

# Automatic Painting System in Congested Area

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**Abstract:** Painting system is implementing on the construction industry in automation. There is a strong need for a mobile robot that can move to paint walls of residential buildings. A control system is used to guide the arm motion and plan the mobile base motion. Wall painting is a simultaneously, enfeeble and hazardous process which makes it an ideal case for automation. Ultrasonic sensors are fitted on the arm and the mobile base to adjust the motion limits when it's detected the obstacles in the room area.

**Keywords :** arm motion, autonomous, Arduino, degree of freedom (DOF).

## I. INTRODUCTION

Now-a-days painting system automated in automotive industry but not yet for the construction industry. Wall painting is a simultaneously, enfeeble and hazardous process which makes it an ideal case for automation. The mobile robot that can move to paint interior walls of residential buildings. In our project, the conceptual design of an autonomous wall painting robot is described consisting of an arm that scans the walls vertically and is fixed which is moved in automatically. The design aim is to satisfy the criteria of simplicity, low weight, low cost and fast painting time. Ultrasonic sensors are fitted on the arm and the mobile base to adjust the motion limits and change in the room area. A control system is designed to guide the arm motion and plan the movable base motion. Therefore, the society must acquire new trends of innovation to prosper in their ways of life.

The community has revolutionized due to the interconnectivity greatly compared to some years back when usage of technology did not exist. Saving human labor numbers and timing are only the two main advantages; besides them we must consider the opportunity to reduce or eliminate human exposure to difficult and hazardous environments, and to improve the quality of such works which would solve most of the problems connected with safety when many activities occur at the same time. In construction industry the labor-drastring is conducted in dangerous situations; therefore, the importance of construction robotics has been realized and is grown rapidly.

The automation in this construction industry is started in the early 90's aiming to optimize equipment operations, improve safety, enhance perception of workspace and furthermore, ensure quality environment for building occupant. The advances in the robotics and automation in the construction industry has grown quickly. Painting is also considered to be the difficult process as it also must paint the whole building. To make this work easier and safer and to reduce the number of labors automation in painting was introduced. The ingredients of painting chemicals affect the painters respiratory and lung system.

## RELATED WORK

**Wenzhou Chen** had designed a special automatic redundant robot painting system (RRPS), which can automatically navigate and paint in the long non-regular duct for industrial application. In this paper, they have been designed only for vertical basis to paint the objects.

**Alessandro Rizziaa** had the simple photographic acquisition does not allow a successful visual investigation. The use of commercial soft wares as image enhancers generally does not lead to satisfactory results. In this paper, they have been focused on the visual analysis of degraded Etruscan wall paintings.

**G.Vasumathi** an approach to automatically spray paint families of Unknown parts has been presented. The approach uses a sensing cell in front of the painting cell, where the part geometry is acquired. From the part geometry process - relevant features are extracted and corresponding paint routines are found and grouped to obtain optimal painting trajectories. Finally a Collision - free robot path and an executable robot Program are generated.

**Kurt H ausler** had designed an automatically spray paint families of unknown parts has been presented. The approach uses a sensing cell in front of the painting cell, where the part geometry is acquired. From the part particular dimensional process and relevant features are extracted. And in ally a collision-free robot path and an executable robot program are generated. The project concept is towards robotic spray painting, the "inverse approach" method can be applied for large range of surface treatment. Examples of processes in which the approach is intended to be applied are: powder painting, washing and cleaning with liquid (including high-pressure cleaning), washing and cleaning with physical contact between tool and part, degreasing, sandblasting, polishing, sealing, grinding, debarring and gluing.

**Koichi Ogawara** the aim is to reproduce the entire process of human painting by a robot system. This paper is focused on the last phase, painting by a robot. The features of the system are manipulation of a paintbrush with a multi-fingered hand and a multi-camera stereo system, and modification of a picture by a visual feedback procedure. For an experiment, an apple and a human are selected as motifs, and experiments to draw them by a robot are performed.

