PRD 403 – Seminar Desain
Template Penelitian dan Jurnal Internasional

Template Penelitian

Kode/Nama Rumpun Ilmu* : Bidang Fokus :

USULAN PENELITIAN

(Skema Penelitian)

JUDUL PENELITIAN

TIM PENGUSUL

Ketua : nama/NIDN

Anggota 1 : nama/NIDN

Anggota 2 : nama/NIDN

UNIVERSITAS PEMBANGUNAN JAYA

BULAN dan TAHUN

HALAMAN PENGESAHAN

Judul Penelitian :
Kode/Nama Rumpun Ilmu :
Ketua Peneliti
a. Nama Lengkap :
b. NIDN/NIM/NIP :
c. Jabatan Fungsional :
d. Program Studi :
e. Nomor HP :
f. Alamat surel (*e-mail*) :
Anggota Peneliti (1)
a. Nama Lengkap :
b. NIDN/NIM/NIP :
c. Perguruan Tinggi :
Anggota Peneliti (2)
a. Nama Lengkap :
b. NIDN/NIM/NIP :
c. Perguruan Tinggi :
Lama Penelitian Keseluruhan : 1 Tahun
Biaya Penelitian Keseluruhan :
Biaya Penelitian :
- Diusulkan ke LP2M
Jumlah Mahasiswa yang Terlibat : .... Orang

Tangerang Selatan, Juli 2020

Mengetahui,
Dekan Fakultas ....

Ketua Peneliti,

(...................................)
NIP/NIK :

(...................................)
NIP/NIK :

Menyetujui,
Kepala LP2M UPJ

(Dr. Edi Purwanto, S.E., M.M)
NIP/NIK : 08.0720.014

IDENTITAS DAN URAIAN UMUM

i. Judul Penelitian : ....

ii. Tim Peneliti :

No	Nama	Jabatan	Bidang Keahlian	Instansi Asal	Alokasi Waktu (jam/minggu)
1					
2					
3					

iii. Objek Penelitian (jenis material yang akan diteliti dan segi penelitian):
....

iv. Masa Pelaksanaan
Mulai : bulan: .... tahun:
Berakhir : bulan: .... tahun:

v. Usulan Biaya LP2M : ....

vi. Lokasi Penelitian : ....

vii. Instansi lain yang terlibat (jika ada, dan uraikan apa kontribusinya)
....

viii. Temuan yang ditargetkan (penjelasan gejala atau kaidah, metode, teori, atau antisipasi yang dikontribusikan pada bidang ilmu)
....
....
....

ix. Kontribusi mendasar pada suatu bidang ilmu (uraikan tidak lebih dari 50 kata, tekankan pada gagasan fundamental dan orisinal yang akan mendukung pengembangan iptek)
....
....
....

x. Jurnal ilmiah yang menjadi sasaran
....

xi. Rencana luaran HAKI (Hak Kekayaan Intelektual), buku, purwarupa atau luaran lainnya yang ditargetkan, tahun rencana perolehan atau penyelesaiannya (jika ada)
....
....

DAFTAR ISI

DAFTAR TABEL

DAFTAR GAMBAR

RINGKASAN

Kemukakan tujuan jangka panjang dan target khusus yang ingin dicapai serta metode yang akan dipakai dalam pencapaian tujuan tersebut. Ringkasan harus mampu menguraikan secara cermat dan singkat tentang rencana kegiatan yang diusulkan. (maksimum 250 kata)

BAB I

PENDAHULUAN

1.1 Latar Belakang

Uraikan **latar belakang** pemilihan topik penelitian yang dilandasi oleh keingintahuan peneliti dalam mengungkapkan suatu gejala/konsep/dugaan untuk mencapai suatu tujuan.Dalam perumusan masalah dapat dijelaskan definisi, asumsi, dan lingkup yang menjadi batasan penelitian.

