CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation

```
void loop(){
      Wire.beginTransmission(MPU);
      Wire.write(0x3B);
      Wire.endTransmission(false);
      Wire.requestFrom(MPU,12,true);
      GyX=Wire.read()<<8|Wire.read();
      GyY=Wire.read()<<8|Wire.read();
      GyZ=Wire.read()<<8|Wire.read();
      Serial.print(" | X = "); Serial.print(GyX);
      Serial.print(" | Y = "); Serial.print(GyY);
      Serial.print(" | Z = "); Serial.print(GyZ);
      delay(5000);
      }
```

This code is to display the results of the X, Y and Z axes from the sensor gyroscope. Source from *https://create.arduino.cc/projecthub/Nicholas_N/how-to-use-the-accelerometer-gyroscope-gy-521-6dfc19.*

```
      Serial.println(kondisiProximity);
      if (kondisiProximity == HIGH)
         digitalWrite(led, LOW);
      else digitalWrite(led, HIGH);
```

When the cat approaches its cage, the proximity sensor lights on and produces zero (0) value. When the cat moves away then sensor lights off and produces one (1) value. This code is to find out the presence of the cat when it comes near the proximity sensor.

The source code is taken from *https://www.codeproject.com/Articles/1109511/IR-obstacle-sensor-with-Arduino.*

```
      digitalWrite(trigPin, LOW);
      delayMicroseconds(2);
      digitalWrite(trigPin, HIGH);
      delayMicroseconds(10);
      digitalWrite(trigPin, LOW);
      duration = pulseIn(echoPin, HIGH);
      distanceUltrasonic= duration*0.034/2;
      Serial.print("distanceUltrasonic: ");
      Serial.println(distanceUltrasonic);
```

The cat approaches the ultrasonic sensor, the value of the sensor gets smaller and if not then the value of the sensor is large. This code is to find out when the cat is near the sensor ultrasonic.

The source code is taken from *https://randomnerdtutorials.com/complete-guide-for-ultrasonic-sensor-hc-sr04/*

