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Automatic Wall Painting Robot Automatic Wall Painting Robot

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Abstract: Wall painting is an ideal candidate for automation since it is so repetitive, labor-intensive, and potentially hazardous. Painting had already been automated in the car industry, but not in the building industry. It is urgently necessary to paint the interior walls of residential buildings using a mobile robot that can move. In order to provide lateral feed motion to cover the painting surface, the arm of the autonomous wall painting robot described in this study is installed on a mobile robot base and scans the walls vertically. The design aims to satisfy the requirements of simplicity, lightness, affordability, and speedy painting. Ultrasonic sensors are put on the arm and the movable base to allow movement while adjusting the mobility constraints. To organise the movement of the mobile base and govern the arm movement, a control system is developed.

Key Words: Automatic, Robot, Sensor, Wall Painting

1. INTRODUCTION

One of the processes that is expanding in this sector is construction and building work. In this continuously changing world, construction is increasing quickly. But there isn't enough labour to do this task. More dangerous issues arise while painting tall buildings than when doing interior building work. People now perceive this line of work as being prestigious due to the rise in educational attainment. The labourers are the foundation of the construction work. But that's where the lagging starts. As a result, robotics and automation are progressing more quickly. Every process becomes simpler with the aid of the robot. Here, we create a painting-related robot.

There are other causes for the labour shortage, including the fact that individuals may perceive these positions as less prestigious than others due to the rise in educational standards. Construction is a labor-intensive and hazardous business; as a result, the value of construction robotics has been recognised and is expanding quickly. Beginning in the early 1990s, robots and automation applications and activities in the construction sector aimed to improve worker perceptions of their workspace, increase safety, and optimise equipment operations. Following this, the construction industry's use of robotics and automation has rapidly advanced.

Literature Survey

Moosa Abdellatif, The author here explained how the autonomous wall-painting robot functions. The inside walls of residential buildings are painted using a moving painting robot that is conceptually designed. The robot maintains contact with the wall surface while using a roller that is fed liquid paint. The roller can now scan painted walls both vertically and horizontally thanks to the robot. The robot may manoeuvre in front of the wall to position itself properly. Chetan P. Vora, Dhaval Thakar, The authors of this research noted that because workers cannot operate robotic systems efficiently, the use of such processes has increased. They created a machine that coats the object with the dipping technique using a semiautomatic configuration that is suitable and that small and medium-sized businesses can benefit from since it is less expensive, offers higher precision, and requires less time to coat. Takuya Gokyu, Masayuki Takasu, Sumio Fukuda, One of the strategies presented by the authors to automate and increase the effectiveness of a number of repair projects is the construction of a Wall-Surface Operation Robot. Painting on tiles separated into single or many colours is done. By speeding up the usual manipulation in this instance, PalJohan& Jan Tommy Gravdahl, the author provided clarification. They would detect errors in ineffective directives. Website address: IJISRT18JA169 440 International Journal of Innovative Science and Research Technology, Volume 3, Issue 1, January 2018, ISSN No: 2456 -2165 They went on to say that a continuous paint coverage was ensured by keeping a higher consistent velocity throughout the orbit, and that the time needed to paint the wall was greatly decreased.

2. ROPOSED METHOD

The process involves creating a plausible, full, and executable robot programme automatically using range sensor data and robotic paint pathways. The method works with a wide variety of parts, including big compressor tanks, small pieces on frames (such as automobile mirrors, plates, and pipes), and motors with gears. The part families (which can have up to 70.000 variants) are known for each industrial customer (Figure 1). The goal is to be able to paint components in any sequence as they move up the conveyor. Automatically determining the part's geometry while it is being transported presents a technical challenge.