1.2 Keutamaan Penelitian

Perlu dikemukakan hal-hal yang melandasi atau argumentasi yang menguatkan bahwa penelitian tersebut penting untuk dilaksanakan **(keutamaan penelitian).**

1.3 Rumusan Masalah

Masalah yang akan diteliti harus dirumuskan secara jelas disertai dengan pendekatan dan konsep untuk menjawab permasalahan, pengujian hipotesis atau dugaan yang akan dibuktikan.

1.4 Target Luaran

Pada bagian ini juga perlu dijelaskan tujuan penelitian secara ringkas dan target luaran yang ingin dicapai.

Tabel 1.1 Rencana Target Capaian Tahunan

No	Jenis Luaran		Keterangan
1	Publikasi Ilmiah	Internasional Bereputasi	
		Internasional	
		Nasional Terakreditasi	
		Nasional Tidak Terakreditasi Ber-ISSN	
2	Pemakalah dalam Temu Ilmiah	Internasional	
		Nasional	
		Lokal Universitas	
3	Dosen Tamu	Internasional	
		Nasional	
4	Hak Kekayaan Intelektual		
5	Teknologi Tepat Guna		
6	Model/Purwarupa/Desain/Karya Seni/ Rekayasa Sosial		
7	Buku Ajar (ISBN)		
8	Terciptanya Jejaring Penelitian		
9	Tingkat Kesiapterapan Teknologi		

BAB 2

TINJAUAN PUSTAKA

Uraikan secara jelas kajian pustaka yang melandasi timbulnya gagasan dan permasalahan yang akan diteliti dengan menguraikan teori, temuan, dan bahan penelitian lain yang diperoleh dari acuan untuk dijadikan landasan dalam pelaksanaan penelitian. **Pustaka yang digunakan sebaiknya mutakhir (maksimum 10 tahun terakhir)** dengan mengutamakan artikel pada **jurnal ilmiah** yang relevan.

BAB 3

METODE PENELITIAN

Uraikan secara rinci metode yang akan digunakan meliputi **tahapan-tahapan penelitian**, **lokasi penelitian**, **peubah yang diamati/diukur**, **model yang digunakan**, **rancangan penelitian**, serta **teknik pengumpulan dan analisis data**.

3.1 Tahapan Penelitian

3.2 Lokasi Penelitian

3.3 Populasi dan Sampel

3.4 Teknik Pengumpulan Data

3.5. Metode Analisis Data

BAB 4
BIAYA DAN JADWAL PENELITIAN

4.1 Anggaran Biaya

Justifikasi anggaran biaya ditulis dengan terperinci dan jelas dan disusun sesuai dengan format sebagai berikut.

Tabel 4.1 Anggaran Biaya Penelitian yang Diajukan

No	Jenis Pengeluaran	Biaya yang Diusulkan
1	Honorarium untuk pelaksana, petugas laboratorium, pengumpul data, pengolah data, penganalisis data, honor operator, dan honor pembuat sistem (maksimum 30% dan dibayarkan sesuai ketentuan)	Rp0.00,-
2	Pembelian bahan habis pakai untuk ATK, fotocopy, surat menyurat, penyusunan laporan, cetak, penjilidan laporan, publikasi, pulsa, internet, bahan laboratorium, langganan jurnal (maksimum 60%)	Rp0.00,-
3	Perjalanan untuk biaya survei/sampling data, seminar/workshop DN-LN, biaya akomodasi-konsumsi, perdiem/lumpsum, transport (maksimum 40%)	Rp0.00,-
4	Sewa untuk peralatan/mesin/ruang laboratorium, kendaraan, kebun percobaan, peralatan penunjang penelitian lainnya (maksimum 40%)	Rp0.00,-
Jumlah		**Rp0.00,-**

4.2 Jadwal Penelitian

Tabel 4.2 Jadwal Kegiatan

No	Jenis Kegiatan	Bulan											
		1	2	3	4	5	6	7	8	9	10	11	12
1													
2													
3													
4													
5													
6													
7													
9													
10													

DAFTAR PUSTAKA

Basuki, A. (2010). *Membangun Web Berbasis PHP dengan CodeIgniter*. Yogyakarta: Lokomedia.

