Design of Electro Powered Automatic Wall Painting Robot using microcontroller

Ms. Muskan F. Mujavar[1], Ms. Priti R. Patil[2], Ms. Supriya M. Masal[3], Ms. Aishwarya G. kamble[4], Ms. Bhagyashree P. Pawar[5], Mr. M. M. Kamble[6].

[2]Electrical Engineering, [3](Assistant Professor) at SBGI, MIRAJ.
[1]SBGI, MIRAJ, SANGLI, INDIA

Abstract-In this paper we are designing Automatic wall painting robot simulation using Tinkercad software for simulation. In Tinkercad simulation we used Atmega328P series microcontroller for flexible control and quick operation we used pulse width modulation (PWM). It can operating time of one axis cycle is ideal 10 sec. By this control we can power up robotic arm to work more flexibly.

Index Term- **(EPAWP) Electro Powered Automatic Wall Painting, Simulation, Microcontroller, Motor Driver IC (Integrated Circuit), pulse width modulation (PWM), ATmega328P, Tinkercad.**

1. INTRODUCTION

Building construction industry is a fast-growing industry now-a-day. There is many high-tech equipment available to do work in several hours which required too much time. In this industry painting also play major role. There are lots of high- tech automatic wall painting robots are available but they are more costly [1]. So, we are designing low cost automatic wall painting robot. In this paper we introduced designing of control unit on Tinkercad software simulation that can power up those particular axes through motors. In that total control and operation can show on Tinker cad software simulation. In that control unit we use microcontroller Atmega328P for commanding to motors through control buttons. When any button can operate microcontroller passes a high or low signal to the motor driver which provide path for voltage coming from the battery to the motor. With this control unit easy control and suitable operation is done. In that simulation we can show all connection details as per required to that mechanism

2. LITERATURE REVIEW

- **Warszawsky and Kahane**, developed a robot for interior finishing tasks named "TAMIR", and was used in four interior finishing tasks namely; painting, plastering, tiling and masonry. The robot has 6 DOF (Degrees Of Freedom) with an average reach of 1.7m and end effector payload of 30 kg. It is mounted on 3 wheeled mobile-robot which gives another 3 DOF. The platform moves between workstations and at each one it deploys four stabilizing legs. The robot arm used is the S-700 model made by General Motors, of 500 Kg weight. A scaled down robot setup for interior wall painting together with a multi color spraying end tool was implemented by Naticchia and claimed to work in full scale without reduction in performance. 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 ceilwere painted in 3.5 hours which is 1.5 times faster than manual painting.

- **Terje Velde** developed a device for automatic spray application of paint. The principle was that a device is disclosed for the automatic spray application of paint. The device has a paint container and a spray nozzle arranged in close connection and adapted to provide paint from the container to the spray nozzle during the spray application. A dosing apparatus regulates the compression of an external surface against the inner volume of the paint container and thereby forces paint out of the container and into the spray nozzle through an opening of the container. Several receiving members are adapted to receive and hold the paint container close to the spray nozzle, such that the paint container is detachable and removable from the device when replacinga paint container. implemented mobile platform was tested and succeeded in carrying the intended load while enabling the plane degrees of freedom. The two-link manipulator was tested and fulfilling the intended reability, while maintaining lowlevels of vibration and noise

3. PROJECT OBJECTIVES

- Automatic painting of wall.
- Robot will be controlled operated by digital controller.
- Reduces cost of painting as compared to human painters.
- Time can be saved by automatic painting.

4. PROJECT APPLICATION

- Applicable for reducing human effort.
- In industrial field for better quality of painting.

5. BLOCK DIAGRAM

In this design we used Atmega328P microcontroller [3][4]. In input section commanding buttons are placed for give command to motors through microcontroller. In output section we use two motor drivers IC. One motor driver IC for Y axis and second motor driver IC for X axis.

