ABSTRACT

This work dwells upon the controlled type of de-coiler machine that runs together with the shearing machine automatically. It encompasses designing, simulation, and analysis of de-coiler systems for uncoiling and cutting sheet metal at the desired length which is applicable particularly in HVAC industry where sheet metal is a backbone for their duct production. It analyzes a control system that enables the unit to cut a continuously rolling strip to length. As per the demand of the industry, the process seems to behave quickly and simple as well with high accuracy and safety. The manufacturing method of the new duct system using this cut to length and De-coiler mechanism can reduce the manufacturing cost, waste in the form of scrap and also increases the rate of productivity by reducing lead time. The proposed De-coiler and cut-to-length machine have a clean and robust design, cost-effective and easy to use for workers, and can also be modified as per demand. The sheet strip position sensor named rotary encoder is used to measure the amount of sheet metal length, based on the design of the duct system and using this information, the decoiler machine will be directed to stop and the pressing machine will cut the sheet. This mechanism provides low operational cost, no power requirement, high accuracy and high safety to the workers who were meant to operate the pressing machine which improves the material handling system in such kind of industries. The implementation of this project has major benefits to improving productivity. The design, simulation, and analysis of this De-coiler mechanism is done with the help of suitable software, such as SolidWorks, Proteus8, and Arduino.