Erinawati, H. D. (2012). Pembangunan Sistem Informasi Pembayaran Sekolah pada Sekolah Menengah Atas (SMA) Negeri 1 Rembang Berbasis Web. *Journal Speed,*

LAMPIRAN

Lampiran 1. Susunan Organisasi Tim Pengusul dan Pembagian Tugas

No	Nama / NIDN	Instansi Asal	Bidang Ilmu	Alokasi Waktu (jam/minggu)	Uraian Tugas
1					-
2					-
3					-

Lampiran 2. Biodata Ketua dan Anggota Pengusul

A. Identitas Diri Ketua Pengusul

1	Nama Lengkap (dengan gelar)	
2	Jenis Kelamin	
3	Jabatan Fungsional	
4	NIP/NIK/Identitas lainnya	
5	NIDN/NIM/NIP	
6	Tempat dan Tanggal Lahir	
7	E-mail	
9	Nomor Telepon/HP	
10	Alamat Kantor	
11	Nomor Telepon/Faks	

B. Riwayat Pendidikan

	S-1	S-2	S-3
Nama Perguruan Tinggi			
Bidang Ilmu			
Tahun Masuk-Lulus			
Judul Skripsi/Tesis/Disertasi			
Nama Pembimbing/Promotor			

C. Pengalaman Penelitian Dalam 5 Tahun Terakhir

(Bukan Skripsi, Tesis, dan Disertasi)

No.	Tahun	Judul Penelitian	Pendanaan	
			Sumber*	Jml (Juta Rp)
1				
2				
3				
Dst.				

** Tuliskan sumber pendanaan baik dari skema penelitian* DRPM *maupun dari sumber lainnya.*

D. Pengalaman Pengabdian Kepada Masyarakat dalam 5 Tahun Terakhir

No.	Tahun	Judul Pengabdian Kepada Masyarakat	Pendanaan	
			Sumber*	Jml (Juta Rp)
1				
2				
3				
Dst.				

** Tuliskan sumber pendanaan baik dari skema pengabdian kepada masyarakat DRPM maupun dari sumber lainnya.*

E. Publikasi Artikel Ilmiah Dalam Jurnal dalam 5 Tahun Terakhir

No.	Judul Artikel Ilmiah	Nama Jurnal	Volume/ Nomor/Tahun
1			
2			
3			
Dst.			

F. Pemakalah Seminar Ilmiah (*Oral Presentation*) dalam 5 Tahun Terakhir

No	Nama Temu ilmiah / Seminar	Judul Artikel Ilmiah	Waktu dan Tempat
1			
2			
3			
Dst			

G. Karya Buku dalam 5 Tahun Terakhir

No	Judul Buku	Tahun	Jumlah Halaman	Penerbit
1				
2				
3				
Dst.				

H. Perolehan HKI dalam 10 Tahun Terakhir

No.	Judul/Tema HKI	Tahun	Jenis	Nomor P/ID
1				
2				
3				
Dst.				

I. Pengalaman Merumuskan Kebijakan Publik/Rekayasa Sosial Lainnya dalam 10 Tahun Terakhir

No.	Judul/Tema/Jenis Rekayasa Sosial Lainnya yang Telah Diterapkan	Tahun	Tempat Penerapan	Respon Masyarakat
1				
2				
3				
Dst.				

J. Penghargaan dalam 10 tahun Terakhir (dari pemerintah, asosiasi atau institusi lainnya)

No.	Jenis Penghargaan	Institusi Pemberi Penghargaan	Tahun
1			
2			
3			
Dst.			

