Final Report

Level 1

ITEM COUNTER

Faculty of Information Technology

University of Moratuwa

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1.0 Introduction

People are always trying to find the easy ways for doing something. With the development of technology people were able to find lot of machines for different purposes. Considering the manufacturing industry most of the times the whole processes are done by using machines. Lots of process are happen automatically. Assembling parts, packing items, separating items, measuring things are example for those processes. In that case, counting the items in a production line is also an important process. In huge manufacturing industry, that process get much time and also much labor hours for doing it. Therefore, developing a machine to do that task is essential.

Considering the item counting process, sometimes we have to count items in a different size. Different shapes.
It helps for packing processes also. Counting correctly the item is a main task for the whole system. Daily production count is affected for many sides which are accounting, marketing, sales and etc. So that, this process became very important task in a manufacturing industry.

2.0 Literature Survey

Several machines have been developed to count the products in production line. Most of these machines are commercially available.

1. **Digital Envelope Paper Counting Machine for Small Items.**

Figure 2.1: Pepper counting machine

Features of the Product

1. PF series feeder provides dependable high-speed batch-counting and consistent performance feed for products such as paper sheets/forms, poster, corrugated material, plastic cards, envelopes, brochures, magazines, collapsed cartons, folded and open edge document, tri-fold and Z-fold document, blister cads, die cuts, hang tag and much more.
2. Servo motor driving system, PLC and touch screen control will be easy to operation.
3. Adopt locate mode belt conveyor ensure the high speed and accuracy feeding products.
4. Multi-function operation system includes double detector, missing feeder auto stop alarm and so on, online monitor.
5. DC motors individual driving the separator roll ensure feed one-piece product.
6. Keyence optical sensor detector accuracy count with auto storage function.

2. Automatic brass swivel union fitting bag counting number feeder granule packing machine

Figure 2.2: Bag counting machine

This machine can automatically archive making bags, count numbering, filling, sealing and printing date codes. This machine adopts the advanced PLC, and the precise sensor system, so the machine can work stably and accurately. This machine can pack one to ten kinds of different hardware parts into one bag.

Feature of the machine

1. The vibration bowl, linear vibration unit and precise counting control unit are customized according to the products. Ensure the precision of each bag.
2. Panasonic PLC is adopted, and there is Chinese and English human-machine operation interface, it is easy to operate. High degree of automation.
3. It is only necessary to set the needed parameters at the display screen, the control system can automatically optimize and match with the actions, realizing the optimal packing speed.
4. Reliable and stable dual light source photoelectric check system, assuring complete logo of the packaging bags.

3.0 Aim & Objectives

Aim

The aim of the project is to develop an automated product counting machine which is targeted for small scale business.

Objectives

1. To enable the machine to separately identify products of 2 heights.
2. Enable machine to obtain an accurate count of the two product types.
3. Display the item count on LCD display,
4. Display the item count on PC monitor.