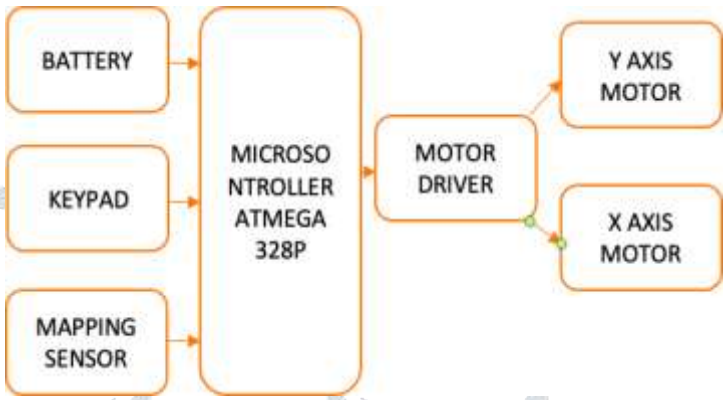

Fig. 1 Block Diagram of Control unit

6. CIRCUIT DIAGRAM:

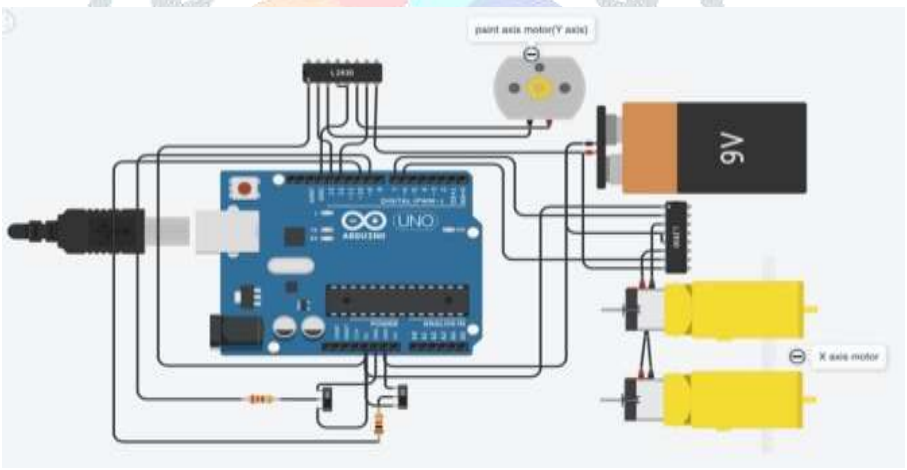

Fig. 2 Circuit Diagram of Control unit

7. OPERATION

For control unit we used ATmega328P microcontroller [4]. These microcontrollers are familiar of Atmel 8-bit AVR microcontroller. In this microcontroller 14 digital I/O pins, 6 analog pins which is also use I/O pins, 2 UART pins are present. In this simulation we use total 7 I/O pins and 2 pins for analog power supply.

In the control unit motors are controlled by PWM modulation method [3]. When any command from button given to microcontroller ATmega328P get output to motor driver IC input pins as digital output when command will apply then motor shaft will have to move and we are connected our Y axis robotic arm on that motor. By powering motor Y axis are goes up.

When axis map sensor maps the Y axis at upside the sensor will send input high signal to microcontroller ATmega328P. microcontroller run the appropriate program and bring the Y axis down. This motoring time is 5 sec both up and down action therefore it required 10 sec to perform one cycle.

When Y axis comes down then one unique signal is generated for run X axis motor. This time delay is different. When one cycle is completed automatically microcontroller ATmega328P give output signal to X axis motor driver for give free path to motor to supply.

8. SIMULATION WORK

A. Y axis Action Mode Operation (I)

In PWM modulation when start the system Y axis motor start and Y axis robotics. For this process microcontroller ATmega328P will generated high signal to output of pin 12, 13. Pin 13 get HIGH pulse and pin 12 get LOW pulse. Motor driver IC sense the signal and allow high voltage reach to the motor. For reaching Y axis to upside it takes ideal 5 sec. (we make more faster changing delay)

Fig. 3. Y axis action operation (I) waveform

Y axis Action Mode Operation (II)

When Y axis reach at top of the robot the axis mapping sensor sense the presence of axis and give input signal to the ATmega328P microcontroller. Microcontroller run the appropriate program to bring the Y axis to down. For this action microcontroller output pin 12, 13 change previous state now the act apposite like 12 acts HIGH and 13 acts LOW. Because of this command motor driver will give reverse voltage to run motor anti-clock wise. And give power to robotic arm for bring down. This action takes 5sec time.

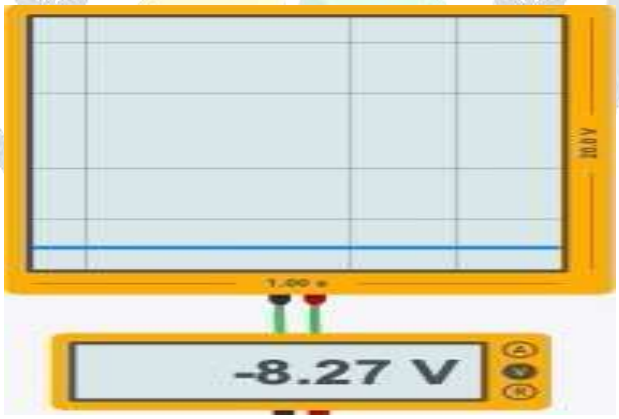

Fig. 4. Y axis action operation (II) waveform

B. X axis Action Mode Operation

when Y axis comes down then axis mapping sensor sense the presence of robotic are down then I will send signal to microcontroller ATmega328P for X axis operation. When axis sense than microcontroller send output to pin 6 to HIGH pulse and pin 5 to LOW pulse. That means motor driver gives order to motor for forwarded action.

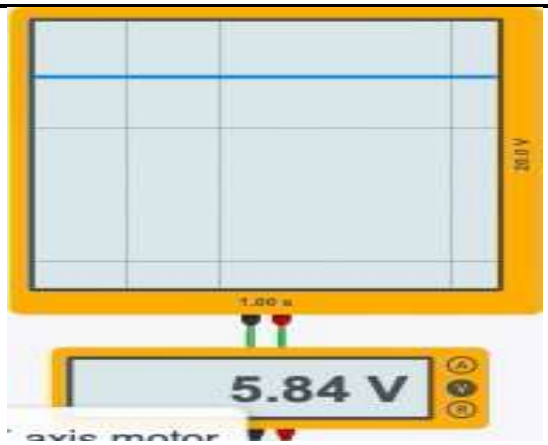

Fig.4: Left mode operation waveform

9. RESULTS

TABLE 1 Results of SIMULATION

Sr No.	Motor	Operation in Mode		
		Action	Speed (rpm)	Voltage
1	Motor Y(I)	Clockwise	+16525	+7.52
2	Motor Y(II)	Anti-Clockwise	-16525	-8.27
3	Motor X	Clockwise	199	+5.84

10. CONCLUSION

In this paper we simulate the simulation for design of electro powered automatic wall painting robot using microcontroller, Tinkercad software, c compiler. By PWM we can control the motors as our convenient speed of operation. Because of PWM we can solve the problem of speed control of motor and smooth operation.

Our task is to design smooth control and its quick operation can do by using PWM method. For simulation we used tinnkercad software and used ATmega328P microcontroller for operation from PWM method to achieve precision time of up-down cycles and provides power to robotic arm through motors.

11. REFERANCE

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