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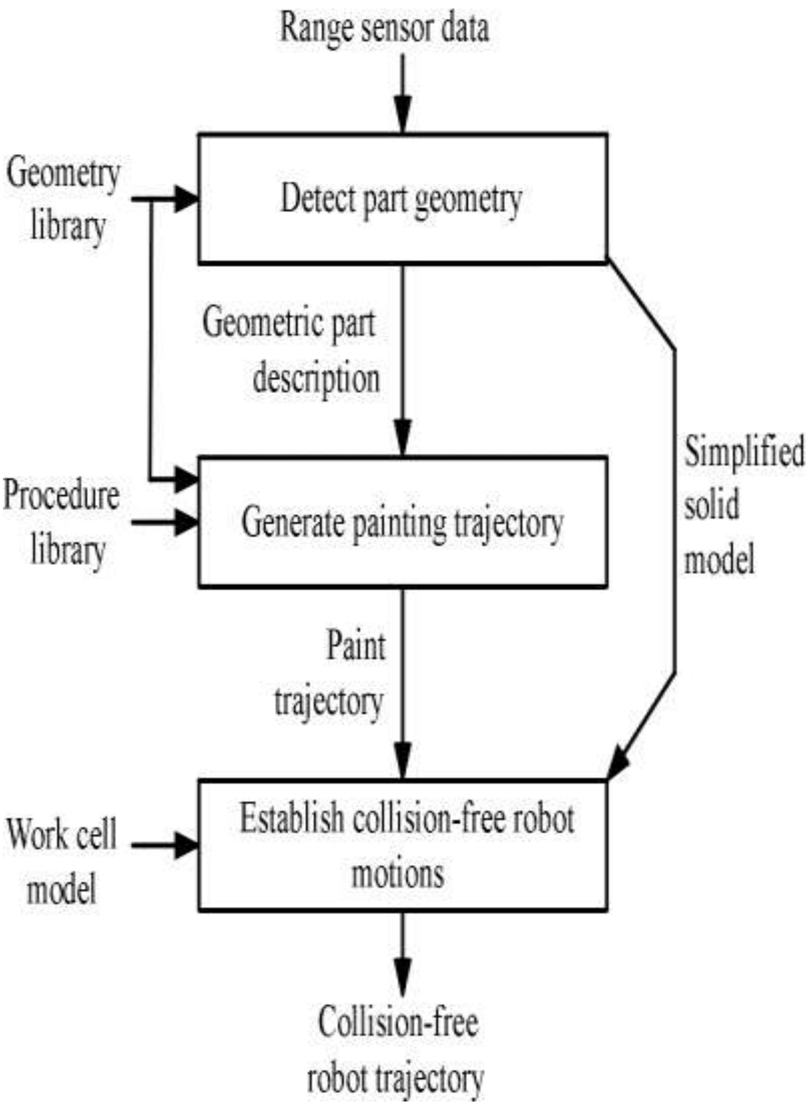

Microcontroller (ATMEGA 328 P)

A serial programmable USART, a byte-oriented 2-wire serial interface, an SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable timer/counters, 23 general-purpose I/O lines, 32 general-purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, and more are all features of the high-performance Atmel 8-bit AVR RIS The device requires 1.8 to 5.5 volts to operate. Throughputs of over 1 MIPS per MHz are achieved by the device, which balances power consumption and processing performance by carrying out powerful instructions in a single clock cycle.

