CHAPTER 5
IMPLEMENTATION AND TESTING

5.1 Implementation

In this project, the application used to create prototype sort of delivery package is Arduino IDE application. And the devices used in this prototype include: Arduino Mega, ultrasonic sensor, laser sensor, ldr sensor, load cell sensor, LCD display, DC geared motor, and a conveyor. Here are some program snippets / snippets of components and sensors used in this prototype project.

Illustration 5.1: Declaration and Initialization
(Illustration 5.1)

Code for pin declaration used as input pin and output pin and also function declaration. Among other things: ultrasonic sensor, laser sensor and ldr sensor, load cell sensor, DC geared motor, led, and also LCD display, wide measurement function, high measuring function, and function run motor conveyor.

(Illustration 5.2)

Code function to set the direction of rotation of a DC geared motor used as a conveyor drive.
Code program to calculate packet length using laser sensor and ldr sensor.

(Illustration 5.3)
The program code to calculate the width of the packet using an ultrasonic sensor.

Illustration 5.4: Function `ukurLebar()`

```c
float ukurLebar()
{
    float offsetKanan = -32.0f;
    float offsetKiri = 0.0f;
    float offsetAkhir = 4.0f;

    float jarakKiri = sensorKiri.read(HCSR04::MetricsEL::mm) + offsetKiri;
    float jarakKanan = sensorKanan.read(HCSR04::MetricsEL::mm) + offsetKanan;

    if (jarakKiri > 0 && jarakKanan > 0)
    {
        float lebar = (248.0f - jarakKanan - jarakKiri - 40.0f);
        if (lebar < 0)
            return 0;
        return (lebar + offsetAkhir) / 10;
    }
    else
    {
        return 0;
    }
}
```
Code program for calculating packet height using ultrasonic sensor.

Illustration 5.5: Function ukurTinggi()

Illustration 5.6: Calculation of Actual Weight (Load Cell)

The code to process the mass or weight calculation using a load cell sensor that has been designed into a weigh board.
Code to display the results of packet volume measurements, packet volumetric weight conversion, and packet mass or weight.

(Illustration 5.8)

This is the variable declaration for the conversion process from volume (cm^3) to weight (gram).
To determine which provisions to choose, actual weight or volumetric weight.

The process of declaration of variable length (p), width (l), height (t), and also volume (v).
5.2 Testing

Here is the testing process prototype package sorting system. In this test process, objects used as packets are objects in the form of boxes / cubes / cubes that have a flat surface. It also has mass or weight. Because, before the test process begins, the object must be loaded first so that the object has a weight / mass so that later it can be calculated by weight on the process of calculating the mass of the object (weighing board). Because if the package has no actual weight (no real mass / weight), then at the end of the process it will be difficult to compare with the volumetric weight.

Prepared items / packets are then placed at the end of the conveyor when the led light is on (alert for the officer to immediately place the package) and the conveyor is still dead for a while until the conveyor is on.
Once the package is placed on top of the conveyor and conveyor then turns on / runs, the front end of the packet will begin to touch the laser beam. And from there, the process of calculating the long value begins.
The packet is still running when the laser beam touches part of the package, to find the value of ms (milliseconds) from the beginning of the laser until the laser does not detect the existence of objects / packets that run through the laser beam.
The back end of the packet is exposed to the laser, it means that the search and counting of ms (millisecond) values has been done successfully. The initial ms value is the value of ms obtained when the packet first touches the laser beam. And the final ms value is the value of ms obtained when the laser beam touches the back end of the package. Thus, the value of ms to be used as a long value, is obtained by calculating the ms value from the front end of the package to the end of the back of the packet.

And as long as the packet touches the laser until it is not exposed to the laser again, the calculation process within the project not only measures the ms (milli seconds) value, but also calculates the value of packet width and value using ultrasonic sensors located on the right, left and upper side of the tunnel.
After the volume counting process is complete, then the packet will proceed to the weigh board.
After calculating the volume value is done, then the packet will be forwarded to weighing board to calculate the actual weight. The package above the conveyor will fall to the weighing board and after that the actual weight calculation process will begin.
The result of calculating the value of P, L, T, Volume, Volumetric Weight and Mass Weight / Actual shown in Serial Monitor.
The results of the calculation of the value of length, width value, high value, conversion of volumetric weight value, actual weight value and arrow arrow as a decision taken.