touched. Also the robot will differentiate the obstacles and the wall that has to be cleaned using image processing technique.

C. Diagnosis of Rising Damp and Salt Attack in Residential building

The authors have identified the predominant salts that are responsible for dampness in the buildings. As buildings are constructed with the materials that have a tendency to resist the effect of water throughout their durability if they are irresistible then dampness will occur. The color of the walls after the occurrence of dampness has been noted here.

D. Design and Development of Wall Climbing Robot and its Control System

They proposed a complete coverage module that climbs through the walls. This robot is designed to navigate on smooth vertical surfaces with the capability to avoid obstacles and overcome if the height is about 1cm. In this paper, various aspects of prototype design and development of the Climbing Robot are conveyed including the body, leg, feet design and gait dynamics.

IV. METHODOLOGY

One of the most important features of the project is designing the system. The design part provides all the different elements of the system such as architecture and components. System design solves the problem by splitting the components of the complex system into smaller components and will perform and operate on each individual component. The overall system consists of Raspberry as a heart of the system is to be interfaced with two ultrasonic sensors, L293D Motor driver and DC motors. On setting the condition of ultrasonic sensor value within the required limit it automatically follows the wall without any human intervention. If it is greater than the value that has preprogrammed, it automatically changes its path. It is a prototype to build more application based on object follower based on distance with the help of image processing technique.[1][8]

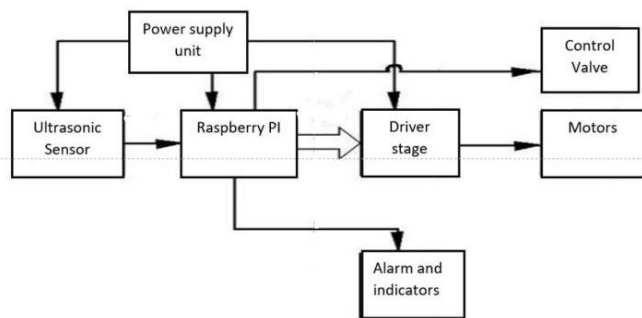


Figure 1: Block diagram

If the wall is away from the robot the raspberry pi camera will detect it and sends the signal to the motor driver, which controls the motor speed and direction. The software within the raspberry pi is used to determine the path towards the wall and sends the signal to the spray paint assembly which in turns starts spraying the paint to the wall. The alarm and indicators give the feedback indicating that the wall is too far away from the robot and need physical attention to guide the robot towards the wall. Control valves helps to clean the large walls using image processing and also the sensors in control valves will be used to detect dampness. [10]

A. Method used to detect dampness in the wall

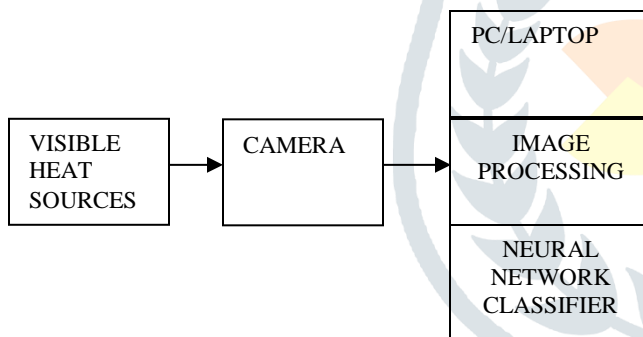


Figure 2: Using ML to detect dampness

With the help of camera, images of visible heat sources, wax candle, furnace etc. will be taken. The images and respective temperature will be record and this is used as database for further processing. The next part is image segmentation, in this image will be segmented into different parts according to the temperature similarity the dampness level will be detected.

B. Masking Technique for Coloring

The raspberry pi camera is connected to Raspberry pi module, with the help of this camera image of the object will be captured and checked for obstacle or wall. If the captured image is an obstacle robot will take 90-degree turn and make a path to avoid the obstacle. If the captured object is a wall then the program moves to the next step. The next step of the code is to check the wall is painted with the specified color or not. For color identification, masking techniques are used. In this

technique, masking of another color check for specified color is on the wall is done, if it is already present it will show that area as white and all other areas as black vice-versa. If all parts of the wall is white then the painting is already done on that particular wall and robot will move to the next position. If the area is not painted it will start to paint the wall with the help of hardware. [9]

V. CONCLUSION

Development of an Autonomous wall painting robot uses simple components like a sensor, a driver circuit, and a DC motor. We can design a robot that performs a wall painting, cleaning and dampness detection operation. The proposed Real time Project will be designed to automate the interior walls painting process, making it easier and more efficient. This design is simple and relatively easy to implement in comparison with the remainder of interior wall painting robots. Adding to that, the stability of its structure, and the fact that it can be built using any other material, judging by its availability, affordability, and following the needed specifications. A method has been developed for automatic spray painting of unknown parts. This machine is very useful for painting of any shape with very time period less. Accuracy of this machine is more as compared to manually painting. It also saves the labor cost and the total cost of painting the any jobs. The methods of painting and intends to enlighten readers and artists alike with knowledge of modern art techniques as well as forgotten techniques of the painting technology.

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