

## CHAPTER 4

### ANALYSIS AND DESIGN

#### 4.1 Analysis

This project records dog activities in a day. Dog activities such as sitting and standing, inside the cage, eating or drinking which will be recorded later. By using gyroscope sensor to detect dogs is standing or sitting. Ultrasonic sensors is to find out the dog inside the cage and drinking. The proximity sensor is to find out if the dog is eating.

This research project, it takes several steps to get data, one of them is using Arduino Lilypad to be installed on the dog's body. Arduino lilypad is used as a microcontroller consisting of sensor gyroscope and ESP8266. Both are connected to a lilypad with 3volt power. The results of the gyroscope sensor will be sent to the mysql server via ESP8266.

Arduino microcontroller to find out whether the dog is in the cage, this project uses an ultrasonic sensor as distance sensor. This also uses a proximity sensor to know is the dog eating. Then all the data obtained from these sensors will be sent to the MySQL server using the ESP8266 wifi module.

In order to determine that the dog activity, this research needs an experiment for one hour to get the data that will be analyzed later. Analysis uses a statistical formula by calculating the average and standard deviation of each x, y, z axis to determine the range of each axis. In determining the range, the average must be bigger than the standard deviation.

Table 4.1: First Calculation Table

Position	Axis	Average	St. Dev
Sleeping	X	(-1523)	170
	Y	395	152
	Z	423	125
Walking	X	(-1508)	129
	Y	(-418)	4731
	Z	394	2041
Sitting	X	1486	55
	Y	(-85)	2994
	Z	(-8)	1734

Table 4.1 above is the initial data after calculating the averages and standard deviations. When the dog sleeps with x, y and z, the average of each position is bigger than the standard deviation so no calculation is needed. When the dog walks and sits the x axis has fulfilled an average bigger than the standard deviation, but y and z axis, on average smaller than the standard deviation, then calculates again by adding the expected number (+) by  $y < 0$  and  $z < 0$ .

Table 4.2: Calculation Table Where y and z &lt; 0

Position	Axis	Average	St. Dev
Sleeping	X	(-1523)	170
	Y	395	152
	Z	423	125
Walking	X<0	(-1508)	129
	Y<0	(-3461)	4827
	Z<0	(-1613)	1704

Sitting	X<0	(-1486)	55
	Y<0	(-2500)	2687
	Z<0	(-1652)	1608

Table 4.2 above is valuable data (+) omitted. When the dog walks and sits the y and z axis, the average is smaller than the standard deviation, then calculates again by adding the omission of the sum of the averages and the standard deviation of each axis by means of y <(the sum of the average and standard deviation) and z <(the sum of average and standard deviations).

Table 4.3: Calculation Table Where y and x < (The Sum Of The Average and St. Dev I)

Position	Axis	Average	St. Dev
Sleeping	X	(-1523)	170
	Y	395	152
	Z	423	125
Walking	X<0	(-1508)	129
	Y>-8000	(-2328)	1967
	Z>-3000	(-1024)	810
Sitting	X<0	(-1486)	55
	Y>-5000	(-1674)	1610
	Z>-3000	(-918)	873

Table 4.3 above is a calculation data by adding the omission of the sum of averages and the standard deviation of each axis by means of y and z <(the sum of the average and standard deviations). When the dog walks and sits the y and z axis, the average is smaller than the standard deviation, then calculates again by adding the omission of the sum of the averages and the standard deviation of each

axis by means of  $y <$ (the sum of the average and standard deviation) and  $z <$ (the sum of average and standard deviations).

Table 4.4: Calculation Table Where  $y$  and  $x <$  (The Sum Of The Average and St. Dev II)

Position	Axis	Average	St. Dev
Sleeping	X	(-1523)	170
	Y	395	152
	Z	423	125
Walking	$X < 0$	-1508	129
	$Y > -8000$	-1300	1100
	$Z > -3000$	-684	546
Sitting	$X < 0$	(-1486)	55
	$Y > -3200$	-920	769
	$Z > -1700$	-450	447

Table 4.4 above is a recalculation data to eliminate the standard deviation value to be smaller than the average by adding the omission of the sum of the averages and the standard deviation of each axis by means of  $y$  and  $z <$ (the sum of average and standard deviations). When the dog walks and sits the  $y$  and  $z$  axis, the average is smaller than the standard deviation, then calculates again by adding the omission of the sum of the averages and the standard deviation of each axis by  $y <$ (the sum of the average and standard deviation) and  $z <$ (the sum of average and standard deviations). The results of this calculation is, when the dog is sitting the values of the  $x$ ,  $y$  and  $z$  axes are on average bigger than the standard deviation. But when the dog is walking a calculation is needed once again for the dog to walk.

