

Automated Washing Machine System using Arduino

A Microprocessors and Microcontrollers Project

by

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ACKNOWLEDGEMENTS

Computer science is a field where you can know it all but still know nothing at all- you spend a semester studying a subject and believe you have a firm grasp on its concepts, but when you are plunged into the industry and expected to work in the area, you realize things aren't working the way you'd like them to, and your knowledge is severely lacking in several ideas. This is why project work is so important- it backs up theoretical knowledge with solid practical implementation skills and helps a student build strong foundations.

This project was very challenging and we thank Prof. Indranil Banerjee, Prof. Soma Bhattacharya, Prof. Soham Nandi Roy, Prof. Debkumar Chowdhury, and Prof. Subhabrata Sengupta for their guidance throughout the semester, and for introducing the subject to us in a lucid and engaging manner. We regret our inability to implement this project on the Intel 8051 platform, partly due to inability to understand hardware interfacing and programming on it, and partly due to its unavailability on short notice in Kolkata. We hope this project is acceptable and shows what we have learned over the last few months.

-Ronit Ray, Subhadeep Biswas

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INTRODUCTION

A washer or washing machine is an electronic device used to wash laundry like clothing and sheets. It is a specialized device that makes use of a pre-programmed microcontroller to integrate a number of functions and automate them for a unified washing and drying process.

The first concepts for washing machines were introduced in Europe in the 1790s. These were complex mechanical machines, and while the structural design and performance was refined over the 18th century, they remained prohibitively expensive and complex. It wasn't until the early 1900s that electric washing machines were proposed, and the 1950s that automatic washing machines were introduced. It was well after the semiconductor revolution that microcontroller-based washing machines as we know them today were introduced in the 1990s.

Operation of a Washing Machine:

The working of a washing machine is very intricate, but the basic steps of operation are:

1. The clothes are loaded into the receptacle.
2. Detergent is added.
3. A pump fills the receptacle with water.
4. The receptacle is now rotated clockwise and anticlockwise repeatedly to ensure that all clothes are exposed to the water-detergent mixture and are also cleaned due to interaction with this mixture and friction due to rubbing against each other.
5. Another pump now drains the receptacle of water and detergent.
6. A fan will dry the clothes in the receptacle before they are extracted.

Implementation in the Project

Due to financial constraints and since a water pump was not available in the market at the time of implementation, we have decided to keep the water filling and draining processes manual for this project. This reduces the project to three integrated components:

1. **The Water Level Sensor** which detects when enough water has been poured into the receptacle
2. **The Motor** which will rotate the receptacle
3. **The Fan** which will dry the receptacle.

Components Used

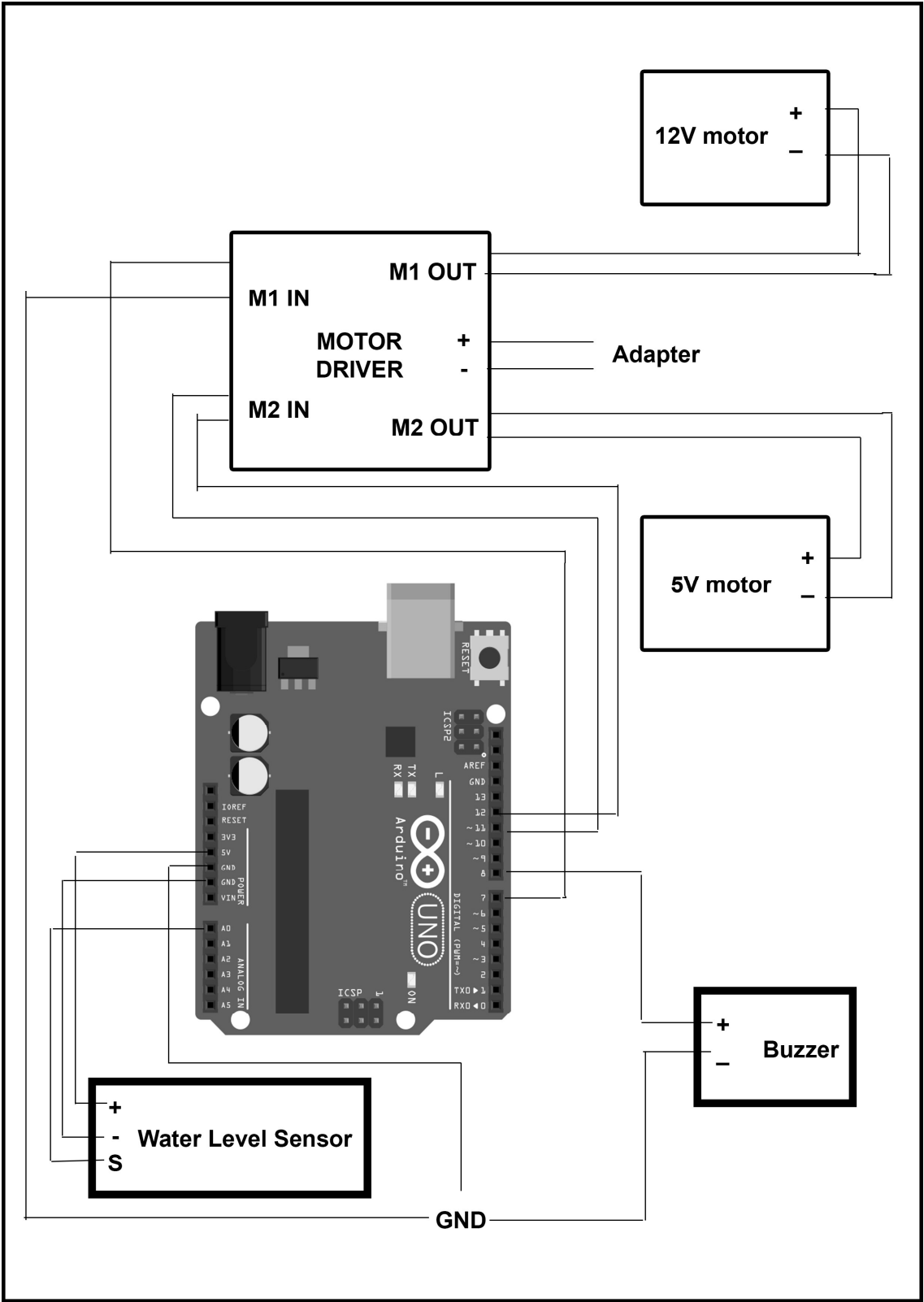
Name	Price
Arduino Uno R3	500
12V DC Motor	200
5V DC motor	150
Motor Driver DRV8825	200
Water Level Sensor	150
DC Motor Fan	100
Buzzer	50
Jumper Wires	50
Breadboard	100