Semua data yang saya isikan dan tercantum dalam biodata ini adalah benar dan dapat dipertanggungjawabkan secara hukum. Apabila di kemudian hari ternyata dijumpai ketidaksesuaian dengan kenyataan, saya sanggup menerima sanksi.
Demikian biodata ini saya buat dengan sebenarnya untuk memenuhi salah satu persyaratan dalam pengajuan Penelitian ....

Tangerang Selatan, ... 2020
Ketua Pengusul

(....................................)

Lampiran 3. Justifikasi Anggaran

1. Honorarium

Honor	Honor/Jam (Rp)	Waktu (jam/minggu)	Minggu	Honor per Tahun (Rp)
Ketua				
Anggota 1				
Anggota 2				
Subtotal (Rp)				**Rp0.00,-**

2. Pembelian bahan habis pakai

Material	Justifikasi Pembelian	Kuantitas	Harga Satuan (Rp)	Harga Peralatan Penunjang (Rp)
				Tahun ke-1
Subtotal (Rp)				**Rp0.00,-**

3. Perjalanan

Material	Justifikasi Perjalanan	Kuantitas	Harga Satuan (Rp)	Biaya per Tahun (Rp)
				Tahun ke-1
Subtotal (Rp)				**Rp0.00,-**

4. Sewa

Material	Justifikasi Sewa	Kuanti tas	Harga Satuan (Rp)	Biaya per Tahun (Rp)
				Tahun ke-1
Subtotal (Rp)				**Rp0.00,-**
TOTAL ANGGARAN YANG DIPERLUKAN SETIAP TAHUN (Rp)				
TOTAL ANGGARAN YANG DIPERLUKAN SELURUHNYA (Rp)				**Rp0.00,-**

Lampiran 4. Surat Pernyataan Ketua Peneliti

SURAT PERYATAAN KETUA PENGUSUL
PENELITIAN ...

Yang bertandatangan di bawah ini :

Nama :

NIDN :

Pangkat/Gol :

Jabatan Fungsional :

Dengan ini menyatakan bahwa proposal saya yang berjudul ....

Yang diusulkan dengan skema .... pada tahun anggaran 2020/2021 **Bersifat Orisinal dan Belum Pernah Dibiayai oleh Lembaga/Sumber Dana Lain.**

Bilamana di kemudian hari ditemukan ketidaksesuaian dengan pernyataan ini, maka saya bersedia untuk bertanggung jawab dan diproses sesuai dengan ketentuan dan hukum yang berlaku serta mengembalikan seluruh biaya penelitian yang saya sudah terima kepada Universitas Pembangunan Jaya.

Demikian pernyataan ini dibuat dengan sesungguhnya dengan sebenar-benarnya.

Tangerang Selatan, Juli 2020

Mengetahui Kepala LP2M UPJ	Yang menyatakan
	Materai 6000
Dr. Edi Purwanto, S.E., M.M NIK/NIP 08.0720.014	(Ketua Pengusul) NIK/NIP

Jurnal Internasional

Chapter 34

Analysis of Performance Proximity Sensor SRF-05 and Maxsonar-EZ2 Implemented Using Arduino

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University of Ahmad Dahlan, Yogyakarta, Indonesia

Abstract

Proximity sensors can be applied to prevent UAVs from crashing into the obstacle. In general, each sensor has a datasheet that displays data specifications. However, the sensor performance when implemented does not necessarily have the same results as the data presented in the datasheet. This study aims to determine SRF-05 and Maxsonar-EZ2 proximity sensors performance. Sensor performance is seen based on detected range, error percentage, and power usage. The variables observed in this study are the distance that is read by the sensor, the percentage of error and the power consumption of the sensor. The type or model of research used is comparative research. A comparison is used to compare the performance of SRF-05 and Maxsonar-EZ2 proximity sensors. The results showed that the SRF-05 sensor had a smaller error percentage of 0.17%, compared to the Maxsonar-EZ2 sensor with an error percentage of 1.51%. The Maxsonar-EZ2 sensor uses less power which is 13.55 mW compared to the SRF-05 sensor which uses 15.09 mW of power. The SRF-05 sensor has a wider detected range that is between 3 cm to 300 cm, compared to the Maxsonar-EZ2 sensor which has a detected range between 16 cm to 120 cm.