4.0 Analysis and Design

4.1 Basic Block Diagram of the project

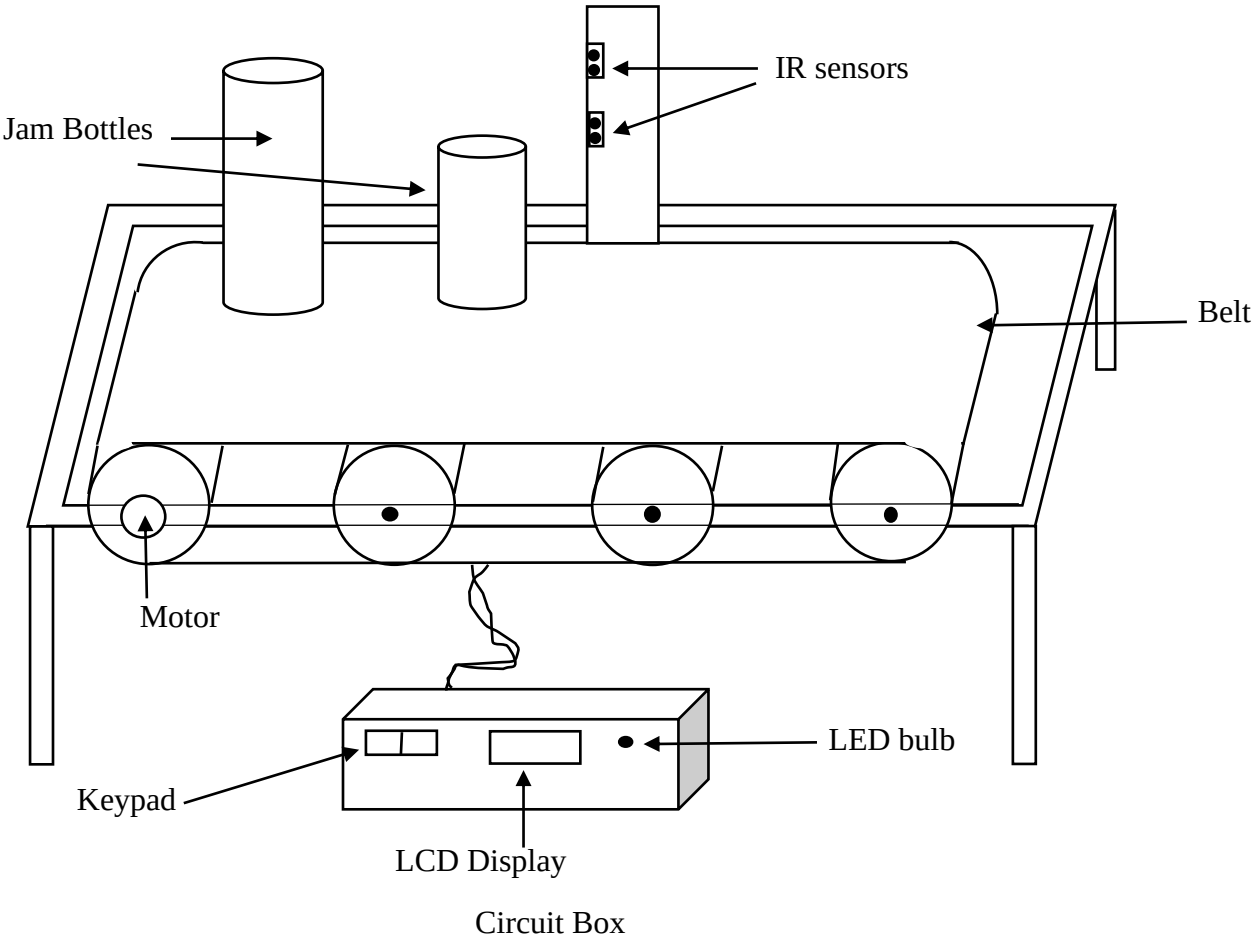

Figure 4.1: Basic Block Diagram of Item Counter

4.2 The 3D view

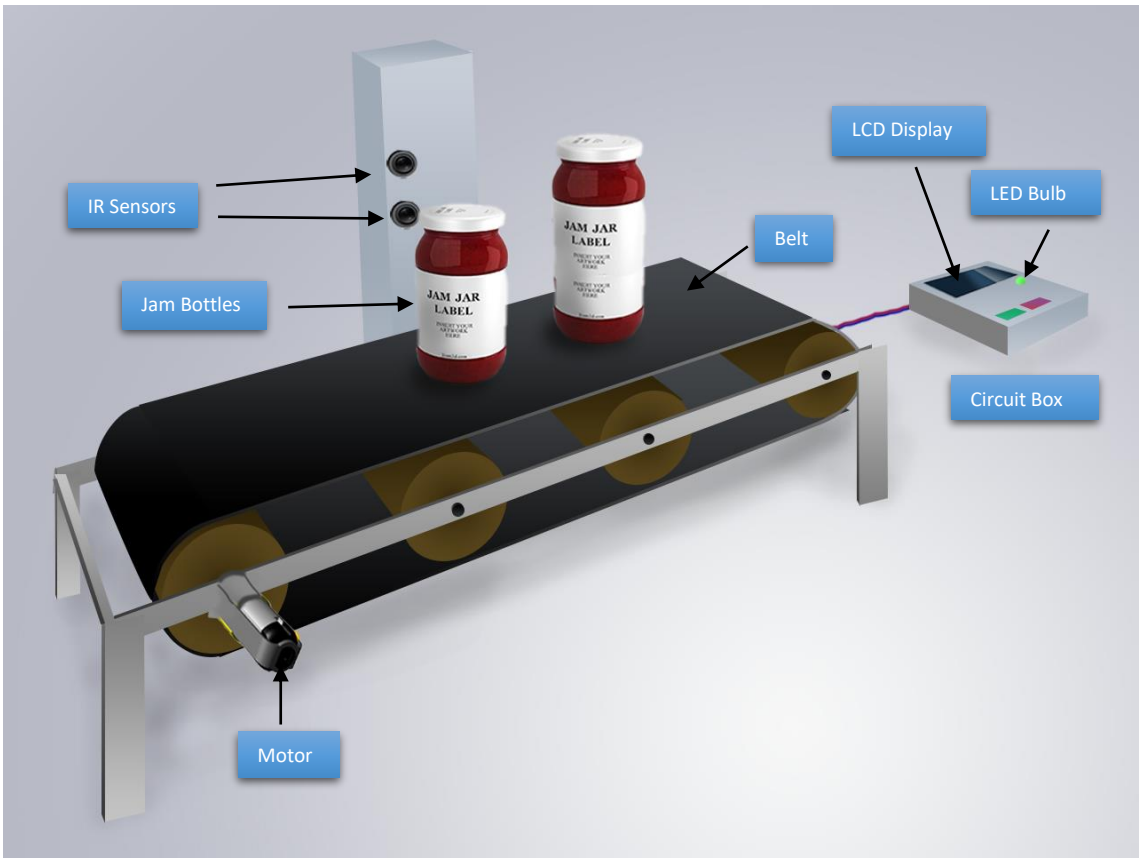

Figure 4.2: 3D View of Item Counter

The item counter consists of a conveyer belt that rotates on three wooden cylindrical wheels. The length of the belt can be designed according to the requirement of client or according to the dimensions of the workspace to suit the process. For our implementation we have considered a 2-foot-long belt. A gear motor has been attached to the driving wheels which provides the force for the entire belt to rotate. The other three wheels are driven wheels. A stand with 2 IR sensors is attached on to the structure to detect the count of the 2 bottles with 2 different heights.

Once the machine is switched on, the LED bulb turns green to show that it has been powered up. The LCD displays the accurate count of the 2 bottles when they pass through the IR sensor. This output is also displayed in a PC.