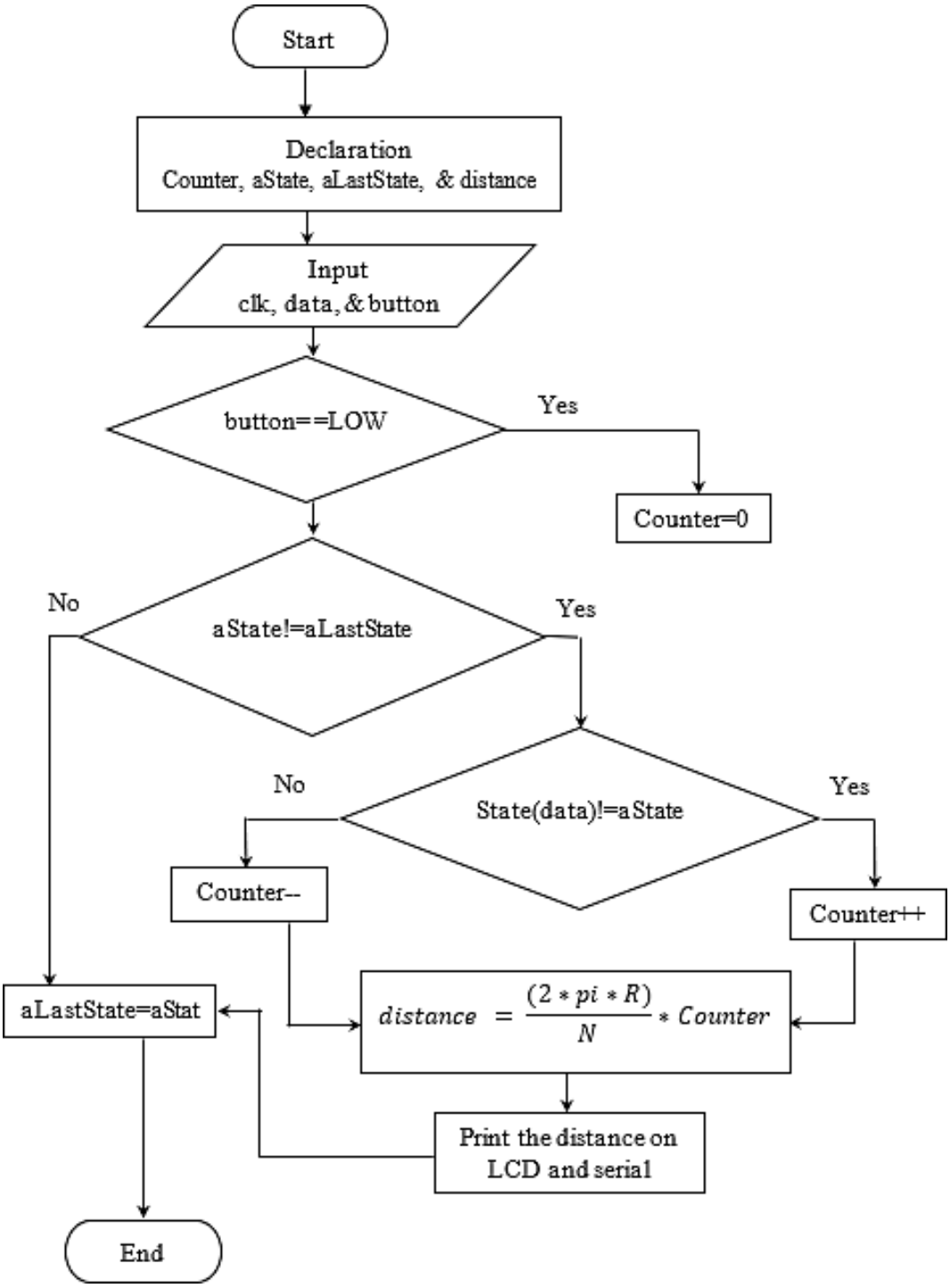


Figure1.1: Programming algorithm

A cut-To-Length device is used to measure what amount of the sheet metal is passed over the roller through the rotary encoder wheel. The rotary encoder will rotate in a counterclockwise direction at a similar speed to the roller shaft. The rotary encoder will be placed at the end of the roller support.

