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Abstract— The objective is to develop a Wall painting robot that helps lessen hand-painted efforts and obtain much less costly painting accessories. Here we have proposed a robotic controlled by the ATMEGA 328p based development Board. An Automatic robotic can be programmed using an easy C-language programming. Used to put off human to hazardous regions, it is good in time management, continuous overall performance. It is also designed to reduce the overall cost of portray by sq. Meters compared to the manual portray technique. It operates via high-stress DC pump and a spray machine all driven horizontally with low torque DC motor. It makes use of wi-fi configuration with a smartphone to manipulate its performance.

Keywords: - Arduino Uno, Relay Module, etc.

I. INTRODUCTION

During the Painting, paint chemicals can damage to human artists consisting of eye issues and breathing problems. Roller paints and paint brushes are used to paint the wall from top to bottom. Repeating the technique consisting of pulling a curler and lifting a ladder can caused back pain. These motives enable us to implement the automatic wall painting robot. This robot is easy and portable. The robotic is designed with some electronic equipment, a spray gun and managing unit to manipulate the robotic performance. They also have a completely low weight in terms of projected energy output and overall performance i.e., the loss is small due to the less variety of shifting parts as a result offering the expected performance.

Because of the low-priced and simple control systems it could manage the vibration of sound and make the operation quiet. It has an extended life, flexibility, useful, reliable, and set up is easy and renovation is easy. Painting is a hard and dirty mission with easy steps to get the result you want, so in assessment robots can paintings more effectively than the work of untrained human beings. It is providing extra accuracy, comparable installation, missing of minor human errors, and robots will no means tired as a human. The undertaking will work on an ATMEGA 328p-based totally IDE-based improvement board i.e., Arduino.

It is using Bluetooth connectivity among phone and robot. All movement operations are managed and may go all the way as informed. Within the vertical motion of the nozzle spray device is used. To move an entire DC robot with a torque of 5Kg-cm is used rated at 12v, 1A. A high stress DC pump is used to provoke paint discharge from Air Gun / Paint CAN (MG995) rated at 12v, 2 Ah.

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II. LITERATURE REVIEW

- The author in this paper had developed an exterior building wall painting robot which aims to reduce manual efforts on painting and cost affective painting accessories. The model had used Raspberry pi board to control all actions, where it is programmed by using python programing language [1].
- An autonomous wall painting robot is the robot uses a sprayer attached with a tank filled with paint. The robot itself adjusted from the walls using an ultrasonic sensor. Cascade lift is used for adjusting height [2].
- Development of a Robot system for applying on plastered walls, in this paper deep neural network is used for unevenness status recognition of wall and robot motion planning for putty paint flattering [3].
- A MATLAB simulation inclusive of a Graphical user interface (GUI) has been created to simulate two different motion paths for the Paint BOT. PAINT bat - FPGA Based wall painting service Robot Prototype is able to paint a workspace specified by user, avoiding all windows area [4].
- In the paper, RoboPainter A detailed design of the RoboPainter used for interior wall painting is given. Here a sprayer-based wall painting robot for interior finishes is introduced and presents in the form of computer aided design (CAD) model [5].

III. Proposed Work

1. We had set the wireless connection of robot in control unit using Bluetooth interface. All movement is controlled from smartphone. The robot is avoiding obstacle using IR sensor connected on the wheel of the robot. Robot is derived using DC motor. When the mechanism is initiated at the first position the pump starts spraying the paint.