5.2 Testing

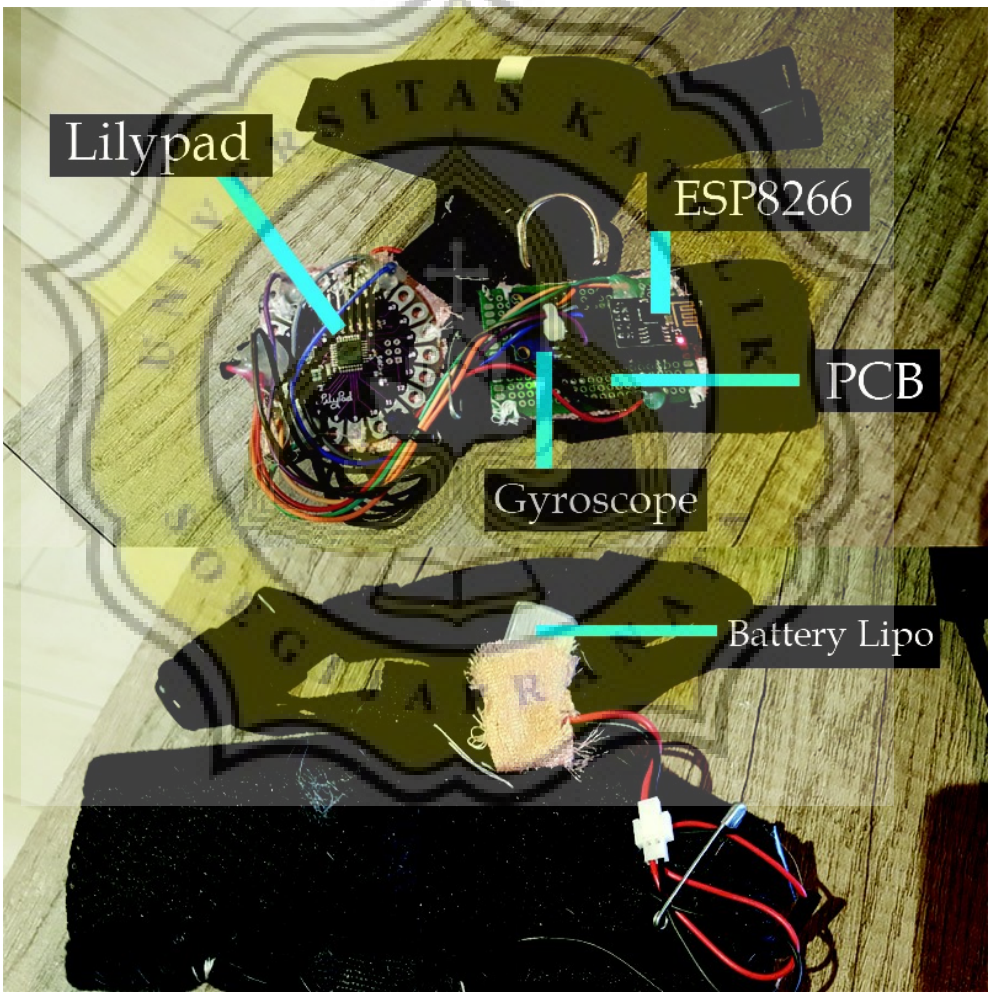

Illustration 5.1: The Vest

The vest on illustration 5.1 shows gyroscope sensor, esp8266 wifi module, battery lipo and arduino lilypad which installed and sewed on vest.

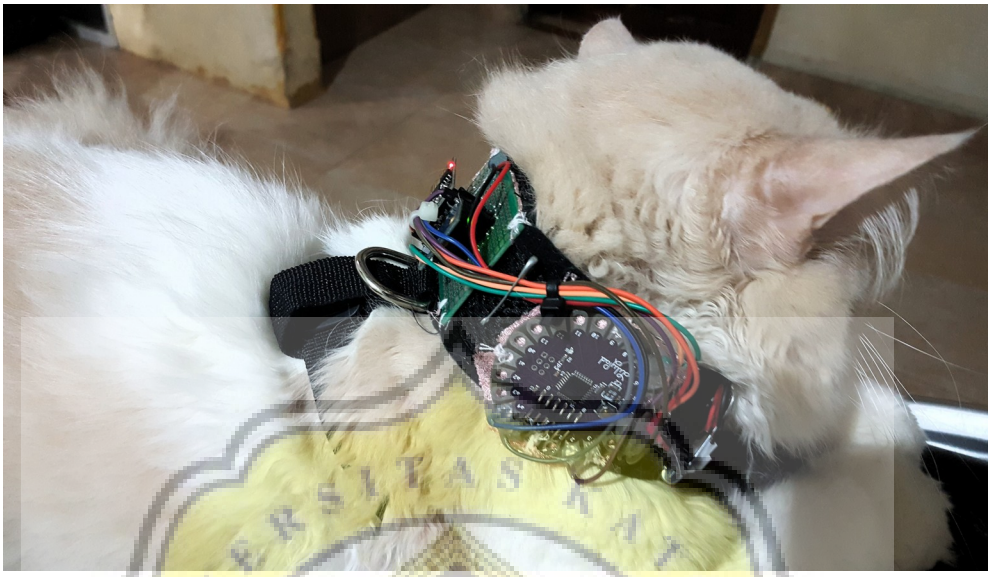

Illustration 5.2: The Cat Using Vest

Illustration 5.2 vest that is applied to cat. The Arduino Lilypad is located next to the neck, because arduino lilypad does not fit if placed on the back of the cat. The pcb consists of a sensor gyroscope and the esp8266 wifi module paired on the back of the cat. The sensor is installed behind and besides making the cat comfortable using a vest and does not interfere with the cat movements.