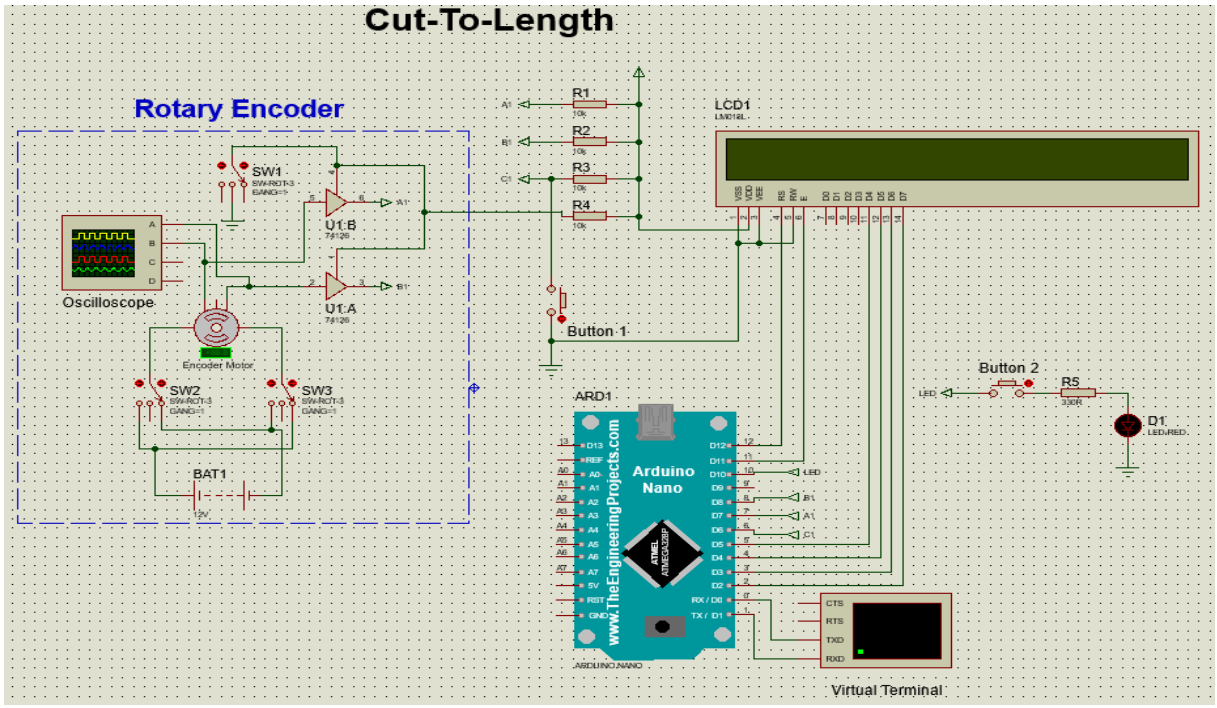


Figure 1.2: Circuit Diagram of cut-to-length on Proteus

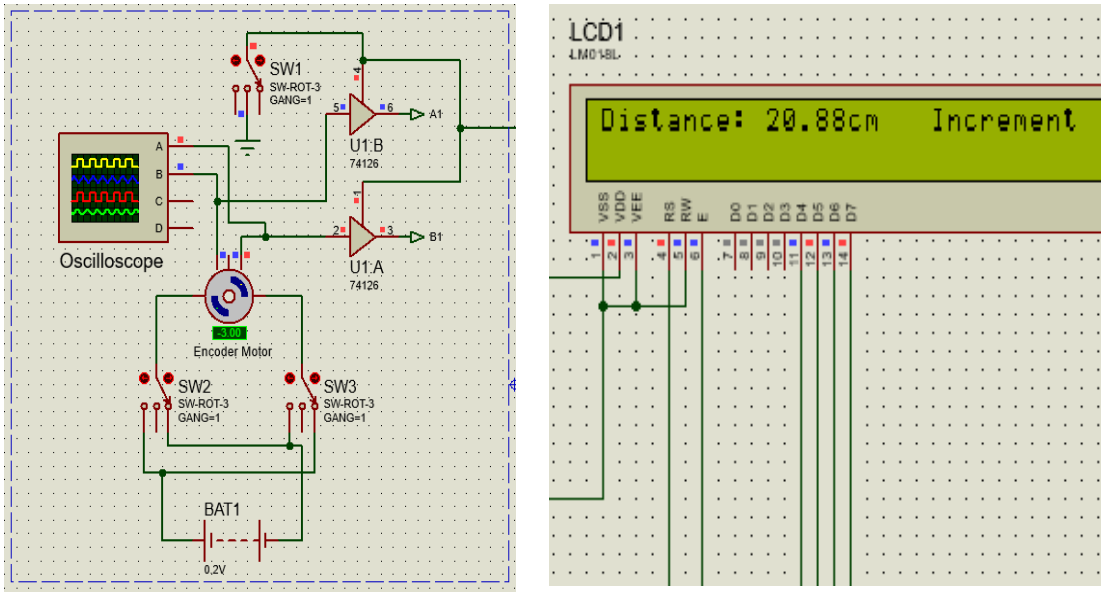


Figure 0.3: Display of the length measured

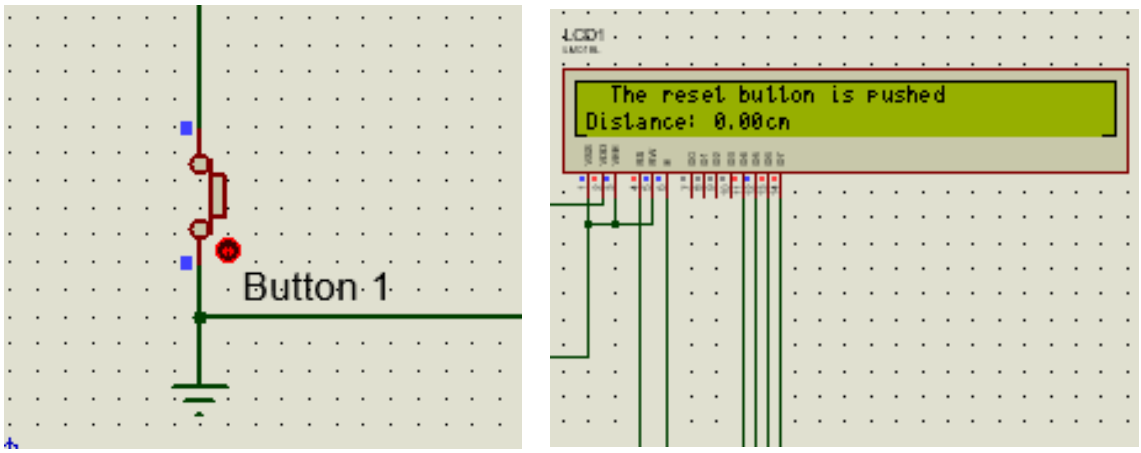


Figure 1.4: Resetting to initial state to make another measurement

ARDUINO CODE

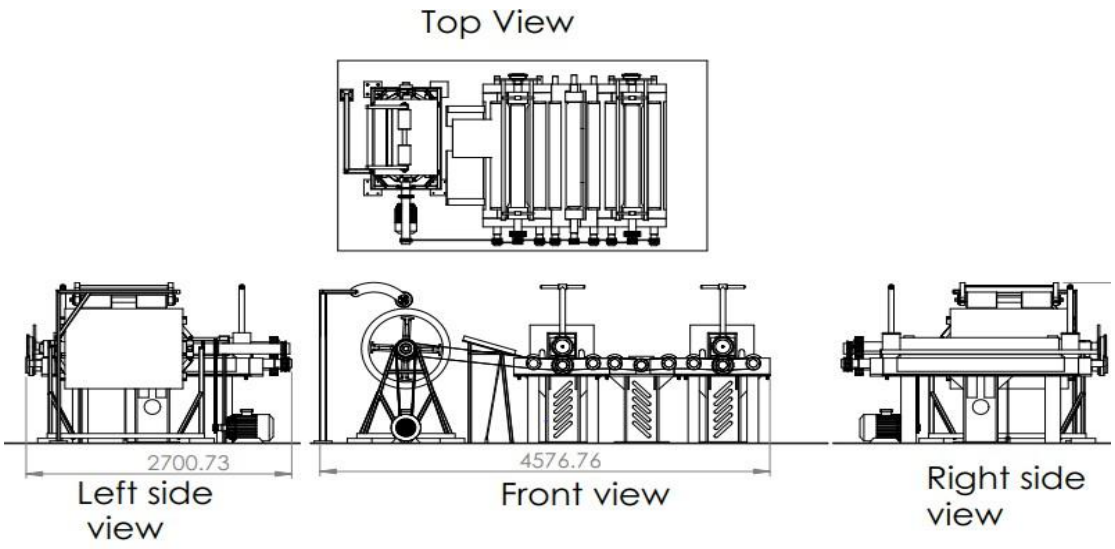
```
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2); //set up LCD

#define clk 7 //clk is the output of A
 #define data 8 //data is the output of B
#define button 6
#define pi 3.14

int LED=10;
int counter = 0;
int aState;
int aLastState;
int N=40;
float R=3.5;
float distance=0;

void setup()
{
  pinMode (clk, INPUT); pinMode (data,
  INPUT); pinMode (button, INPUT);
  pinMode (LED, OUTPUT);
```

```
  aLastState = digitalRead(clk);// Reads the initial state of the clk(outputA)
  lcd.begin(40, 2);
  Serial.begin(9600);
  Serial.println("          Cut-To-Length");
  Serial.println("Prepared by:
  Zewidu,Birhanu,Biruk,Melaku"); Serial.println(" ");
  lcd.setCursor(10,0);
  lcd.print("Cut-To-
  Length");
  lcd.setCursor(0,1);
  lcd.print("Prepared by: Zewidu,Birhanu,Biruk,Melaku");
  delay(3000);
  lcd.clear();
}
void loop()
{
  digitalWrite(LED, HIGH);
  if (digitalRead(button) == LOW)
  {
    counter = 0;
    distance = 0;
    lcd.setCursor(0,0);
    lcd.print("  The reset button is pushed");
    lcd.setCursor(0,1);
    lcd.print("Distance: ");
    lcd.print(distance);
    lcd.print("cm");
