Automated Robotic Equipment For Wall Painting And Sensing

Abhishek.R.Patil [1], Poonam.N.Patil[2], Mukesh.B.Chavan[3], Rohit.R.Kumbhar[4], Abhijit.T.Patil[5]
[1, 2, 3, 4, 5]Department of Mechanical Engineering
[1, 2, 3, 4, 5]Vishveshwarya Technical Campus, Patgaon, Maharashtra, India

Abstract-*Painting forms a major operation in an construction of domestic as well as commercial buildings. With the advancements in technology, it has become inevitable to harness the power of automation in every aspect of life. This paper briefly discusses automated wall painting equipment for wall painting and sensing. The developed machine is able to paint the wall automatically using vertical lift to travel vertically and move the platform horizontally. Further the machine is equipped with wall sensing system to smartly detect the windows and automatically shut off the painting system in window area thus saving the paint.*

Keywords-Automation, painting, wall, window, vertical lift etc.

I. INTRODUCTION

Despite of widespread reach of technology and advancements in automation, Construction work has been neglected from automation point of view. Painting is one the major process for construction and is almost done by everyone from domestic to commercial projects.

Today wall painting is usually done with the painting rollers which are dipped in the painting bucket and rolled over the wall which applies the required paint to the wall. Using this method painting can be done faster compared to conventional brush painting, but is ineffective compared to spray painting.
Before the widespread use of rollers which are far more effective and increase the painting speed, the painting was usually done with the help of brushes. This was time consuming and more a work of skill. The painters need to be more skilled for using the brushes and the time required to paint the entire house or wall using the brush was more. Also too much of paint was wasted in dipping the brush every time in the paint bucket and the coat of paint applied was also non uniform.

In comparison to the brushes the rollers which are used for painting, which are the widely used for domestic and commercial wall painting equipment's today are more effective. The amount of time required for painting using rollers is very less as compared to the brushes. Nut the amount of paint required on the other hand is more and the uniformity of the paint cannot be achieved.

With the invention and advent of paint spraying equipment's, the painting work has become easy and saves lot of time. This is very advantageous over the painting using the painting brush. Using brush not only consumes time but is requires more skills. Thus spray painting is not only faster method but is also to use and is more effective over the other painting methods employed.

This paper discusses the utilization of spray painting system to automate the painting task. The machine is developed with a spray gun incorporated onto the machine. The developed machine consists of vertical lift and a horizontal travel system, which makes the spray gun to travel horizontally as well as vertically to perform a painting operation automatically..

II. LITERATURE REVIEW

There is a lot of research work going on in this field since past few years. Referring to those we wish to expand the study and implement automation in painting.

Warszawsky [1] and Kahane [2], developed a robot forinterior finishing tasks named "TAMIR", and was used in four interior finishing tasks namely; painting, plastering, tiling and masonry

A scaled down robot setup for interior wall painting together with a multicolor spraying end tool were implemented by Naticchia [3], [4], [5], and claimed to work in full scale without reduction in performance.

A full scale mechanism for ceil painting was introduced by Aris [6]. It had 3DOF without considering those of the platform, a working envelope of (84cm by 72 cm by 122 cm). Significant improvement in painting time and cost had been reached where 46 m of ceil were painted in 3.5 hours which is 1.5 times faster than manual painting.

III. PROPOSED RESEARCH WORK

This Paper discusses the research work carried out on development of automated machine for wall painting and sensing. The research involves firstly carrying a deep study of existing wall painting equipment available in the market and practices followed currently. This involves carrying out a deep literature review of current practices available in the market. After this the material survey will be done to find out the best suitable materials for project. This involves choosing a proper material for chassis of the robot, Choosing a appropriate drive train , calculating the power requirements, choosing proper motors drivers , and choosing a proper controller board.

After this the logic will be developed to paint automatically by using a controller board and then this logic will be tested. The logic for painting will be improvised by revision till the required performance is achieved.

The program will be developed and the system will be fabricated so that it can paint the wall automatically.

The working principle of the proposes robot is easy to implement for practical purposes on commercial scale also. This project consists of development of a base robot platform. This platform is movable using the drive system provided to it and forms the base for incorporating all other components. Initially the user of this robot has to place to robot in one corner of the wall to be painted. After initiating the painting operation by pressing the button on the robot, the robot starts painting. The robot consists of a spray painting equipment mounted on a vertical travel mechanism. When initiated the robot starts painting by activating the spray equipment. Simultaneously the vertical travel system is also activated which moves the spray gun automatically upwards, thus painting the complete vertical portion of the wall the robot is placed. After painting the complete vertical portion, the robot base moves forward automatically to paint the adjacent portion. The figure shows the line diagram of the robot.