The total cost of the project is around 1500 INR. A shoebox was used to make the body of the washing machine, and various parts were glued together using a glue gun.

Operational Algorithm:

1. Water is poured into receptacle
2. If sensor.level > 600 then
 - a. Buzzer alert
 - b. Repeat 5 times
 - i. Rotate motor clockwise 5s
 - ii. Rotate motor anticlockwise 5s
 - c. Buzzer alert
3. Wait 10s while water is drained.
4. Run fan 15s
5. Buzzer alert for completion.

CIRCUIT DESIGN



This circuit was designed on Adobe Photoshop CC.

Code

The code was written on the Arduino IDE and burned using a Mini USB cord.

```
void setup() {  
    pinMode(A0, INPUT); //Water Level  
    pinMode(8, OUTPUT); //Buzzer  
    pinMode(7, OUTPUT); //Fan  
    pinMode(11, OUTPUT);  
    pinMode(12, OUTPUT); //Motor  
    Serial.begin(9600);  
}  
  
void loop() {  
    int a=analogRead(A0);  
    Serial.println(a);  
  
    if(a>600) {  
        digitalWrite(8, HIGH);  
        delay(3000);  
        digitalWrite(8, LOW);  
  
        for(int i=1; i<=5; i++){  
            digitalWrite(11, HIGH);  
            digitalWrite(12, LOW);  
            delay(5000);  
  
            digitalWrite(12, HIGH);  
            digitalWrite(11, LOW);  
            delay(5000);  
  
            digitalWrite(11, LOW);  
            digitalWrite(12, LOW);  
        }  
  
        digitalWrite(8, HIGH);  
        delay(3000);  
  
        digitalWrite(8, LOW);  
        delay(10000);  
  
        digitalWrite(7, HIGH);  
        delay(15000);  
        digitalWrite(7, LOW);  
  
        digitalWrite(8, HIGH);  
        delay(3000);  
        digitalWrite(8, LOW);  
        delay(10000);  
    }  
}
```

CONCLUSION

The project was implemented successfully. A video of the operation can be found at <https://www.youtube.com/channel/UCb9fthBo074O1fgcjHbYeag>. For future scope, we would like to use pumps for the water inflow and drainage processes. The project serves as a proof of concept that a microcontroller can be used to automate the working of a washing machine.

REFERENCES

Tutorials:

1. <https://www.arduino.cc/en/Tutorial/HomePage>
2. <https://home.howstuffworks.com/washer.htm>

Datasheets:

1. Arduino UNO: <http://datasheet.octopart.com/A000066-Arduino-datasheet-38879526.pdf>
2. ATmega 328p Microcontroller: http://www.atmel.com/images/Atmel-8271-8-bit-AVR-Microcontroller-ATmega48A-48PA-88A-88PA-168A-168PA-328-328P_datasheet_Complete.pdf
3. Water Level Sensor: http://www.fecegypt.com/uploads/dataSheet/1480850810_water.pdf
<https://www.emartee.com/Attachment.php?name=42240.pdf>
4. Motor Driver: <https://www.ti.com/lit/ds/symlink/drv8825.pdf>
5. Buzzer: <http://www.farnell.com/datasheets/2171929.pdf>