    Serial.println("  The reset button is
    pushed"); delay(1000);
    lcd.clear();
```

```
  }
  aState = digitalRead(clk); // Reads the "current" state of the clk(outputA)
  // If the previous and the current state of the clk(outputA) are different, that means a Pulse has occured
  if (aState != aLastState)
  {
    // If the data(outputB) state is different to the clk(outputA) state, that means the encoder is rotating clockwise
    if (digitalRead(data) != aState)
    {
      counter --;
      Serial.print("Counter:
      ");
      Serial.print(counter);
      Serial.print("        ");
      Serial.print("Distance:
      ");
      Serial.print(distance);
      Serial.print("cm");
      Serial.println("
      Decrement");

      lcd.setCursor(0,0);
      lcd.print("Distance: ");
      lcd.print(distance);
      lcd.print("cm");
      lcd.println("
      Decrement");
    }
    else
    {
```

```
  counter ++;
  Serial.print("Counter:
  ");
  Serial.print(counter);
  Serial.print("        ");
  Serial.print("Distance
  : ");
  Serial.print(distance);
  Serial.print("cm");
  Serial.println("
  Increment");

  lcd.setCursor(0,0);
  lcd.print("Distance:
  ");
  lcd.print(distance);
  lcd.print("cm");
  lcd.println("
  Increment");
}

if (counter < 1)
{
  counter = 0;
}
distance=((2*pi*R)/N)*counter;
```

```
  }
  aLastState = aState; // Updates the previous state of the clk(outputA) with the current sta
}
```



Assembly of Decoiler and Roller