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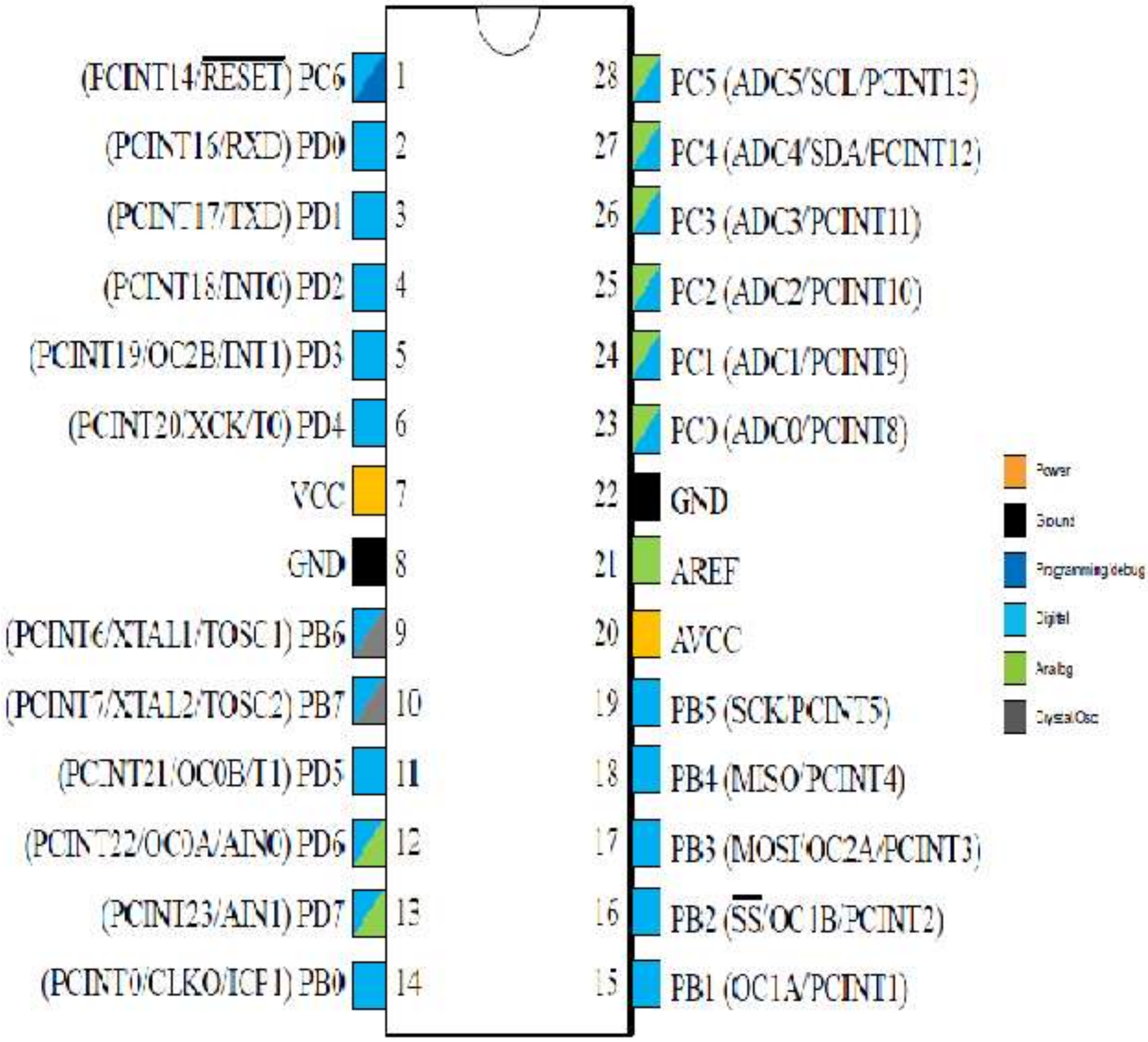

Figure 2. At Mega 328 P

IR Sensor

An electrical gadget that produces infrared light to sense certain features of its environment is called a sensor. Both the heat and motion of an item can be measured by an IR sensor. These kinds of sensors are referred to as passive IR sensors since they do not emit infrared radiation; instead, they merely measure it. Typically, all items emit some type of thermal radiation in the infrared range. Although these radiations are invisible to the human eye, an infrared sensor can pick them up The emitter and detector are both infrared LEDs (Light Emitting Diodes). The only device that can detect IR light with the same wavelength as an IR LED is an IR photodiode. The output voltages and resistances of the photodiode are proportional to the IR light received when it strikes it.

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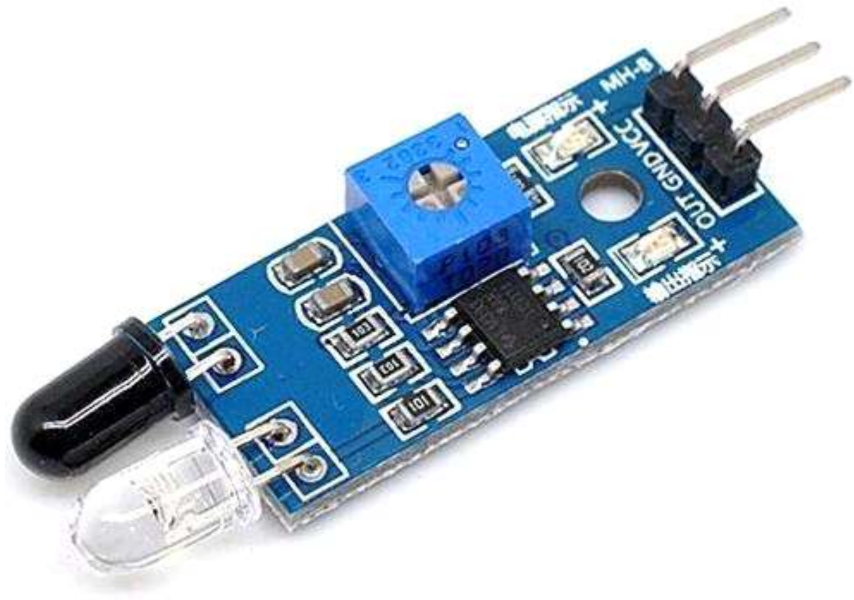

