runlinc Beginners Project 6: Washing Machine Control (STEMSEL Version)

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Introduction

Problem

Many machines need to perform steps in a specific order to complete their tasks. We want to investigate this by making a washing machine.

Background

Before the invention of the washing machine, it was necessary to wash all our clothes by hand. Now we can just put the clothes and some washing detergent in, walk away and do other things while the machine does the job for us. However, the machine must do the right steps in the right order. It would be no good if the machine tried to spin the clothes dry first, then added the water! Many other devices around the home need to perform tasks in the right order, such as microwaves, dishwashers, and bread makers. Machines that perform a step-by-step process are also used in industry, such as in bottling plants and car factories. Can you think of any other machines that need to have a step-by-step process?

Ideas

What are the steps we need that our washing machine should perform? How can we show each of these processes by using our kits?

Plan

The user will need to put the dirty clothes and detergent in, so the first thing we want our washing machine to do is to fill the tub with water, then wash the clothes by spinning the tub back and forth. Once the clothes are washed, the washing machine should pump out the dirty water. We may then want to add a rinse cycle or a spin cycle to our washing machine.

This project uses the STEMSEL controller board, a yellow LED (on the board), a red LED, and an electric motor. The washing machine controller will start a wash cycle by pumping water into the washing machine, indicated by a yellow LED. The motor will then turn in one direction and pause, turn in the opposite direction, pause and repeat five times to “wash” the clothes. After that, the water will be pumped out indicated by a red LED.

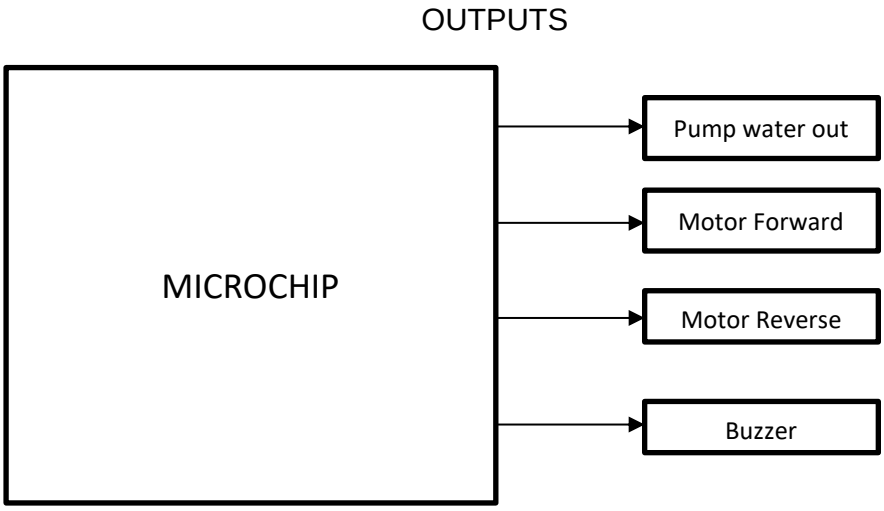

Figure 1: Block diagram of Microchip outputs

runlinc Background

Runlinc is a web page inside a Wi-Fi chip. The programming is done in the browser and sent to the chip over Wi-Fi. The runlinc web page inside the Wi-Fi chip will command the microchips to do sensing, control, data logging Internet of Things (IoT). It can predict and command.

Part A: Design the Circuit on runlinc

Note: Refer to runlinc Wi-Fi Setup Guide document to connect to runlinc

Use the left side of the runlinc web page to construct an input/output (I/O).

For port C4 name it MotorForward and set it as DIGITAL_OUT.

For port C5 name it MotorReverse and set it as DIGITAL_OUT.

For port B6 name it PumpWaterOut and set it as DIGITAL_OUT.

For port C0 name it YellowLED and set it as DIGITAL_OUT.

For port C6 name it Buzzer and set it as DIGITAL_OUT.

Figure 2: I/O configuration

Part B: Build the Circuit

In our circuit design, we will be using a red LED, a DC Motor and a buzzer. We happen to have these in our kits, so these can be used on our circuit design, as per the plan.