Keywords: performance analysis, proximity sensors, SRF-05, Maxsonar-EZ2.

Introduction

Urban life has an impact on the level of community mobility. Urban people want a better quality of life [1]. All processes are expected to take place quickly. The process of communication, transportation and logistics delivery is always strived to take place quickly. However, the phenomenon of congestion in urban

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areas has become commonplace. This will have an impact on the process of shipping goods to be hampered. One way that can be done is to use a UAV to help send goods.

The presence of unmanned aerial vehicles (UAVs) is a technological development in the field of aviation [2]. UAV is an unmanned aircraft system that can carry out flying missions either flying independently with the help of autopilot or driven remotely with the help of remote control. One type of UAV is a quadrotor which is a multi-copter with four rotors. The quadrotor can be controlled remotely so that it can be used as an aerial monitoring robot. The use of quadrotor is quite extensive, among others, for military purposes, forest monitoring, border monitoring, traffic monitoring and photography [3].

The use of quadrotor in open areas has been equipped with an excellent navigation system with the use of GPS sensors (Global Positioning System) [4]. The use of GPS sensors can improve the accuracy of the navigation position on a quadrotor [5]. However, this navigation system is not good if used in a closed room, for example in a building or building. The use of GPS for navigation in a closed room can make GPS signals cannot be received properly, so the position data is not accurate.

The accuracy of the position data on the quadrotor navigation system is very important. The accuracy of the position of a quadrotor in roaming is determined by the accuracy of sensor data received from GPS [6]. One impact of inaccurate position data is the occurrence of a collision. Collisions can occur between quadrotor with another quadrotor or between quadrotor with walls or other objects around it. This incident can be overcome by adding an ultrasonic sensor to detect objects around its [7]. However, the ability of quadrotor in avoiding collisions is also determined by the performance of ultrasonic sensors in providing data [8]. The faster and more accurate the data received by the navigation system on the quadrotor, the better the performance will be. So, the quadrotor can avoid a collision quickly if there are obstacles around it. The accuracy of distance data is determined by the percentage of sensor error is detected the distance data of the object in front of it. The smaller the percentage of errors in detected a sensor's data, the more accurate the data it reads.

The quality of ultrasonic sensors used will affect the performance of quadrotor in responding to obstacles when flying, especially when flying indoors. So, information about the performance of this ultrasonic sensor is very important to know in a navigation system on a quadrotor. Research on navigation systems on quadrotor has been carried out by previous researchers. A researched on developing automatic navigation systems on quadrotor using a 2D laser finder for forest exploration [9]. Other researched on developing quadrotor navigation systems based on crowd-sourcing electronics for regions that do not get GPS signals [10]. A designed a position tracking system on UAVs used Single RGB Camera for automatic position search [11]. Implementing the navigation system used optical flow and ultrasonic sensors without GPS [12]. Implementing ultrasonic and barometric sensors that were used together to maintain the quadcopter at a consistent altitude [13]. Based on research conducted by previous researchers on navigation systems on a quadrotor, the authors conducted a study to observe the performance of the SRF-05 and Maxsonar-EZ2 proximity sensors.

The use of UAVs as a means of transportation is one of the breakthroughs in efforts to support urban development with high-density levels [14]. However, the use of UAVs as a means of transportation must pay attention to safety factors. The selection and use of a good sensor can avoid the risk of collisions and accidents on UAVs. The purpose of this study is to determine differences in the performance of the SRF-05 proximity sensor with Maxsonar-EZ2 before it is applied to the quadrotor navigation system [15].

METHOD

This research presents a performance evaluation of proximity sensors. The evaluation is done based on the observed variables: the shortest distance and the farthest distance readable by the sensors, the percentage of sensor error, and the power consumption of sensors. Two different proximity sensors are used in this study, those are SRF-05 and Maxsonar-EZ2.