IR Sensor in Figure 3

Principles of Operations

A light sensor's operation has already been discussed. IR sensors use a specific light sensor to detect a specific light wavelength in the infrared (IR) spectrum. Using an LED that emits light at the same wavelength as the sensor allows you to gauge the strength of the light that is being received. When an object is close to a light sensor, light from the LED bounces off the object and enters the sensor. This significantly raises the intensity, This can already be determined using a threshold. Since the sensor looks for reflected light in order to work, it is possible to have a sensor that can return the value of the reflected light. This type of sensor can then be used to gauge the object's "brightness." It's useful for tasks like line tracking.

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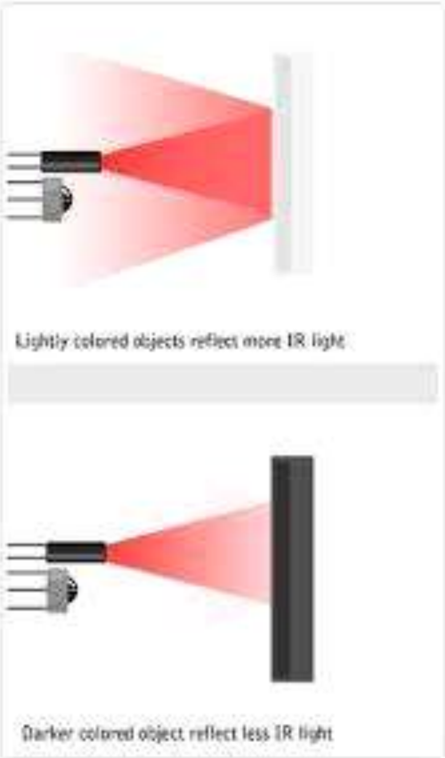

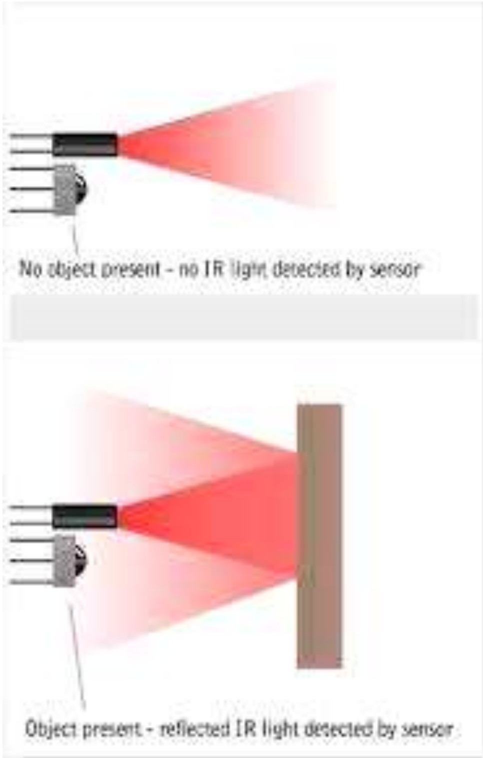

Working on an Object (Figure 4) Working With Reflected Light in Figure 5

Liquid Crystal Display (LCD)

