

# Android Based, Arduino Powered Automated Wall Painting

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**Abstract:** The most common view of any construction site today is a set of scaffolds margined around the walls of the buildings with laborers hanging around those scaffolds struggling to reach here and there with a full stretch of their body. Seems quite funny at times, but if we look carefully, it may result into grave consequences. Also most of the times the surrounding environments are so unhealthy that it's almost an unbearable situation for the workers, forcing them either to quit or to welcome some deadly consequences to their health. The autonomous wall painting robot (Wall-E) developed is a silver lining to all the problems discussed above. Also these problems make wall painting an ideal candidate to enjoy the pleasure of technological world and get automated by various advanced features available today as a hybrid of hardware and software, and exempt human beings from surviving such atrocities. The autonomous wall painting robot (named Wall-E) developed can perform the entire task judiciously, quickly, efficiently and even effectively as compared to humans. The robot will move in all four directions (top, down, left, right) with the help of belts with which we attach the robot and the belt will be controlled by the motor. This motor will be responsible for the rotation (powered by a suitable source) of the belt. The robot basically will be controlled by the Bluetooth signals being sent from the android application. So, the user will have the signal control through a standard android application. The nozzle attached will do the rest, will spray paint the subject wall within given contours as directed by the user.

**Keyword:** Arduino [1], processing IDE [5], Arduino IDE [4], IC L298 [3], android

## I. INTRODUCTION

In this mechanized world, there is a growing urge of automatic execution of almost all our works. Humans avoid getting physically involved in the task; rather find machines to carry out our designated work.

Now talking of the autonomous wall painting robot. Some of the reasons we wanted to automate this process were:-

1. To save human efforts and improve throughput.
2. To reduce the environmental risks on human lives.
3. To overall raise the quality of work.

In other words, we are developing a painting machine for wall painting, but it needs to be incorporated with automatic features of robotics. So in this paper we will go

through the possibilities to reproduce drawings on interior walls, just as paper sheets are printed by printing machines.

We started off by programming the arduino to some basic functionalities and then establishing its connection with the bluetooth module.

Once, the connection was made, we configured the overall module which was being powered by the arduino's adapter itself, to be made visible so that nearby devices could establish connection with it.

The next step involved the making of an android app which could be used over different devices supported by android. The app basically let us connect to the arduino plus bluetooth module and let us control its functionalities as well as send and receive data from it.

Then, we made use of an IC (L298) which helped in controlling the motors. The IC's main function is to be able to switch on and off the motors along with regulating its voltage as well as reversing their polarity in order to reverse their direction of motion.

Now, the conveyor belts which are being controlled by the motors are carrying the entire setup which weighs a little less than half a kilogram. The app can now let us spray in the direction in whichever way we want. It controls the nozzle toggle, intensity and the movement controls.

The chassis on which the entire structure is supported is made of aluminum tubes.

## II. MODULAR APPROACH

### A. Graphical User Interface Development [3]

The prime motive of our project was to develop one which could make use of one of the most widespread technology nowadays, the android operating system which is being run over millions of devices and is open source.

Our initial development on the android front were a few basic applications (apps) that helped us in understanding how the background coding of android system works and how we could modify it to our requirements.

For this we installed an IDE called "Processing" which is a simple yet a very powerful IDE. It is easy to use and helps us to design apps in a very quick manner.

Some of our intermediate apps contained a few buttons functioning like on-off switches. Others included setting up bluetooth connection with any nearby open visible device.

Finally, we developed an app which included buttons as well as sliders for controlling the motors intensity.

The processing makes use of several libraries like APIWidgets which helps in buttons, etc. When we are through with the coding of our app, we connect our cell phone/tablet with a USB cable to our PC and upload the app.

The steps are:

- i. Downloading Processing as well as SDK manager for its total setup.
- ii. Turning on USB connection in our phone which can be found under debugging option.
- iii. Coding of the application as required.
- iv. Uploading it to the device via a USB.
- v. Running the app on device, making sure it has a bluetooth feature.