Proximity Sensors: SRF-05 and Maxsonar-EZ2

The SRF-05 sensor is a proximity sensor that is able to detect obstacles in front of it in the range of 3 cm-300 cm with a working voltage of 5V. This sensor uses the principle of time of flight. SRF-05 sensor will measure the time from the sound emitted to the sound reflected. The measured time will be compared with the distance traveled is shown in Figure 1. The working principle of this sensor uses ultrasonic pulses. This pulse is an ultrasonic signal with a frequency of ± 41 kHz for 12 periods. The signal is sent by an ultrasonic transmitter. When a pulse hits a barrier, this pulse is reflected and is received again by an ultrasonic receiver. The distance between the measuring device and the barrier can be calculated by measuring the time interval between when the pulse is sent and the reflected pulse is received [16].

The Maxsonar-EZ2 sensor is a proximity sensor. As per the datasheet, this sensor is able to detect obstacles in front of it in the range of 0 - 6.45 m with a working voltage between 2.5V-5.5V. Maxsonar-EZ2 ultrasonic sensor has a

slimmer shape. The principle works almost the same as proximity sensors in general, namely by emitting an ultrasonic signal and then recapturing it after the signal bounces about a particular object [17]. The Maxsonar-EZ2 ultrasonic sensor is shown in Figure 2. In the Maxsonar-EZ2 Ultrasonic Sensor, the ultrasonic signal emitted has a pulse width between 0.88 ms to 37.5 ms. Within 250 ms after power is activated, the Maxsonar-EZ2 sensor is ready to accept the RX command.

Fig. 1(a). SRF-05 Sensor

Fig. 1(b). Maxsonar-EZ2 Sensor

Research Steps

The steps in this study were divided into five stages, i.e. determine research problems and research objectives, and determine the variables to be observed, collect data, data analysis, and make conclusions as shown in Figure 2.

Fig. 2. Steps of the Research

The variables observed in this study are the shortest distance and the farthest distance readable by the sensors, the percentage of sensor error and the sensor's power consumption. The research model used is comparative research. Comparisons were made to find a performance comparison of the two research objects namely the SRF-05 proximity sensor and the Maxsonar-EZ2 as shown in Figure 3.

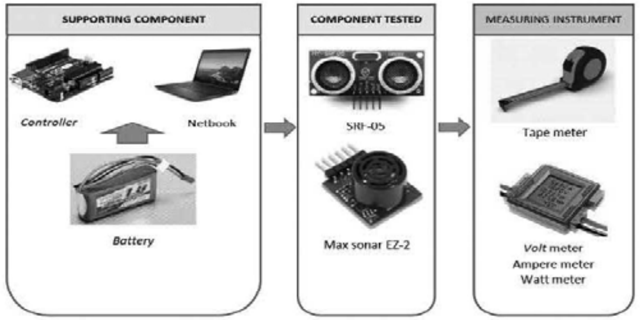

Fig. 3. Design of the research

The study was conducted by observing the data of each variable on each sensor. The observed data are the closest distance and the farthest distance read by the sensors, the percentage of sensor error and the power consumption required by the sensor. The data of each observed variable is then compared between the SRF-05 sensor and the maxsonar-EZ2. The performance of the two sensors can be determined based on data obtained from each of the observed variables.

RESULTS AND DISCUSSION

In this paper, data are obtained from testing each sensor. The data result of distance detected obtained from the distance detected results by testing the SRF-05 Sensor and Maxsonar-EZ2 [18]. Based on the distance detected data, then the maximum distance and minimum distance data detected by each sensor can be known. From the data of distance detected also obtained the difference between the distance detected and the actual distance, so it can be seen the value of the percentage of error in each sensor. The error percentage is calculated using the following equation:

$$e = \frac{e}{a} \times 100 \quad (1)$$

where e is the error and a is the actual value. Power consumption of the sensors is determined based on voltage and current of the SRF-05 and Maxsonar-EZ2 sensors. Based on the voltage and current data, the power consumption is calculated using the following equation:

$$P = V \times I \quad (2)$$

where P is the power in Watt, V is the voltage in Volt, and I is the current in Ampere.