LCD is the name of the display technology used in laptops and other portable computers (liquid crystal display). Similar to light-emitting diode and gas-plasma technologies, LCDs enable panels to be substantially thinner than cathode ray tube technology. LCDs function on the principle of blocking light rather than emitting it, which results in a significant reduction in power usage compared to LED and gas-display displays. LCDs are made using either an active matrix display grid or a passive matrix display grid. The active matrix LCD is also known as a thin film transistor display. Conductors in the passive matrix LCD are arranged in a grid. with pixels positioned at each intersection of the grid. A current is provided through two conductors to control the amount of light for each pixel on the grid. In an active matrix, each pixel intersection has a transistor, making it possible to modulate pixel brightness with less current. This allows for more frequent switching of the active matrix display's current, which speeds up screen refresh. When a light source is present, they line up to prevent When there is no electric charge applied, the object becomes translucent. The desired images are displayed with a rapid cursor through. The fundamental concept behind LCD panels is this. The most common display technology used is LCD because of its advantages over other display technologies. They are flat, thin, and consume far less electricity than LED screens and cathode ray tubes (CRTs).

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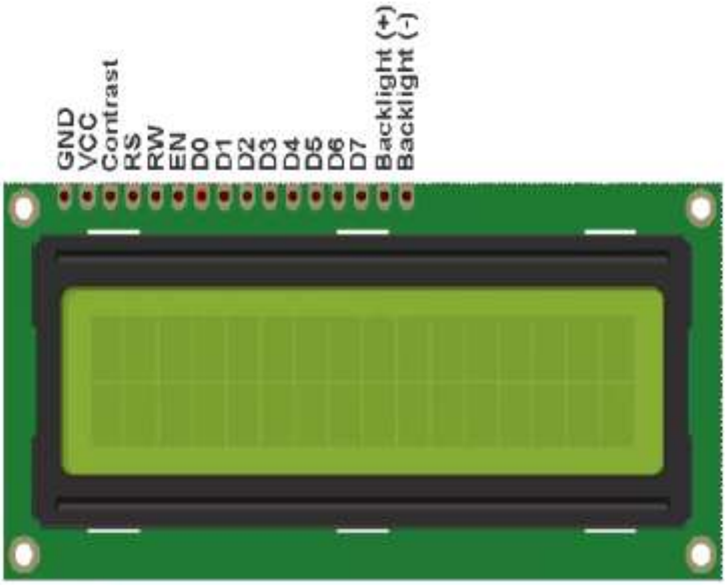

Diagram 6. LCD Display

Motor Drivers

To control the motors in autonomous robots, an integrated circuit chip known as a motor driver IC is commonly employed. Robotic microcontrollers and the robot's motors are connected by motor driver ICs. The L293 series, including the L293NE and others, is where you will find the majority of motor driver ICs. These ICs are made to manage two DC motors at once. Two H-bridges make up L293D. The simplest circuit for managing a motor with a low current rating is an H-bridge. In this tutorial, the motor driver IC will just be referred to as L293D.

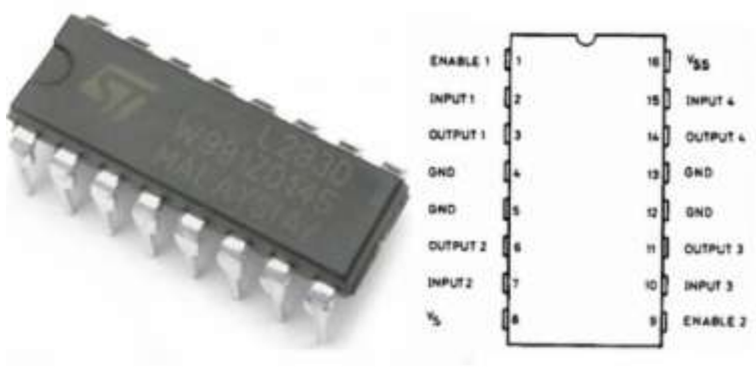

Figure 7. IC L293D

Sprayer

A device sprays a coating (such as paint, ink, varnish, etc.) into the air and onto a surface in the painting process known as spray painting. The most popular varieties atomize and guide the

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paint particles using compressed gas, often air. Spray guns, which are typically separated from one another by their size and the size of the spray pattern they generate, were developed from airbrushes. Hand-held airbrushes are used as an alternative. Using a brush for precise tasks like fine art, painting nails, or photo editing. Spraying with an air gun requires equipment that is often larger. It is often employed to evenly coat huge surfaces with liquid. Different spray patterns are possible with sprayers that can be either hand-held or automated and feature replaceable heads. Cans of one colour spray paint are lightweight and convenient to store.

