



**Design of IOT-Based Flood Early Warning System
and Automatic Dam Gate Control**

UNDERGRADUATE THESIS

**Submitted as on of The Requirements to Obtain
Sarjana Teknik (S.T.)**

By:

Albi Alghiffhari

003201900029

FACULTY OF ENGINEERING

MECHANICAL ENGINEERING STUDY PROGRAM

PRESIDENT UNIVERSITY

2023

THESIS APPROVAL

Design Of IOT-Based Flood Early Warning Tool and Automatic Dam Gate Control

By

Albi Alghiffhari

003201900029

Approved by



(Dr. Ir. Wahyono Spto Widodo M. Eng.Pract.)

Thesis Supervisor



(Dr. Eng. Lydia Anggraini, S.T., M.Eng.)

Head of Study Program Mechanical Engineering

PANEL OF EXAMINER APPROVAL

The Panel of Examiners declare that the undergraduate thesis entitled

**Design Of IOT-Based Flood Early Warning Tool and Automatic
Dam Gate Control**

that was submitted by Albi Alghiffhari majoring in Mechanical Engineering from the Faculty of Engineering was assessed and approved to have passed the Oral Examination on May, 3rd 2023

Panel of Examiner



(Iksan Bukhori, ST., M.Phil.)

Chair of Panel Examiner



(Riyanto Aji, ST., M.Msi)

Examiner I

STATEMENT OF ORIGINALITY

In my capacity as an active student of President University and as the author of the undergraduate **thesis/final project/business plan** (underline that applies) stated below:

Name : Albi Alghiffhari
Student ID number : 003201900029
Study Program : Mechanical Engineering
Faculty : Engineering

I hereby declare that my undergraduate thesis/final project/business plan entitled **Design Of IOT-Based Flood Early Warning Tool and Automatic Dam Gate Control** is, to the best of my knowledge and belief, an original piece of work based on sound academic principles. If there is any plagiarism, including but not limited to Artificial Intelligence plagiarism, is detected in this undergraduate thesis/final project/business plan, I am willing to be personally responsible for the consequences of these acts of plagiarism, and accept the sanctions against these acts in accordance with the rules and policies of President University.

I also declare that this work, either in whole or in part, has not been submitted to another university to obtain a degree.

Cikarang, 30 March 2023



Albi Alghiffhari

SCIENTIFIC PUBLICATION APPROVAL FOR ACADEMIC INTEREST

As a student of the President University, I, the undersigned:

Name : Albi Alghiffhari
Student ID number : 00201900029
Study program : Mechanical Engineering

for the purpose of development of science and technology, certify, and approve to give President University a non-exclusive royalty-free right upon my final report with the title:

Design Of IOT-Based Flood Early Warning Tool and Automatic Dam Gate Control

With this non-exclusive royalty-free right, President University is entitled to converse, to convert, to manage in a database, to maintain, and to publish my final report. There are to be done with the obligation from President University to mention my name as the copyright owner of my final report.

This statement I made in truth.

Cikarang, 30 March 2023



Albi Alghiffhari

ADVISOR'S APPROVAL FOR PUBLICATION

As a lecturer of the President University, I, the undersigned:

Advisor's Name : Dr. Ir. Wahyono Sapto Widodo M. Eng.Pract.
NIDN : 0409076804
Study program : Mechanical Engineering
Faculty : Engineering

declare that following thesis:

Title of thesis : Design Of Iot-Based Flood Early Warning
: Tool and Automatic Dame Gate Control
Undergraduate Thesis author : Albi Alghiffhari
Student ID number : 003201900029

will be published in **journal/institution's repository / proceeding / unpublish /**
..... (underline that applies)

Cikarang, 30 March 2023



Dr. Ir. Wahyono Sapto Widodo M. Eng.Pract.

TURNITIN TEST RESULT

Design of IOT-Based Flood Early Warning System and Automatic Dam Gate Control

ORIGINALITY REPORT

14% SIMILARITY INDEX	11% INTERNET SOURCES	7% PUBLICATIONS	8% STUDENT PAPERS
--------------------------------	--------------------------------	---------------------------	-----------------------------

PRIMARY SOURCES

1	Submitted to Wawasan Open University Student Paper	1%
2	Zaenal Mutaqin Subekti, Suhadi Suhadi, Ramdani Ramdani, Amat Suroso, Rudi Budi Agung, Miftakhus Surur. "Internet of Things-based Early Warning Car Theft Security System Using Smartphones", 2021 Sixth International Conference on Informatics and Computing (ICIC), 2021 Publication	1%
3	ojs.polmed.ac.id Internet Source	1%
4	Submitted to Universiti Teknologi MARA Student Paper	1%
5	digilib.polban.ac.id Internet Source	1%
6	blog.ub.ac.id Internet Source	1%

