Mechatronics Lab Report 1

01.21.22

Nick Morse

Ryan Colon

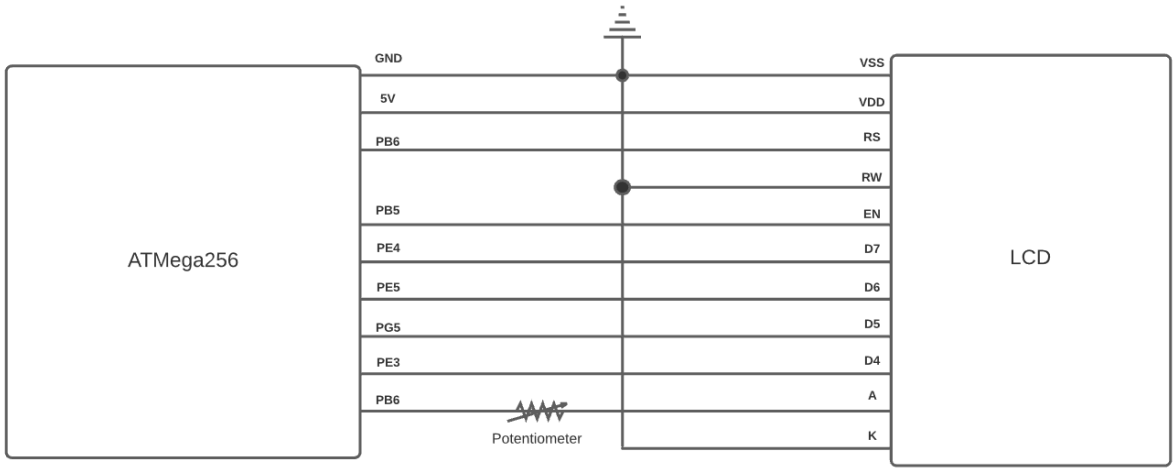
Summary:

Lab 1 required us to print a recipe to an LCD screen. In order to interface from the ATmega to the LCD we needed to use the LiquidCrystal library available for the ATmega. From this library we utilized the lcd.begin, lcd.clear, lcd.setCursor, and lcd.print functions.

When creating the circuit we used the LCD data lines 4 – 7 and hooked them up to the ATmega pins 5-2 respectively. We also hooked the LCD enable line to pin 11 of the ATmega, and the LCD register select pin to pin 12 of the ATmega. We were only concerned with writing to the LCD screen, so we tied the LCD read/write (RW) pin to ground, and then we powered the LCD with 5V from the ATmega processor (+VDD, -VSS). The LCD also has an anode (A) and cathode (K) pin for powering the backlight of the screen, so we hooked LCD pin A up to the output of a potentiometer with 3.3V across it and hooked the LCD cathode (K) pin to ground. We decided to use a potentiometer to power the backlight so we could easily adjust the brightness of the screen.

In order to test that our implementation was working we exchanged code between each other, recreated the circuit, and then ran the code and made sure it functioned as intended.

Circuit Diagram:



Code:

Ryan's Recipe code:

```
/*
Intelligent Machines Lab 1 LCD Recipe
Ryan Colon
01.16.22
 */

#include <LiquidCrystal.h>

const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

const int upperCPMBound = 800, lowerCPMBound = 700;

int upperCPms, lowerCPms;

String currLowerMessage;

void setup() {
  lcd.begin(16,2);
  lcd.clear();
  Serial.begin(9600);

  upperCPms = ceil((60.0 * 1000.0) / (float) upperCPMBound);
  lowerCPms = ceil((60.0 * 1000.0) / (float) lowerCPMBound);

  Serial.print("upper bound:\t");
```

```
Serial.println(upperCPms);
Serial.print("lower  bound:\t");
Serial.println(lowerCPms);

typeToLCD("Ryan's Recipe:");
lcd.setCursor(0,1);
typeToLCD("Cinnamon Toast!");
delay(2500);
lcd.clear();
typeToLCD("You'll need:");
lcd.setCursor(0,1);
typeToLCD("  A toaster");
currLowerMessage = "  A toaster";
delay(1500);
vertScrollLCD("  1 slice bread");
delay(1500);
vertScrollLCD("  Some butter");
delay(1500);
vertScrollLCD("  Some cinnamon");
delay(2500);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("   Let's get    ");
lcd.setCursor(0,1);
lcd.print("   toasting!    ");
delay(2000);
LCDStepFormatting(1, "  get bread");
delay(2500);
LCDStepFormatting(2, "bread in toaster");
```

```
  delay(2500);
  LCDStepFormatting(3, "  toast bread");
  delay(2500);
  LCDStepFormatting(4, "  wait for toast");
  delay(2500);
  LCDStepFormatting(5, "  butter time");
  delay(2500);
  LCDStepFormatting(6, "butter the toast");
  delay(2500);
  LCDStepFormatting(7, "  spray cinnamon");
  delay(2500);
  LCDStepFormatting(8, "  feed \"mother\"");
}

void loop() {

}

/*
Function to display text to lcd using a vertical scrolling effect
You need to initialize currLowerMessage before using
If you see the lower text before scrolling not mention the top text after scrolling
then you need to double check and make sure currLowerMessage is being used properly
*/
void vertScrollLCD(String textToPrint){
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(currLowerMessage);
  lcd.setCursor(0,1);
```

```
  typeToLCD(textToPrint);
  currLowerMessage = textToPrint;
}

//Function that takes a string and writes it to the LCD in a typing style
void typeToLCD(String toType){
  for(int i = 0; i < toType.length(); i++){
    lcd.print(toType[i]);
    delay(random(lowerCPms, upperCPms));
  }
}

//Function to print string in text formatting
//can not accept a stepNum value > 99
void LCDStepFormatting(int stepNum, String toPrint){
  String stepString = "Step ";
  char temp[2];
  itoa(stepNum, temp, 10);
  stepString += temp;
  stepString += ':';

  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(stepString);
  lcd.setCursor(0,1);
  typeToLCD(toPrint);
}
```

Nick’s Recipe code:

```
#include <LiquidCrystal.h>

// Each int corresponds with the given pin on the board.
const int rs = 34, en = 36, d4 = 38, d5 = 40, d6 = 42, d7 = 44;
LiquidCrystal lcd(rs,en,d4,d5,d6,d7);

void setup () {
  lcd.begin(16,2);
  lcd.print("Roast Marshmallow");
  lcd.setCursor(0,1);
  lcd.print("1.Obtain mallow.");
  lcd.setCursor(18,0);
  lcd.print("2.Skewer mallow.");
  lcd.setCursor(18,1);
  lcd.print("3.Grill mallow.");
  delay(1000);
}

void loop () {
  for(int Count = 0; Count < 29; Count++)
  {
    lcd.scrollDisplayLeft();
    delay(800);
  }
}
```