4.3 Overall Architectural Diagram

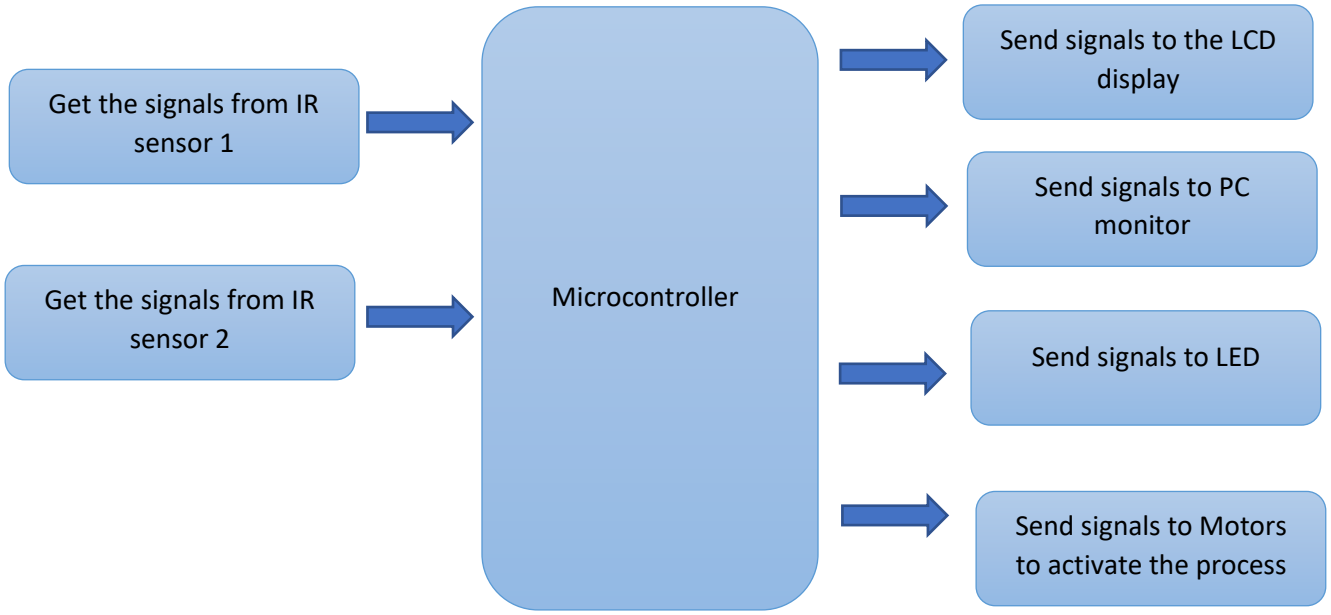

Figure 4.3 Overall Architectural Diagram

There are 2 IR sensors that does the basic functionality of the machine. Sensor 1 detects when a tall bottle passes through it and the sensor 2 detects the smaller bottle. Signals are sent when a bottle of a particular height passes through the sensors. This becomes input to the microcontroller. There are 4 outputs received from the microcontroller. One signal is send to the LCD display to display the count of the short bottles and long bottles.

Another signal is passed to the PC to display the same count. Signal is send to the LED bulb when the machine is powered on. Signals are also sent to the gear motor when the relevant switch to activate the gear motor is switched on.