GPT ZERO RESULT

Stats

Average Perplexity Score: 165.462



A document's *perplexity* is a measurement of the randomness of the text

Burstiness Score: 525.975



A document's *burstiness* is a measurement of the variation in perplexity

Your sentence with the highest perplexity, "4 BAB II", has a perplexity of: 3307

ABSTRACT

Flooding is still a problem in big cities in Indonesia, one way that can be done to minimize the occurrence of floods that will come unexpectedly is to provide information earlier before a flood occurs. The research being conducted this time, "IoT Design of Website-Based Flood Early Warning Devices and Automatic Dam Gate Controllers. The design of this Flood Detection System is an IoT project based on the esp8266 microcontroller which is integrated with a web application and mySQL database. The working principle of this system is that a sensor that is installed perpendicularly at a certain height above the water level will emit ultrasonic waves with a speed of 340 m/s in the air. The waves will then hit the surface of the water and bounce back towards the sensor. In addition, the sluice at the dam will also process an ultrasonic sensor which functions as a distance meter when the water level reaches its highest point, and the servo motor as the sluice will carry out the command to raise the sluice automatically and simultaneously with the sound of a siren marking the water point. the characteristics of the HCSR-04 can detect flood water levels with an accuracy rate of 99.4% and servo motor 0. when the position of the dam is in a state of danger. Tests in the lab show that the system built can record water levels in real-time which can be monitored from the monitoring website, , the error rate that occurs on the sensor is at least 0.5% so that the performance of the equipment and system goes well.

Keywords: Internet of Things, Nodemcu Amica Esp 8266, HCSR-04, Dam Control, Flood Early Warning

ACKNOWLEDGEMENT

First of all, I want to thank God in the most sincere way possible since this study would not be possible without His help and favor. By completing my thesis, I also came to the realization that I can succeed because of the support, inspiration, direction, and encouragement of the people around me. I would thus want to thank them for their support in helping me to complete my thesis.

- First and foremost, I want to thank my family, especially my parents, who have always supported me emotionally and physically, from the bottom of my heart. I appreciate your unceasing prayers and love.
- Second, I would like to thank my thesis advisor, Dr. Ir. Wahyono Sapto Widodo M. Eng.Pract and Drs. Nanang Ali Suitisna, M.Eng . Thank you for your help and advice. I am delighted to have you as my thesis advisor. Thank you for your helpful advice and recommendations, which considerably benefited me in finishing this thesis.
- Third, for each of my Mechanical Engineering study program instructors, whom I cannot name individually. I appreciate your time, effort, attention, patience, and support in ensuring we get the most out of our studies.
- Finally, I would want to thank all of the participants in this study for their efforts, willingness, and time, which enabled this thesis to be completed successfully.

LIST OF CONTENT

THESIS APPROVAL	II
PANEL OF EXAMINER APPROVAL	III
STATEMENT OF ORIGINALITY	IV
SCIENTIFIC PUBLICATION APPROVAL FOR ACADEMIC INTEREST	V
ADVISOR'S APPROVAL FOR PUBLICATION	VI
TURNITIN TEST RESULT	VII
GPT ZERO RESULT	VIII
ABSTRACT	IX
ACKNOWLEDGEMENT	X
LIST OF CONTENT	XI
LIST OF FIGURES	XV
LIST OF TABLES	XVII
BAB I INTRODUCTION	1
1.1 Background	1
1.2 Formulation of the problem	2
1.3 Purpose	3
1.4 Problem Limitation	3
BAB II LITERATURE REVIEW	4
2.1 Flood	4
2.2 Disaster management	5
2.3 Weir Door	5
2.4 Hardware components	6

2.4.1	Sensor HCSR-04	6
2.4.2	MG 996 R Servo Motors	7
2.4.3	Buzzer Y	9
2.4.4	NodeMCU ESP8266 v.3	9
2.4.5	Relay Module	11
2.4.6	Arduino Uno R3	13
2.4.7	Liquid Crystal Display	14
2.4.8	Board (Project Board)	15
2.5	Software	16
2.5.1	Arduino-type IDE	16
2.5.2	XAMPP	17
2.5.3	MySQL	19
2.5.4	Phpmyadmin	19
2.5.5	Perl	19
BAB III METHODOLOGY		20
3.1	Research Method	20
3.2	Time and Place of Research	20
3.3	Tools and materials	21
3.4	Research Phases	22
3.5	Problem Identification	23
3.6	Data Collection	23
3.7	Conceptual Design	24
3.8	System Design	24
3.8.1	Design of System Flood Detection	24
3.8.2	Hardware Preparation	26