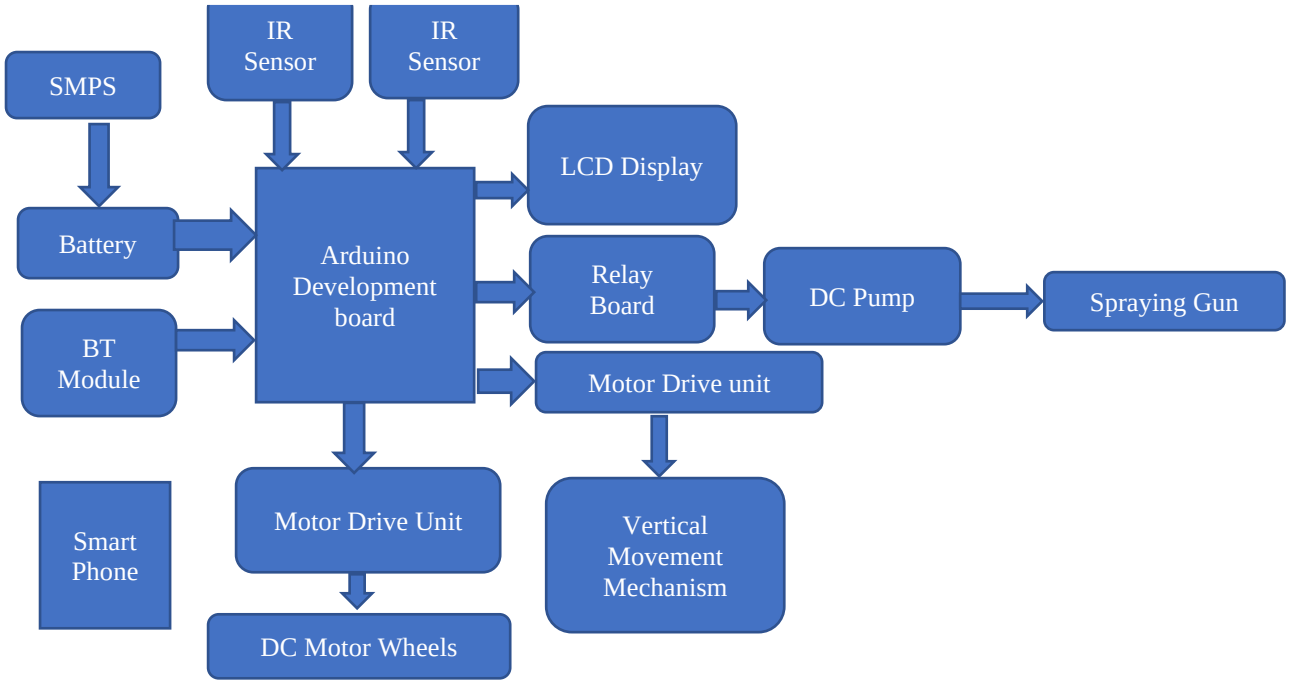

Fig1. Block Diagram For Automatic Wall Painting Robot

IV. HARDWARE USED

1. Dc Geared Motor-2(for wheels movements) 12V, 100rpm low torque 1kg-cm
2. IR sensor
3. DC geared Motor (for spray gun) 12v,30rpm high 5 kg-cm
4. SMPS 12V,10Ah.
5. AT-mega 328p Based Development Board
6. Bluetooth Module (HC-05)
7. High pressure DC pump 12V, 2Ah
8. L298n Motor Driver
9. LCD Display 16*2
10. Relay Module 12v
11. Spray Gun12 Paint Can (2L)
12. Pipe
13. Connecting Wires
14. Connectors
15. Screw Bolt

V. Software Used

Platform: Arduino IDE 1.8.13(Software)
Language: Embedded C

VI. FLOWCHART

All functions of robot will operate through smartphone wirelessly according to instructions for various movements in all directions is given by user. For that the connection is established between robot and smartphone using Bluetooth module. The robot can move in left, right, forward, backward along with 360^0 rotations on floor. As the spraying gun is mounted on robot, the painting process will start after command receive from smartphone.

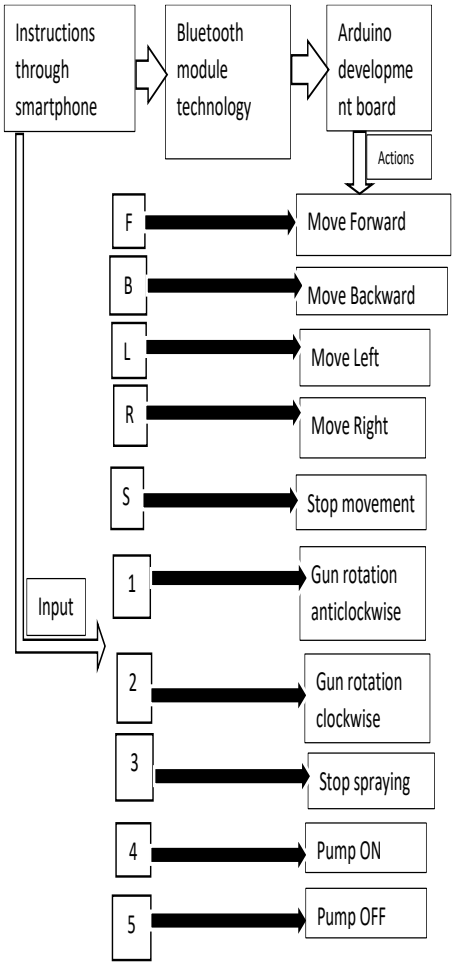

Fig.2 Flowchart for working of Robot

VII.COMPONENT SPECIFICATION

- ***DC Motor (operates on 12v, Speed :100 RPM)***

DC motors (brush-type) have built-in commutation, meaning that as the motor rotates, mechanical brushes automatically commutate coils on the rotor. DC motors operate from a direct current power source.

- **Arduino Uno**

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins.

- **12 V Battery**

12 V, 1.3 Amp Battery is high power battery easily handle all the function. An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars.

- **Liquid Crystal Display**

This device can be used to display any message, status or also can be used for debugging purpose. In this project it

VIII.ADVANTAGES

(i) It is non contactable with wall.
(ii) Easy to operate and installation.
(iii) There is negligible maintenance cost.
(iv) User can control the Robot wirelessly using Bluetooth module technology.

IX.DISADVANTAGES

(i) The user handling robot must have some basic smartphone handling skills.
(ii) Proper protection should be provided to electronic components to avoid any damage from paint.