Table 4.5: Calculation Table Dog's Walking Where  $y$  and  $x <$  (The Sum Of The Average and St. Dev)

<b>Position</b>	<b>Axis</b>	<b>Average</b>	<b>St. Dev</b>
Sleeping	X	(-1523)	170
	Y	395	152
	Z	423	125
Walking	X<0	-1508	129
	Y>-2400	-851	716
	Z>-1200	-461	337
Sitting	X<0	(-1486)	55
	Y>-3200	-920	769
	Z>-1700	-450	447

Table 4.5 above is a recalculation data when the dog is walking, after recalculation the average value is bigger than the standard deviation. The dog's activity while sleeping, sitting and standing has fulfilled the average value bigger than the standard deviation.

The result of the analysis obtained from the ultrasonic sensor and proximity sensor, which is installed in the dog cage, are as follows:

Table 4.6: Table In Dog Cage

<b>No</b>	<b>Eating</b>	<b>Drinking</b>	<b>Cage</b>
1	1	108	20
2	1	108	64
3	0	107	16
4	0	90	5
5	1	93	82
6	1	108	65

From table 4.6 above the proximity sensor used to find out dogs eat, ultrasonic sensors are used to find the dog, ineating or drinking. Ouput from proximity sensors in the form of numbers 1 and 0, when the value is 1 there is no object that decides the sensor, when the value is 0 then there is an object approaches the sensor. The output of the ultrasonic sensor when the object approaches the sensor will change the value to small and when the object away from the sensor the value will change much bigger value.

## 4.2 Desain

This research project requires the right placement of the sensors, so the installation becomes easier. In this sub chapter will explain using images about the design of sensors placement and flowchart data.

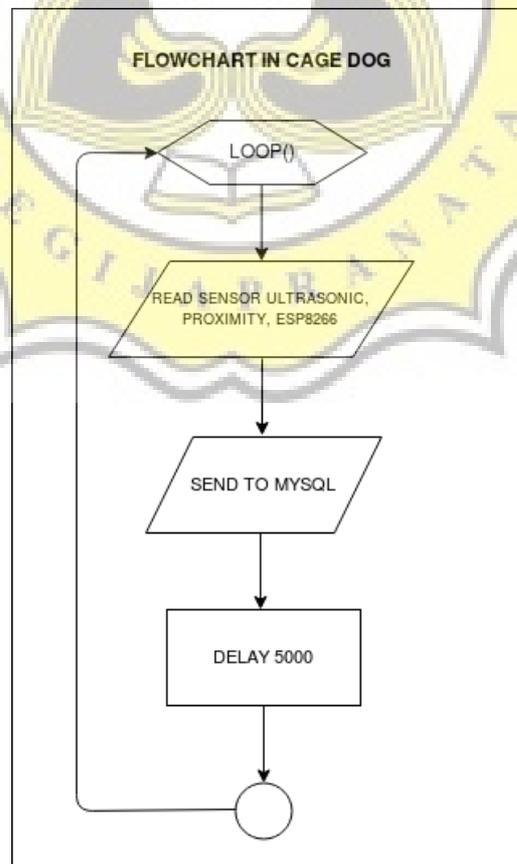


Illustration 4.1: Flowchart In Cage Dog

From the flowchart diagram above explains from each sensor is looping to get data. First is reading from each ultrasonic, proximity and ESP8266 sensors. Then after reading from each sensors, the data can be sent to MySQL. After the data has been sent, it will pause for 5 seconds. Then looping in retrieving data.