3.8.3	Automatic Dam Design.....	26
3.8.4	Hardware Preparation.....	27
3.8.5	Flow Chart System.....	28
3.9	Software Design.....	29
3.9.1	Installing Software Ide Arduino.....	29
3.9.2	Nodemcu Driver Installation.....	31
3.9.3	Installing XAMPP on Windows 10	32
3.9.4	Activating Server and Database Through Xampp	33
3.9.5	Processing the Phpmyadmin Database.....	35
3.10	HCSR-04 Sensor Data Characteristics Method	37
3.11	SG90 Servo Motor Characteristics Method	37
3.12	Method of Connecting Database To Website	37
3.13	Method of Opening and Closing Automatic Watergates	38
BAB 4 RESULT AND DISCUSSION		39
3.1	Hardware Design.....	39
3.2	Overall System Design Results.....	39
3.3	The result of the design of the Automatic Water Gate.....	44
3.4	Database View and Web View	45
3.4.1	XAMPP.....	45
3.4.2	Database View	45
3.4.3	Web View.....	46
3.5	HCRS Sensor Characteristics Results -04	49
3.6	Comparison of water level values between HCRS 04 and Ruler.....	49
3.7	Results of MG 966R Servo Motor Characteristics	51
3.8	Dam gate testing with automatic mode.....	53

CHAPTER V CONCLUSIONS.....	54
5.1 CONCLUSION.....	54
5.2 ADVICE.....	54
REFERENSI	55
APPENDIX.....	58

LIST OF FIGURES

Figure 2. 1 HC SR04 ultrasonic sensor	7
Figure 2. 2 SG90 motors	8
Figure 2. 3 Buzzers	9
Figure 2. 4 NodeMCU ESP826 and Pin Scheme.....	10
Figure 2. 5 Relay Module 4 channel 5v DC.....	13
Figure 2. 6 Arduino Uno R3	13
Figure 2. 7 LCD I2C 16 x 2	15
Figure 2. 8 Breadboard.....	15
Figure 2. 9 Display of the Arduino program.....	17
Figure 2. 10 Display Xampp	18
Figure 3. 1 Design of IOT-Based Flood Detection Tool	25
Figure 3. 2 Automatic dam system	26
Figure 3. 3 Flow Chart System	27
Figure 3. 7 Display arduino.cc/Main/Software	29
Figure 3. 8 The arduino.exe file is in the arduino folder.....	30
Figure 3. 9 Preferences window on arduino	30
Figure 3. 10 Boards Manager window on arduino.....	31
Figure 3. 11 Device Manager view	32
Figure 3. 12 Xamp view.....	33
Figure 3. 13 Activate server and Mysql on XAMPP	34
Figure 3. 14 PhpMyAdmin Database view	34
Figure 3. 15 Creating New Databases.....	35
Figure 3. 16 Create Tables in the database	36
Figure 3. 17 Creating Table Formats	36

Figure 4. 1 Tool view	39
Figure 4. 2 Display of Flood Detection Hardware	40
Figure 4. 3 Automatic Dam Circuit.....	41
Figure 4. 4 Water Level Reading Simulation.....	42
Figure 4. 5 Watergate Simulation	43
Figure 4. 6 Sluice Gate When Closed and Open.....	44
Figure 4. 7 Display of the XAMPP control panel.....	45
Figure 4. 8 PhpMyAdmin, which is an open-source website	46
Figure 4. 9 Display on web	46
Figure 4. 10 Dashboard display	47
Figure 4. 11 The data log widget display.....	47
Figure 4. 12 The chart widget	48
Figure 4. 13 Setting View	48
Figure 4. 14 Display Log Out	49
Figure 4. 15 Comparison of Water Level Values Between HCSR-04 and Ruler ..	50
Figure 4. 16 Graph Comparison Between Bows and MG 966R Servo Motors.....	52

LIST OF TABLES

Table 3. 1 Nodemcu Pin connection	26
Table 3. 2 Arduino Pin Connection.....	27
Table 4. 1 Comparison of Water Level Values Between HCSR-04 and Ruler	50
Table 4. 2 Comparison Between Arc and Angle of Servo Motor	52
Table 4. 3 Dam gate testing with automatic mode.....	53