X.RESULT AND DISCUSSION

The experimental results indicate that the proposed robot could smoothly paint the walls with an accuracy of up to 90% (spray gun accuracy) and in a very efficient time. Therefore, the system was developed with the option for the workers to select among several options to ensure that the prototype can be used for various heights. However, future development should be done to select any length according to the building's height. One further shortcoming is due to the capacity of the paint tank. The current system uses up to 1 liter of paint. This is inconvenient because the paint has to be filled by the workers' multiple times in some instances. The robot can further be improved by using more sensors that can enhance the results. The aforementioned shortcomings can be eliminated with further research and work.

Fig.3 Control bord and prototype of Automatic wall painting Robot.

Time taken for vertical translation of spray gun:-

Table 1. Time Taken for Vertical Translation

Test1: Time taken (seconds)	Test 2: Time taken (seconds)	Average	Distance measured (feet)
1.8	1.9	1.85	0.3
2.5	2.7	2.6	0.6
3.3	3.5	3.4	0.92
4.8	4.6	4.7	1.23
5.0	4.8	4.9	1.50
7.2	7.0	7.1	1.82
8.3	8.5	8.4	2.22

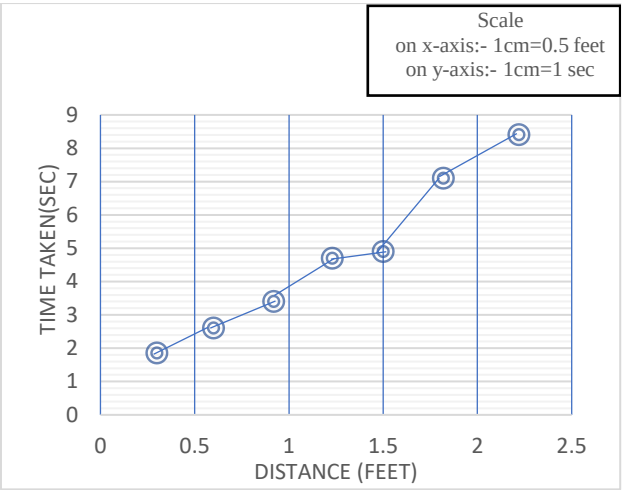

Fig. 4 Time taken by vertical Translation

Table 1. shows the time taken for the vertical movement of the motor, no variation of speed in done because it may cause uneven paint coating on a wall which will lead more complications in completing the painting process. The vertical movement testing indicates that overall vertical movement of mobile part was linear and smooth. Therefore, the painting process would run smoothly.

Time taken for horizontal Translation of paint spray gun :-

Table 2. Time taken for horizontal Translation

Test1: Time taken (seconds)	Test 2: Time taken (seconds)	Average	Distance measured (feet)
3.2	3.0	3.1	0.82
5.0	5.1	5.05	1.64
7.3	7.2	7.25	2.46
9.3	9.5	9.4	3.2
11.4	11.6	11.5	4.92
15.0	14.8	14.9	6.56
17.4	17.2	17.3	7.2

While taking Horizontal movement for robot it must be ensured that the movement of spray gun was at a constant speed, because change in speed may cause the paint job improper.

Table 2. shows the time taken for horizontal translation of spray gun, the result shows that as long as the painting area increased, the more time is needed for Robot to paint the desired area.

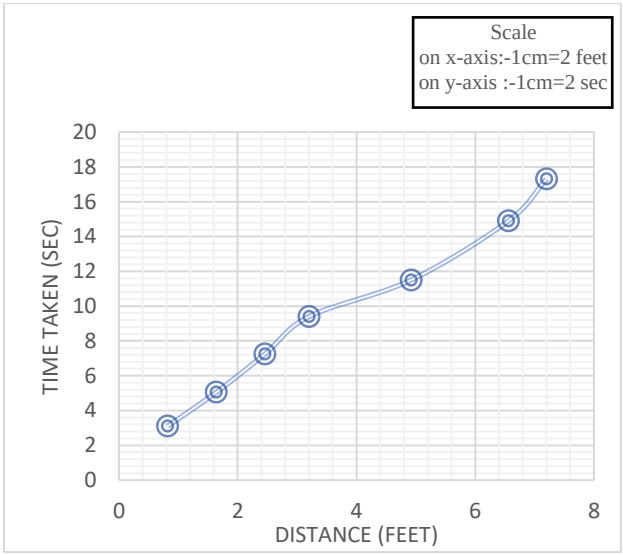

Fig. 5 Time taken by Horizontal Translation

Simplification of DC motor used for running the Robot:-

Table 3. For vertical Movement of spray gun

1	Type of Motor	Permanent magnet DC Geared Motor
2	speed	30 rpm at 12V
3	Voltage	4V to12V
4	Torque range	5 Kg-cm
5	Stall Torque	28 Kg-cm
6	Shaft Diameter	6 mm

Table 4. For Horizontal Movement of Robot (Motor near the wheel)

1	Type of Motor	DC Geared Motor
2	Operating voltage	12 V DC
3	Torque	1 Kg-cm
4	No load current	60 mA
5	Load current	300 mA
6	Shaft Diameter	6 mm
7	Speed	100 rpm

XI. Conclusion

The robot will paint the wall according to the instructions given by user via smartphone. The approach uses IR transmitter and IR receiver to detect the presence of obstacle. 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, reduces time consumption. One of the issues with this 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.

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