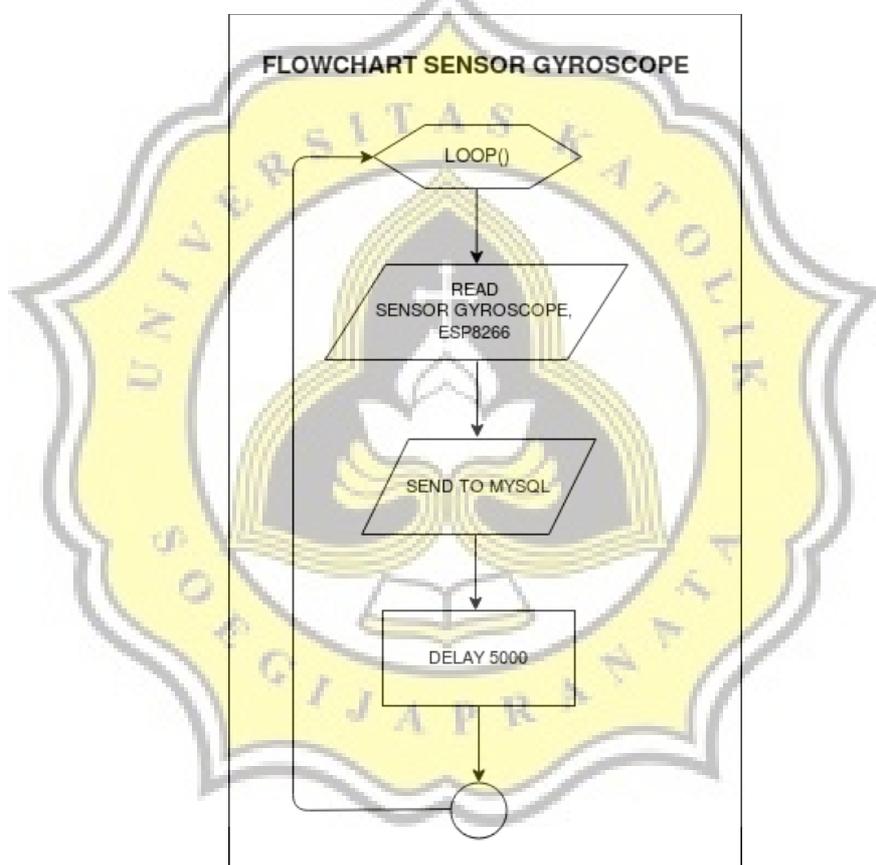


Illustration 4.2: Flowchart Sensor Gyroscope

From the flowchart diagram above explains the gyroscope sensor is looping to get data. First is reading from the gyroscope and ESP8266 sensors. After reading from the sensor data that can be sent to MySQL, after the data has been sent, it will pause for 5 seconds. Then looping in retrieving data.

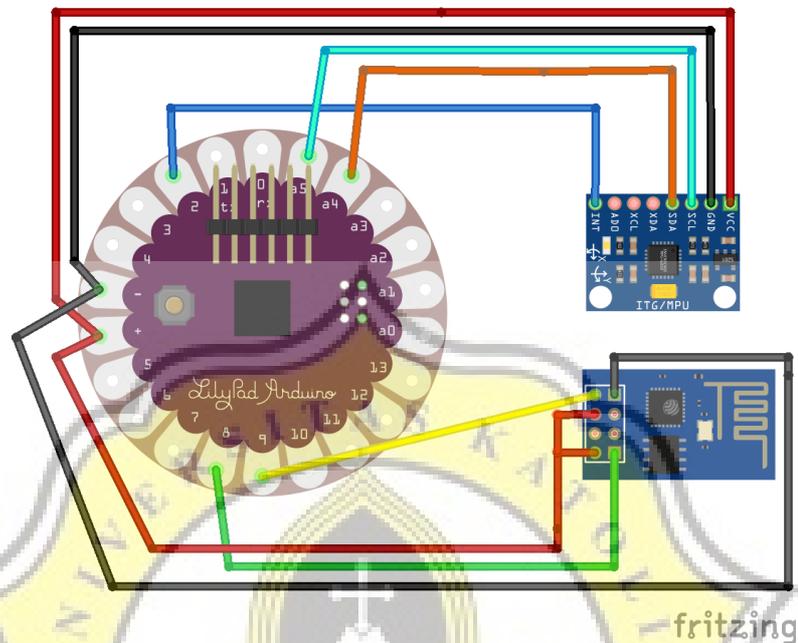


Illustration 4.3: Circuit In Dog Strap

Illustration 4.3 is a circuit design consisting of an Lilypad Arduino, gyroscope sensor and ESP8266 wifi module. This circuit will be attached to dog's body using dog's strap. Arduino lilypad uses a voltage of 3.3volt. So that all sensors can work with lithium polymer battery with a 3.7volt 720mAh voltage.

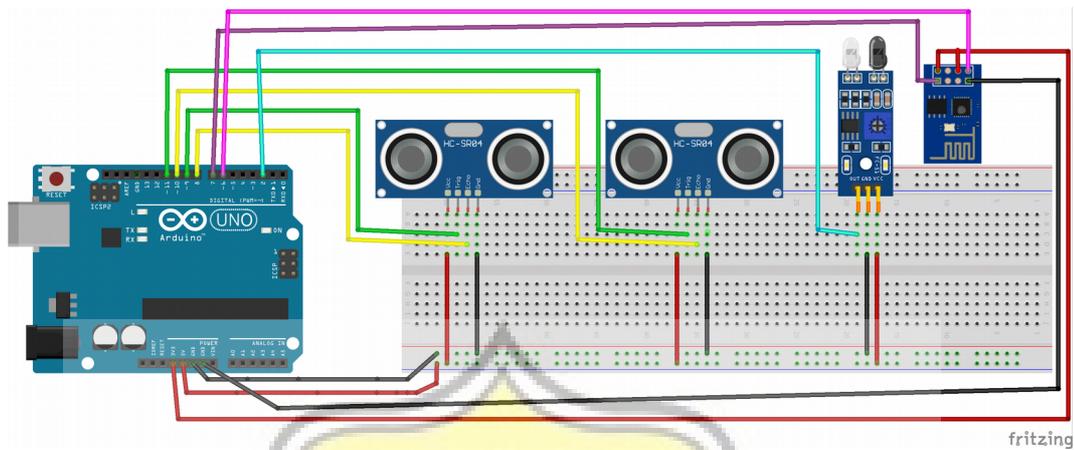


Illustration 4.4: Circuit In Dog Cage

From the illustration 4.4 is a circuit design that will be attached to dog cage using an arduino uno. Arduino Uno which consists of two ultrasonic sensors, one proximity sensor and ESP8266 wifi module. The ultrasonic sensor and proximity are using 5 volt, while the ESP8266 wifi module is given 3.3volt. Power of All sensors are supplied by Powerbank which has a 5volt output.