4.4 The flow chart of the operation

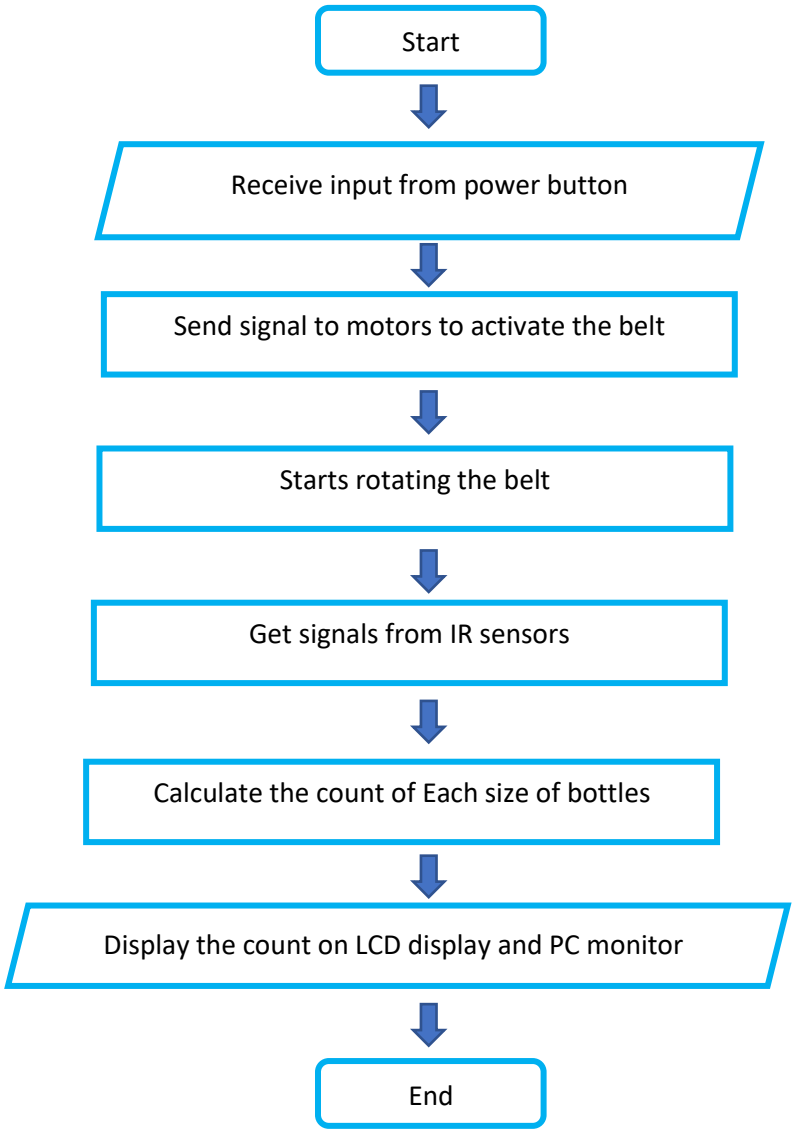

Figure 4.4 The flow chart of the operation

5.0 Testing and Implementing

Figure 5.1: Testing the machine

Initial testing is done to check whether the conveyer belt is rotating properly. The voltage supplied from the 12V gear motor was controlled to obtain a voltage of 5V in order to obtain the optimum speed of rotation.

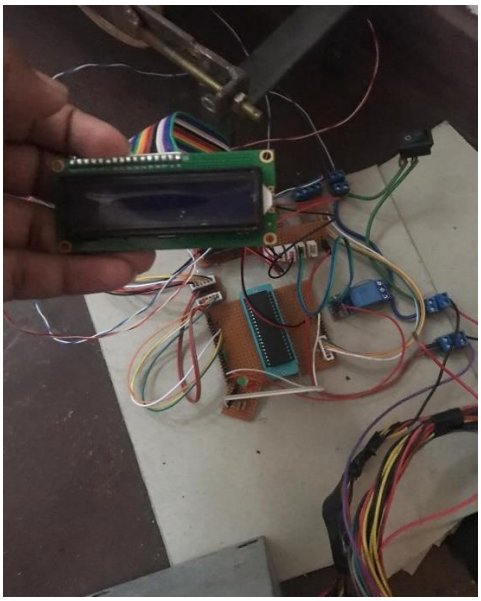

Figure 5.2: Testing the circuit

Testing whether the circuit is functioning properly when the machine is powered up.

Figure 5.3: Testing the LCD display

Testing whether an accurate count is displayed in the LCD display when the 2 sensors are tested.

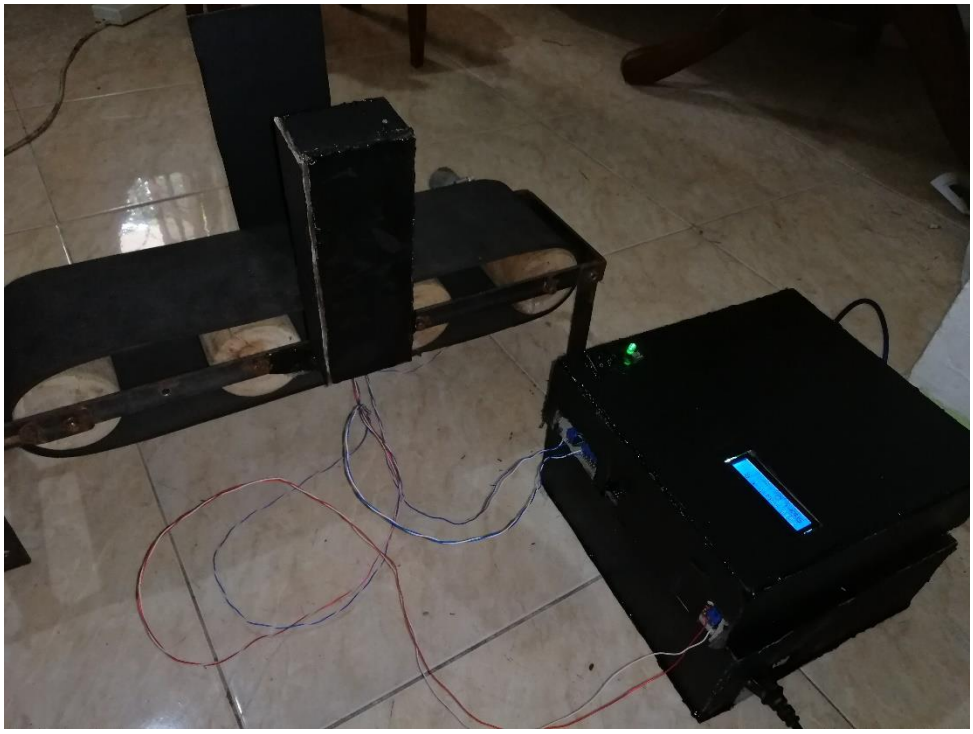

Figure 5.4: Completed machine

Final tests were done on the completed project to check if it displays an accurate count of the bottles.