**Pokarnekar Pranita Uttam** Control unit on the robot is interface with the Bluetooth device which is used for receiving the signal transmitted by android application. These signals are applied to the robot for movement. The wireless control robot used RF modulation. But our project for robotic control makes use of an android mobile phone which is very small chip and is easily available for this purpose. The android mobile user has to install a designed application then we need to turn Bluetooth and also wireless communication technique is used to control the robot.

**Utkarsha S. Bawane** a method has been developed for automatic spray painting of unknown parts. This machine is very useful for painting of any shape with very little time period. Accuracy of this machine is more as compared to manual painting. It also saves the labor cost and the total cost of painting any jobs. The methods of painting and intend to enlighten readers and artists alike with knowledge of modern art techniques as well as forgotten techniques of the painting technology. By using the automatic painting machine it is clear that the human efforts are reduced as well as the cost of labor also reduces. Automatic painting machine can also print the huge building easily and safely without any hazards to human being and laborers.

**P.U.Gaikwad** Special robots and automation technology have the potential to increase productivity by performing tasks efficiently and improving working conditions through applications that limit the exposure of humans to safety hazards. Our project is a prototype model for providing automation in painting, texting and drawing using PIC microcontroller. And also it reduces space by using. Thus this process seems to be easier when compared to others.

**P.keerthana** automatically paint the wall of given dimension has been designed and implemented. The approach uses infrared (IR) transmitter and IR receiver to detect the presence of wall. The microcontroller unit to control the movement of the dc motor. The robot eliminates the hazards caused due to the painting chemicals to the human painters such as eye and respiratory system problems and also the nature of painting procedure that requires repeated work and hand rising makes it boring, time and effort consuming. The robot is cost effective, reduces work force for human workers, and reduces time consumption. The pitfall of the project is that the robot continues painting even after the end of the wall hence it can be overcome by adding some indicating objects such as buzzers. In the future the painting robot can be enhanced by using image processing in order to scan the objects and obstacles that are present in the wall so that those objects can be automatically omitted while painting.

**Alessandro Gasparetto** an automated optimum path and trajectory generation system for robotic painting process is presented. The process structure, the automation and the implementation steps are described. Graph theory and operative research techniques are applied to provide a general and optimal solution for the path planning problem. The path optimization has been done considering the coordinates of the primitives such as nodes, segments and curves like arcs and creating an algorithm able to take into account several constraints posed by robotized painting. The system is easy-to-use and flexible allowing to treat different and special shapes, and to fill the gap between the image acquisition and trajectory planning process leading a new, fast, general and automatic mechatronic system for robotic painting purposes.

**Sundar Ganesh CS** When the system is switched on, the motor starts rotating and keeps on till the system is switched off. The worker loads the job on the holding fixture. The Motor Starts Loading of Job is detected by an IR sensor. Spray Painting starts. Pneumatic Cylinder Extends. Job not detected. Spray stops. Pneumatic Cylinder Retracts. Job is Unloaded. Job when loaded, is detected by an IR sensor. This causes the spray painting process to start by actuating the paint gun. The pneumatic cylinder holding the paint gun extends making the paint to cover the entire surface area of the job. When the paint gun is lifted above the job size, the IR sensor stops detecting the job. This stops the spray paint and the pneumatic cylinder retracts to its starting position. The job will be unloaded by the worker and the next job can be inserted.

**VaniMukundan** had designed a Painting Robot structure and components to be used and their ratings. After that for choosing the main component geared motor is depended up on the net weight of the system. By taking approximate weights we choose the motor rating. To initiate this project's hardware in the seventh semester, we fabricated the frame for the wall painting robot. The remaining works of the project will be done in the eighth semester. It includes the purchasing of the components, its testing, designing, make practice for its painting.