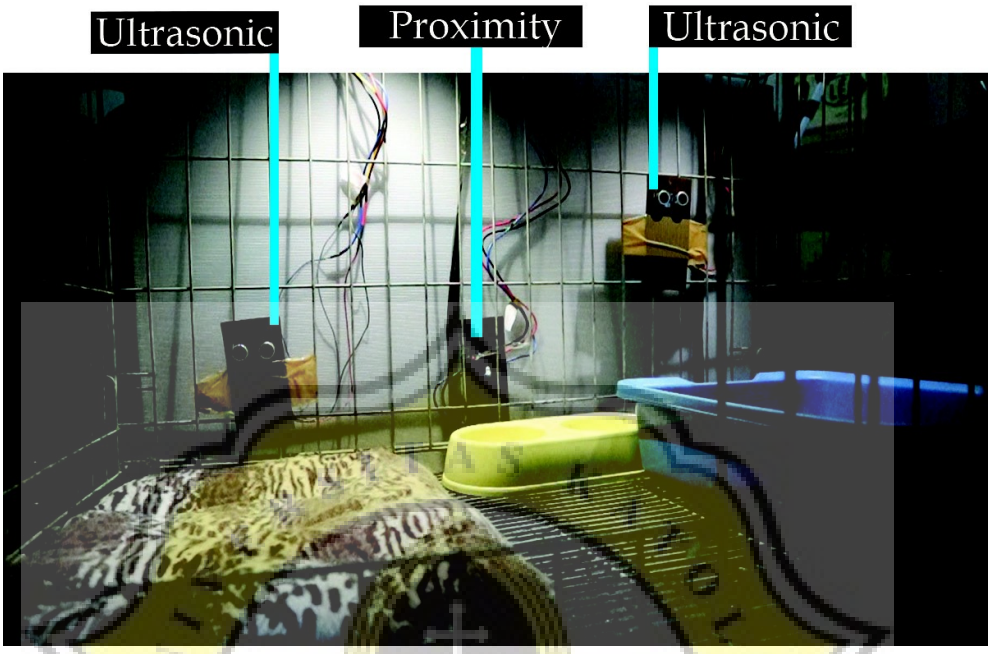

Illustration 5.3: The Cage

Placement of sensors on the cage is on illustration 5.3. All sensors placed in the cage to find out the activity of cat in the cage.

Collecting data in a cage is carried out for 1 hour. Cat eating, sleeping and pooping activities are recorded and stored on the server.

Range data recording from the gyroscope sensor:

Table 5.1: The Data Before Process

Crawl	**X Axis**	**Y Axis**	**Z Axis**
St. Dev	82	2253	1403
Average	-1106	-1234	-129
Sit	**X Axis**	**Y Axis**	**Z Axis**
St. Dev	298	2213	2982
Average	-1568	-279	-362
Sleep	**X Axis**	**Y Axis**	**Z Axis**
St. Dev	306	200	103
Average	-1455	-470	-315

Table 5.2: The Data After Process

Crawl	**X Axis > -1200**	**Y Axis >-4000**	**Z Axis > -1000**
St. Dev	82	823	203
Average	-1106	-1119	-378
Sit	**X Axis > -2000**	**Y Axis >-2500**	**Z Axis > -1000**
St. Dev	298	588	221
Average	-1568	-858	-348
Sleep	**X Axis > -1400**	**Y Axis >-900**	**Z Axis > -400**
St. Dev	306	200	103
Average	-1455	-470	-315

The initial data obtained has a high standard deviation. Data that has a high standard deviation will be processed again using a statistical formula and produces a smaller standard deviation value.

Table 5.3: The Range Position Of Cat

Crawl	St.Dev	Average	Range
X Axis	82	-1106	-1024 - (-1188)
Y Axis	823	-1119	-296 - (-1942)
Z Axis	203	-378	-175 - (-581)
Sit			
X Axis	298	-1568	-1270 - (-1866)
Y Axis	588	-858	-207 - (-1446)
Z Axis	221	-348	-127 - (-569)
Sleep			
X Axis	306	-1455	-1149 - (-1761)
Y Axis	92	-444	-352 - (-536)
Z Axis	50	-290	-240 - (-340)

The range position of cat movement in table 5.3. The position of the cat crawl in the range Y -296 to -1942 and Z axis -175 to -581. The position of the cat sit in the range Y -207 to -1446 axis and Z -127 to -569 axis. Sleeping cat position range Y -352 to -536 axis and range Z axis -240 to -340.

To distinguish the cat when sleeping or sitting, can be seen the range that has been processed using statistic formula at table 5.3. to distinguish sitting position and crawling position can be seen the deviation standard and the biggest value of the average at table 5.1. with seeing the data of cat movement that has high value, that means the cat is crawling.

Table 5.4: The Data Sensor From Cage

Food Bowl (Proximity)	**Bed (Ultrasonic1)**	**Sandbox (Ultrasonic2)**
1	2274	47
1	2274	46
1	2273	46
1	2273	46
1	2274	47
1	2276	47
1	12	47
1	12	46
1	20	46
1	2275	46

The sensor for the cage get three data from the proximity sensor and two ultrasonic sensors. Ultrasonic sensor 1 is placed in the bed, ultrasonic sensor 2 placed in the sand box. Read the ultrasonic sensor values in table 5.3 the value of the ultrasonic sensor is 46-48 then the cat is not near the ultrasonic sensor. The value of the ultrasonic sensor is smaller than 46-48 so the cat is near the ultrasonic sensor, if the value is too large then the cat is near the sensor ultrasonic. Proximity sensor is placed near the food bowl to find out that the cat is in the eating place. The proximity sensor is worth 1 so that the cat is not near the sensor and if the value is 0, the cat is near the sensor.