Detected Distance

Sensor performance testing is done by observing the data of distance sensed by the sensor. The distance data read by the sensor is then compared to the actual distance. Before conducting the test, the sensor is mounted on a quadcopter electronic system as shown in Figure 4.

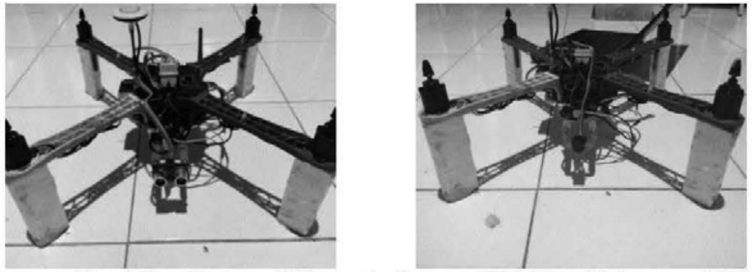

Fig. 4. Installation of Ultrasonic Sensors SRF-05 and Maxsonar-EZ2

The test is done by measuring the actual distance using the tape meter then the distance data that is detected by the sensor [19]. The distance data read by the sensor is displayed through the serial monitor application in the Arduino IDE software as shown in Figure 5. The average percentage of errors can be calculated as shown in Table 1. SRF-05 sensor and Maxsonar-EZ2 testing are done by observing the distance data that is read by each sensor as shown in Figure 6. The test results show that both types of sensors can read distances well. The SRF-05 sensor can read distances between 3 cm and 300 cm.

The Maxsonar-EZ2 sensor can read distances between 16 cm and 120 cm. The minimum distance that can be read by the SRF-05 sensor is 3 cm, this result is shown by the inability of the SRF-05 sensor to read a distance of less than 3 cm. The maximum distance that can be read by the SRF-05 sensor is 300 cm. While the minimum distance that can be read by the Maxsonar-EZ2 sensor is 16 cm, this result is shown by the inability of the Maxsonar-EZ2 sensor to read a distance of less than 16 cm. The maximum distance that can be read by the

Maxsonar-EZ2 sensor is 120 cm, this result is shown by the inability of the Maxsonar-EZ2 sensor to read a distance of more than 120 cm. The percentage of error of SRF-05 sensor data has an average of 0.17%. The percentage of error of the Maxsonar-EZ2 sensor data is 1.53% if using analog data output on pin AN while using pulse data output on the PW pin has an error percentage of 1.51%. Based on testing data, the SRF-05 sensor has a smaller error percentage compared to the Maxsonar-EZ2 sensor. Besides the SRF-05 sensor also has a wider measurement range than the Maxsonar-EZ2 sensor.