5.1 Final Code of the project

```
#define D4 eS_PORTC4
#define D5 eS_PORTC5
#define D6 eS_PORTC6
#define D7 eS_PORTC7
#define RS eS_PORTC0
#define EN eS_PORTC1

#include <avr/io.h>
#include "lcd.h"
#include <avr/pgmspace.h>
#include <avr/interrupt.h>
#include <util/delay.h>
```

```c
#include <stdlib.h>
#include <stdio.h>
#define F_CPU 8000000UL
#include <time.h>
#include "UART.c"


int tallCount = 0;
int shortCount = 0;
char tallNum[5];
char shortNum[5];
int motorVal = 0;


int main(void)
{

	// Enable C ports.
	MCUCSR = (1<<JTD);
	MCUCSR = (1<<JTD);
	DDRC = 0xff;
	DDRA = 0xff;
	DDRB = 0x00;
	PORTA = 0b00000001;
	PORTD = 0xff;
	UARTinitials();
	usart_string_transmit("UART INIT...");
	usart_string_transmit("\n");
	MCUCSR = (1<<JTD);
	MCUCSR = (1<<JTD);
	Lcd4_Init();
	Lcd4_Clear();
	Lcd4_Set_Cursor(1,0);
	Lcd4_Write_String("   Welcome!!!   ");
	_delay_ms(10000);
	Lcd4_Clear();
	Lcd4_Set_Cursor(1,0);
	Lcd4_Write_String("    Power On    ");
	lightOn();
	_delay_ms(10000);
	motorOn();
	itoa(tallCount, tallNum, 10);
	itoa(shortCount, shortNum, 10);

    while (1)
    {
		getCount();
    }
}
```

```
void motorOn(){
	PORTA &=~(1<<PINA0);
}

void motorOff(){
	PORTA |=(1<<PINA0);
}

void lightOn(){
	PORTA |=(1<<PINA1);
}

void lightOff(){
	PORTA &=~(1<<PINA1);
}

void getCount(){
	Lcd4_Clear();
	Lcd4_Set_Cursor(1,0);
	Lcd4_Write_String(" Tall Count :");
	Lcd4_Set_Cursor(1,13);
	Lcd4_Write_String(tallNum);
	Lcd4_Set_Cursor(2,0);
	Lcd4_Write_String("Short Count: ");
	Lcd4_Set_Cursor(2,13);
	Lcd4_Write_String(shortNum);
	_delay_ms(500);
	usart_string_transmit("Tall Count : ");
	usart_string_transmit(tallNum);
	usart_string_transmit(" Short Count : ");
	usart_string_transmit(shortNum);
	usart_string_transmit("\n");
	if(bit_is_clear(PINB,3)){

	}
	if(bit_is_clear(PINB,0)){
		while (bit_is_clear(PINB,0))
		{
			_delay_ms(1);
		}
		tallCount++;
		shortCount--;
		itoa(tallCount, tallNum, 10);
		itoa(shortCount, shortNum, 10);

	}else if (bit_is_clear(PINB, 1)){
		while (bit_is_clear(PINB,1))
		{
			_delay_ms(1);
		}
		shortCount++;
		itoa(shortCount, shortNum, 10);
	}else{

	}
```

6.0 Reference

1. https://www.microchip.com/

2.https://www.alibaba.com/product-detail/Digital-Envelope-Paper-Counting-Machine-For_62141587419.html?spm=a2700.7724857.normalList.168.7044a8461QxzdG

3.https://www.alibaba.com/product-detail/automatic-brass-swivel-union-fittings-bag_60788546832.html?spm=a2700.7724857.normalList.67.7044a8461QxzdG