## II. METHODOLOGY

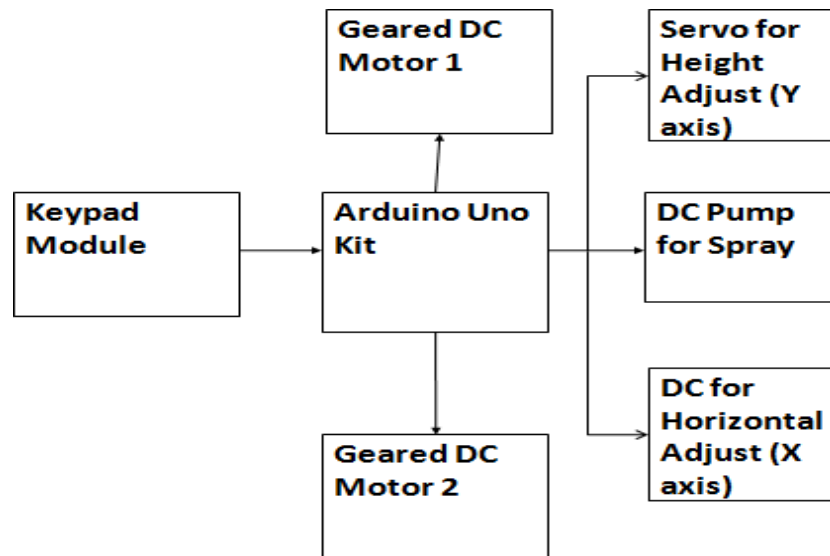
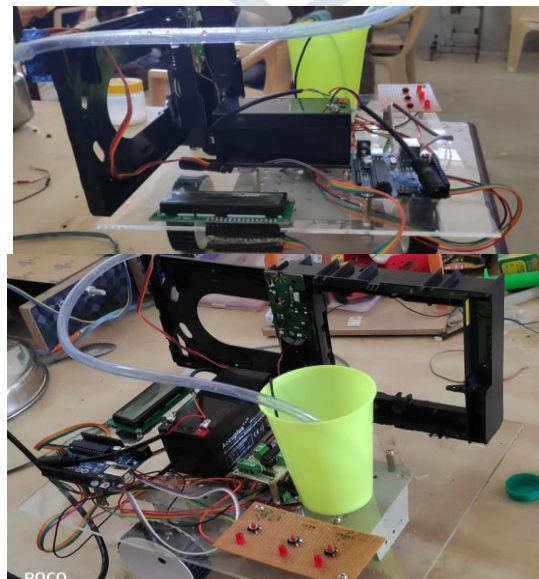
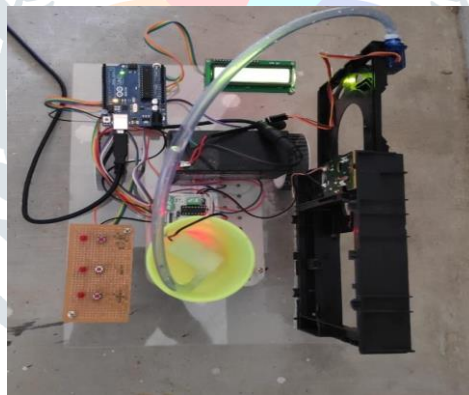


Fig: Block Diagram

- Our system utilizes Arduino Uno, the open source and user friendly hardware, with Wifi connectivity
- Uses keypad for distance coverage and stops when it reaches the maximum limit
- The DC pump used as spraying unit the X & Y directions controlled by separate Servo motors for better area coverage.

## III. RESULT



**IV. CONCLUSION**

A prototype that paints an area of  $3.14m^2$  was designed. The approach uses 2 ultrasonic sensors to measure distance and provide feedback to the Arduino boards which in turn controls the base wheels and the actuator. The prototype was designed for the purpose of automating the interior walls painting process, making it easier and more efficient. This design is simple in nature 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 in accordance to the needed specifications. A full-scale interior wall painting robot based on this prototype would be beneficial to the construction field corporations, granting these corporations the ability to provide painting services in addition to the actual construction work, which gives an advantage over other painting and construction corporations, while maintaining a reasonable spending ceiling on acquiring the robot and/or building it.

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