### **B. Arduino Coding [2]**

The arduino is a device that helps us in connecting appliances like motors and LEDs with our Android based device with the help of a Bluetooth module named HC-05[2].

Arduino senses the inputs in forms of signals and converts them into commands as per the device connected to it.

The HC-05 module connected is connected to arduino using a breadboard. On successful wiring connections the LEDs of the arduino as well as the HC-05 light up (red) showing that the circuit has been completed.

The IDE we use for coding the arduino is ARDUINO IDE. It also makes use of a USB cable which can be attached to the arduino board. The programming language used in these IDEs is very similar to that of JAVA and C++.

Its steps can be summarized as follows:

- i. Downloading and creating appropriate paths for ARDUINO IDE's directories.
- ii. Enabling the bluetooth admin functionality so that our module is able to make use of the connections based on bluetooth.
- iii. Coding of our arduino program.
- iv. Configuring the HC-05 module via arduino.
- v. Uploading the entire workspace to the arduino with the help of a USB.

### **C. Bluetooth Connection [2]**

The entire processing of this automated wall painting system is dependent on our Bluetooth connectivity, as all our signals are sent by means of this bluetooth.

Our Bluetooth device HC05 [2] is attached to the circuit. The coding for its connectivity with the arduino board is done successfully.

As soon as the arduino board [4] is provided the power the GUI asks the phone to switch on its own Bluetooth. On doing so the device detects the Bluetooth HC05.

Now we can send our signals for motors, pumps [5] etc.

The supporting structure of the entire robot is now developed. All the unit products are basically contained in this chassis.

### **III. AIM FOR DEVELOPMENT [7]**

Wall painting as we see in general are usually on scaffolds carried out by humans on the given wall. This kind of system has major disadvantages as well as some serious overhead.

It is carried out on in various scenarios like unkempt and dangerous places as well as it requires work to handle the additional scaffolds (i.e. building and managing it). This leaves no scope of improvement and cost reduction.

In the present scenario there were few robots present in the market which could do the job in a sense but not to our expectation level. Also in few of them rough sketch had to be done on the wall and the painting could be done on it. But this was a double overhead including the effort to build the rough sketch the wall being much larger.

Few goals prior to this development is as follows:-

- Safety improvement.
- Develop an easy fitting machine chassis for simplicity.
- To implement multiple colors.
- To widen the application areas and not get restricted to external structures.

### **IV. CONDITIONS FOR DEVELOPMENT [8]**

The following conditions have been kept in mind prior to development:

- (1) On feeding an input program, the structure starts painting accordingly.
- (2) To carry out its function on any given position on the wall.
- (4) The entire chassis and internal equipment weighs less than 4 kg in the prototype version.
- (5) Several colors can be utilised at any given point.

### **V. CONCLUSION**

Wall-e was basically developed with idea of reducing human errors and wastage of time. The prototype proves to be successfully delivering both these qualities along with efficient resource utilisation. For further enhancement we would like to add a drawing module in which the user inputs a certain image and with the help of image processing the system recognises the image and paints it on the wall.

### **REFERENCES**

- [1] Exploring Arduino - John Warren and Josh Adams
- [2] youtube.com/jeremyblum
- [3] Programming Handheld Systems with Android by Dr. Adam Porter (available on course era)
- [4] <http://spectrum.ieee.org/robotics> [For Robotics study]
- [5] <http://playground.arduino.cc/Learning/Tutorial>
- [6] Set up of a robotized system for interior wall paintingsystem. By: B. Naticchia, A. Giretti, A. Carbonari
- [7] Development of wall painting system by: Takuya Gokyu, Masayuki Takasu, Sumio FukudaTokyu Construction Co. Ltd.
- [8] Development of an automatic four color spraying device carried by a robot arm. BY:Development of an automatic four color spraying device carried by a robot arm.