III. METHODOLOGY

The following research methodology was implemented through the research work which is discusses in this section.

1) The chassis and the drive train:

The chassis and the drive train forms the integral component of the project. The chassis consists of frame on which all the components are mounted and the drive train is responsible for moving the robot forward when one pass of painting is complete.

2) The electronic components and the microcontroller board:

Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. A Sensor converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) into a signal which can be measured electrically.

Sensors are used to detect the presence of wall and the data is fed into the microcontroller board.

The microcontroller board is responsible for handling all the automation. It initiates the painting operation, signals the vertical traverse as well as moves the robot forward.

The microcontroller used here is ATMELS AVR ATMEGA MICROCONTROLLER. A microcontroller (sometimes abbreviated µC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

The Atmel AVR is a CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega achieves throughputs approaching 1MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.

3) The vertical travel system:

This system consists of mechanism for elevating the Painting equipment and lowering it in response to the signals from the microcontroller.

IV. COMPONENTS USED

The following components were used for development of this machine.

- **The paint zoom professional spray paint system:**

This is used to spray the paint and will be used for actual painting operation. This is mounted onto the vertical lift fabricated

- **Relay Board**

The relay board is used to control the motor of the machine. The motor is connected to the drive train and the drive train is connected to the shaft. The relays drive the motors based on the commands received from the microcontroller.

- **Microcontroller board**

The microcontroller board is the heart of the project and the microcontroller is responsible for the total automation. The program fed in the microcontroller checks of the different states of the machine and performs the spraying operation automatically.

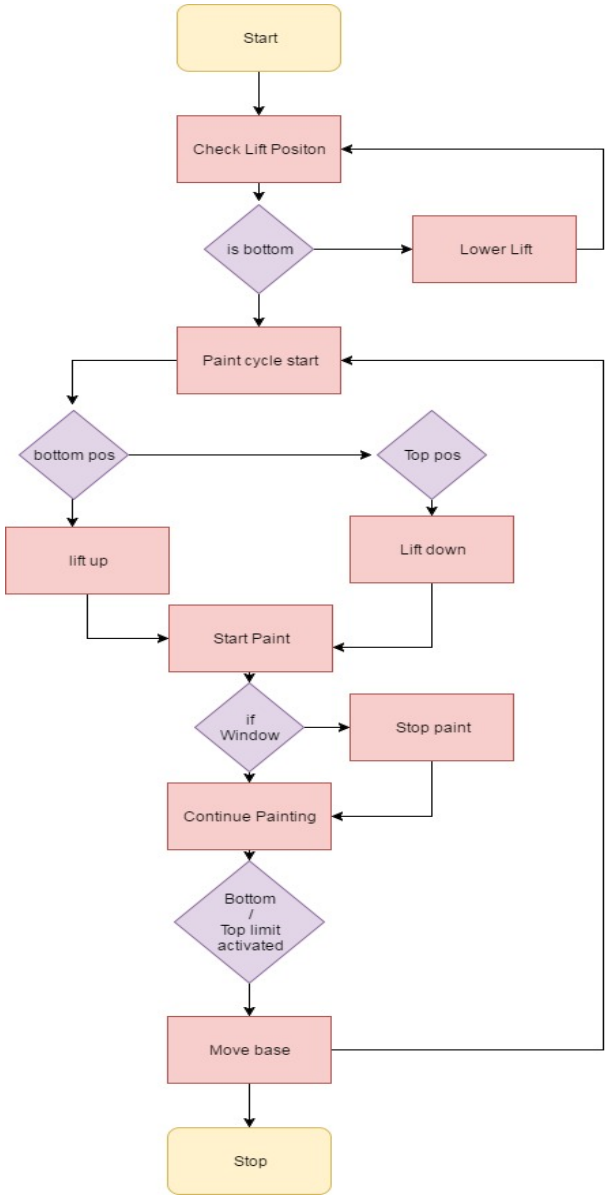
- **D.C Geared Motors**

The DC geared motors form the part of drive train and help in driving the machine forward as well as moving the vertical lift

- **The window sensor:**

The window sensor used in this project is long range infrared sensor. This sensor is responsible for sensing the windows and stopping the spray gun at window area.

- **FLOW CHART**



V. CONCLUSION

The paper discusses the concept of automated wall painting machine for wall painting and sensing. The developed machine will not only automate the process but also save the cost of manual labor implemented in painting. The developed machine can work autonomously and can be further improved for accuracy and painting of irregular surfaces.

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The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression, “One of us (R. B. G.) thanks . . .” Instead, try “R. B. G. thanks”. Put applicable sponsor acknowledgments here; DO NOT place them on the first page of your paper or as a footnote.

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