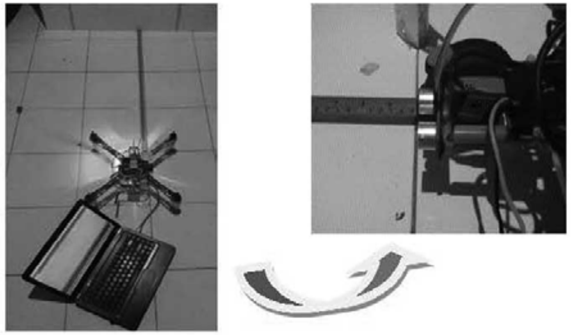

Fig. 5. How to Test the Sensor

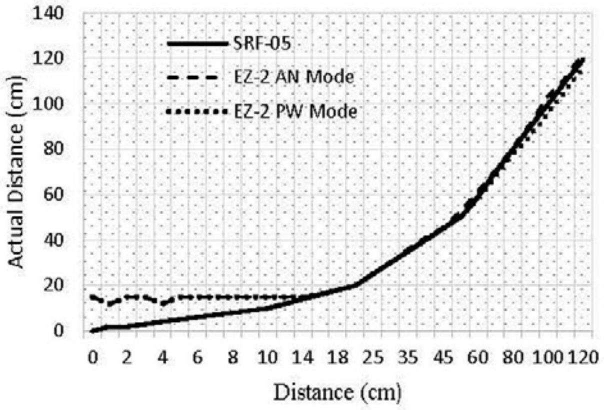

Fig. 6. Distance Detected Testing Results

Table 1. The average percentage of errors

Average Percentage of Errors (%)		
SRF-05	EZ-2 AN Mode	EZ-2 PW Mode
0.17	1.53	1.51

Power Consumption

Testing is done by measuring the electric current and sensor voltage. In this test, the parameters observed are the voltage and current flowing in each sensor when the sensor is activated when the sensor detects the object in front of it. The magnitude of the electric current on the sensor is measured using an ampere meter, while the voltage is measured using a voltmeter. Data from the test results are presented as shown in Table 2.

Table 2. Test Results of SRF-05 Sensors and Maxsonar-EZ2 Sensor Power

Measurement Distance (cm)	Average Power (mW)	
	SRF-05	EZ-2
15	15.085	13.53
50	15.09	13.57
100	15.095	13.56

The test results show that each sensor uses almost the same power in different distance measurement ranges, between measurements of distances of 20 cm, 50 cm, and 100 cm. However, the two types of sensors use different power. When working at a 5 Volt DC source voltage the SRF-05 sensor uses the power of 15,085 mW at a test distance of 20 cm, 15.09 mW at a test distance of 50 cm and 15,095 mW at a test distance of 100 cm. The Maxsonar-EZ2 sensor uses the power of 13.53 mW at a test distance of 20 cm, 13.57 mW at a test distance of 50 cm and 13.56 mW at a test distance of 100 cm. Based on this test data, the Maxsonar-EZ2 sensor uses lower power compared to the SRF-05 sensor.

Comparison Results between SRF-05 Sensor and Maxsonar-EZ2

A comparison of the performance of the two sensors based on the test results is presented as shown in Table 3. The data shows that the SRF-05 sensor has a smaller error rate compared to the maxsonar-EZ2 sensor, which is 0.17%. The SRF-05 sensor has a wider detected range than the Maxsonar-EZ2 sensor, which ranges from 3 cm to 300 cm, while the Maxsonar-EZ2 sensor only has a distance detected range between 16 cm and 120 cm. The Maxsonar-EZ2 sensor uses less power which is 13.55 mW compared to the SRF-05 sensor which uses the power of 15.09 mW.

Table 3. Comparison of SRF-05 and EZ-2 Sensor Performance

Sensor Type	% Error	Distance Detected Range (cm)		Power (mW)
SRF-05	0.17	3	300	15.09
EZ-2 AN Mode	1.53	16	120	13.55
EZ-2 PW Mode	1.51	16	120	13.55

CONCLUSIONS

This research has shown the performance of the SRF-05 sensor with the Maxsonar-EZ2 sensor. Testing the performance of each sensor is done by observing the data of the closest distance and the farthest distance read by the sensor, the percentage of sensor error and the power consumption by the sensor. The results showed that the percentage of error detected by the SRF-05 proximity sensor was smaller than the Maxsonar-EZ2 proximity sensor. The power used by the Maxsonar-EZ2 proximity sensor is smaller compared to the SRF-05 sensor. The detected range of the SRF-05 proximity sensor is wider than the Maxsonar-EZ2 proximity sensor. To support urban development that will implement UAV technology that has a good level of security, it is better to choose sensors with smaller error rates so that the accuracy is better. Based on the results of this study, the recommendations given to produce UAVs that are expected to have better security can choose the SRF-05 proximity sensor than Maxsonar-EZ2.

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