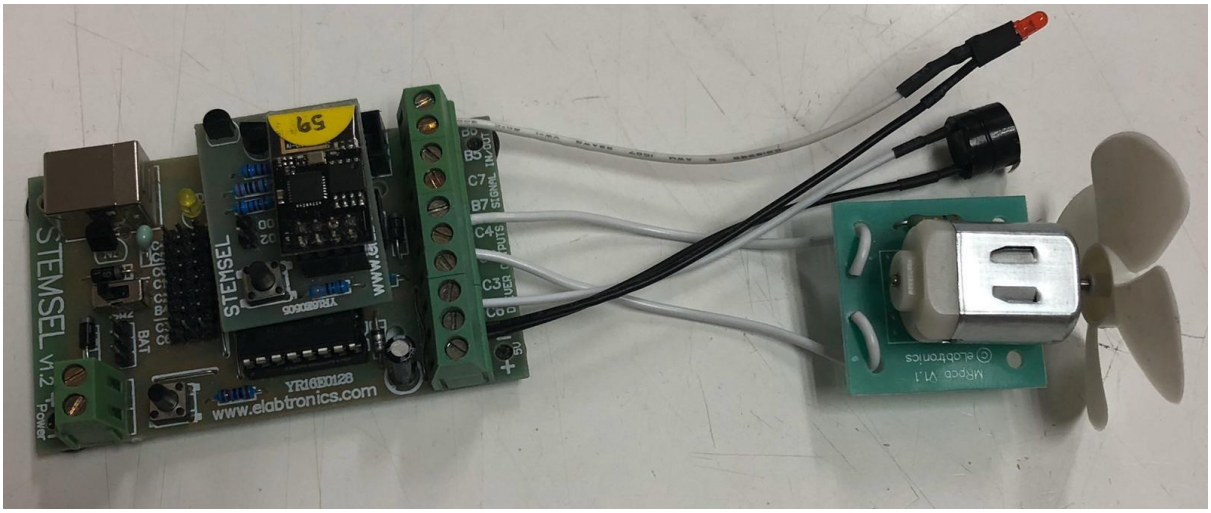

Figure 3: Circuit connection with microchip

Wiring Instructions

For red LED, connect the white wire to port B6 and black wire to the negative pin.

For DC motor, connect white wires to C4 and C5 ports.

For buzzer, connect the white wire to C6 and black wire to the negative pin.

Part C: Program the Circuit

Use the blocks on the right side of the runlinc webpage to program the functions of the washing machine. Use the HTML to add content, CSS to add style to your taste and JavaScript to program the microchip. In this case, JavaScript and JavaScript Loop are needed to program the microchip to act like a Washing Machine. Type the following code. The lines beginning with a double slash are comments and are not read by the microchip, they're just there to remind yourself of what the code does.

JavaScript

```
washingcyclerepeat = 5;
```

JavaScript Loop

```
//WASH
for (Cycle = 0; Cycle < 2; Cycle++ )
{

  //FILL WATER
  turnOn( YellowLED );
  await mSec( 5000 );
  turnOff( YellowLED );

  //WASH
  for (Count = 0; Count < washingcyclerepeat; Count++ )
  {
    turnOn( MotorForward );
    await mSec( 1000 );
    turnOff( MotorForward );
    await mSec( 1000 );
    turnOn( MotorReverse );
    await mSec( 1000 );
    turnOff( MotorReverse );
    await mSec( 1000 );
  }

  //PUMP WATER OUT

  turnOn( PumpWaterOut );
  await mSec( 5000 );
  turnOff( PumpWaterOut );
}
turnOn( Buzzer );
await mSec( 2000 );
turnOff( Buzzer );

break;
```

Summary

Washing machines save a lot of time around the house, but they must perform the correct tasks at the correct time. This is also important in the manufacturing industry since a similar step-by-step process is often used. By using runlinc and coding the program on it, it is easy to see these tasks so that we know our washing machine is working correctly.