Photo 8. Sprayer

Working Of Wall Painting Robot
Set the wall distance in the robot's control unit using the Keypad interface. The sprayer unit moves up and down with air pressure through a nozzle to clean the wall as the robot initially starts from the right. After that, fill the sprayer with paint, turn on the robot from the right side, and the sprayer part will move to the left until it reaches the desired distance. The robot will then move to the right, and the process will then be repeated. Using an IR sensor mounted on the robot's wheel, the robot's movement is measured in terms of distance.

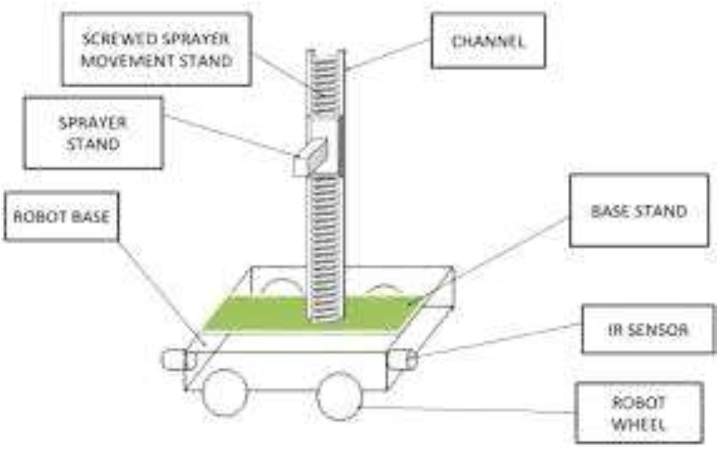

Figure 9. Basic Model

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3. DISCUSSION

For a suitable process quality, the painting technique outlines how to apply sprayer to the surface. The primary concept is to make it possible to design paint strokes that go all the way around the part even though various geometric primitives need to be covered all the way along the surface.

Step-by-step instructions

Preparing the work surface is step 1 of 7.Doors, windows, power outlets, and skirting boards should all be thoroughly taped off during the preparation phase. Cover the floor with film, cardboard, or dust sheets, and use paper that is about 30 cm wide to cover the margins of the adjacent walls. The masking tape should be tightly applied in order to guarantee a clean edge.

Step 2 of 7: Getting ready to paint

Stir the paint thoroughly, then mount the base unit to the container with the height-adjustable paint bucket, and dip the suction tube into the paint. Given that it uses paint that is taken directly from the original container, the W 990 FLEXiO spraying system is particularly well suited for big wall and ceiling expanses.

3rd of 7th step: Getting the sprayer ready

To determine the right amount of air and paint for your particular working speed, perform a spray test on a piece of cardboard. This means you can configure it so that there is little overspray. The test poster can be used to get acquainted with the sprayer.

Step 4 of 7: Applying the spray correctly

A continuous distance of 15-20 cm, sprayed in slightly overlapping stripes while holding the gun parallel to the wall, will result in an equal finish.

5th of 7th Step: Sequence

Always operate in the shadows. beginning with the ceiling proceed to the window ledges next. Do the edges next, and the main surface last.

6th of 7th Step: Corners are sprayed in.

As you work, it's simple to spray corners and edges. If you're only painting one wall, placing a piece of cardboard in the corner will provide a clean edge. This eliminates the need for time-consuming painting or masking that involves cutting in with a paint brush or masking.

The final step is to clean the device.

After spraying, clean the spraying system by running warm water through the tube and pump unit to flush them, and then cleaning the paint-carrying components of the spray gun, such as the nozzle, with warm water.

4. CONCLUSION

We thoroughly researched the Automatic Sensor Based Wall Painting Robot idea. This project will be finished in sections. As a first step, we created a Painting Robot structure, together with the components to be employed, and their ratings. Next, the system's net weight will determine which main component—a geared motor—to use. We select the motor rating by using approximation weights. We created the frame for the wall-painting robot in the seventh semester to launch this project's hardware. In the eighth semester, the project's remaining tasks

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will be completed. It involves buying the components, testing them, designing them, and practising painting.

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