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Implementation Of Sugeno Fuzzy Logic On A Rice-Eating Bird Repellent In Rice Fields To Help Farmers Based On Microcontrollers

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ABSTRACT

The rapid development of technology in the current era, especially in the field of sensors, has made many technologies that use sensors appear. In the agricultural sector itself, the use of sensor technology is not spared. In the agricultural sector, rice fields also require a tool that can detect pests which are usually done by the manual method. The purpose of this research is to help farmers repel bird pests with automation tools to make it easier to monitor the fields from pests. This study conducted experiments carried out by manipulating the research object. The tools used are Arduino Uno microcontrollers as tool controllers, PIR sensors as detection sensors and servo motors as tool drivers. When a pest is detected by the sensor it is then sent to the device controller in the form of Arduino after which the servo motor moves. From the results of testing all the components of the tool, it can be concluded that the results of the entire system work and function in accordance with the system design, the results of the PIR sensor test can detect objects that pass through the sensor with an average of 120 cm

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1. INTRODUCTION

Indonesian people use rice as a staple food, because rice can contribute 45-55% of protein to the human body. While rice production has not been able to meet the needs of the community, this is caused by several obstacles including the presence of bird pests in the rice fields. The most severe damage caused by bird pests is crop failure. Birds usually attack rice plants in colonies or in groups. This is a loss as a result of being eaten, loss of yield can also occur from damage to plants that fall over and the grains of rice fall out due to pests of birds.

Plants that are damaged by pests so that the yields are not optimal due to pests, sensors are made in the rice field dolls to drive away these pests so that farmers can more easily drive away pests that interfere with plants. The development of existing technology is of course by innovating technology in the form of prototypes that can help farmers protect their fields from pest attacks. This tool works automatically by using a motion sensor device that is combined with the rice field people which will later produce output on the rice field people's movements, in the hope of scaring away pests, especially birds like farmers who use the manual method. Arduino is an electronic kit or open source electronic circuit board which has the main component, namely a microcontroller chip with the AVR type from the Atmel company. The microcontroller in it and this chip or IC (integrated circuit) can be programmed using a computer according to what we want

2. RESEARCH METHODS

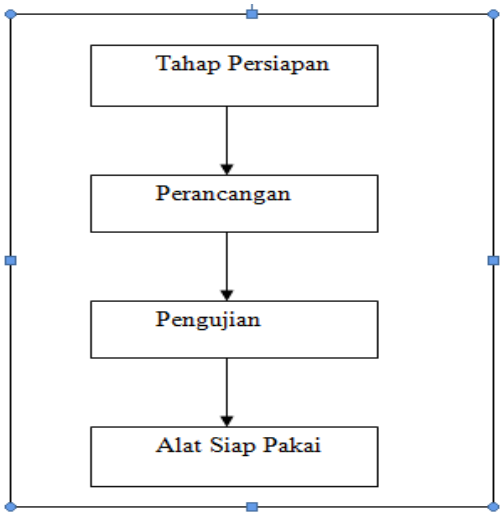

Figure 1. Work Procedure Stages

a. The stage of preparing a series of activities before starting the stage of collecting double data and managing it.
b. The design of this research contains the development of the requirements stages which are changed into gblock diagrams, flowcharts and other things, so that the researcher understands the flow or function of the plans that are not made.
c. At g-stage g, the tests were not carried out g-various g-tests that have been implemented at the g-previous g-stages g and g produced the real
d. The implementation stage is the process of implementing everything that has been gwell designed between ghardware and software, which has not been combined.

The data collection technique used in this research is literature study. Researchers carry out search activities and collect data related to case studies or problems in research obtained from journals, books, works

2.1. Needs Analysis

System requirements analysis is the process of obtaining the information a system needs from a user (farmer). In designing this system, references in the design are obtained from user information. This stage is carried out so that what will be made or designed can meet the needs of the system based on data obtained from prospective users. Requirements analysis includes hardware and software requirements.

3. RESULTS AND ANALYSIS

3.1. Data Analysis

The selection test criteria data used in the rice-eating bird repellent system using the fuzzy sugeno method amount to 4 criteria namely.

Table 1. Criteria Data For The Fuzzy Sugeno Method

Test Criteria			
Kode	Name	Weight	W
C1	Top movement	25%	0.25
C2	Left movement	25%	0.25
C3	Right movement	25%	0.25
C4	Forward movement	25%	0.25

1. determining the value of the detection distance criterion c1 the movement of the variable the value of the upward movement criteria is converted to the fuzzy number below

Table 2. Determination Of The Criterion Value Of The Movement Detection Distance (C1).

Range (m)	Weight	Mark
4	Not Good	1
3.1 – 4	Not Good	2
2.1 – 3	Enough	3
1.1 – 2	Good	4
1	Very good	5

2. determining the value of the detection distance criterion C2 the movement of the variable the value of the upward movement criteria is converted to the fuzzy number below

Table 3. Determination Of The Criterion Value Of The Movement Detection Distance (C2)

Range (m)	Weight	Mark
4	Not Good	1
3.1 – 4	Not Good	2
2.1 – 3	Enough	3
1.1 – 2	Good	4
1	Very good	5

3. determining the value of the detection distance criterion C3 the movement of the variable the value of the upward movement criteria is converted to the fuzzy number below

Table 4. Determination Of The Criterion Value Of The Movement Detection Distance (C3)

Range (m)	Weight	Mark
4	Not Good	1
3.1 – 4	Not Good	2
2.1 – 3	Enough	3
1.1 – 2	Good	4
1	Very good	5

4. determining the value of the detection distance criterion C3 the movement of the variable the value of the upward movement criteria is converted to the fuzzy number below

Table 5. Determination of the criterion value of the movement detection distance (C4)

Range (m)	Weight	Mark
4	Not Good	1
3.1 – 4	Not Good	2
2.1 – 3	Enough	3
1.1 – 2	Good	4
1	Very good	5

3.2. **Application**

Table 6. Representation Of Input Data

time	Alternatif	C1	C2	C3	C4
00:00	V1	2	4	4	1
00:05	V2	2	3	4	1
00:10	V3	3	2	3	2
00:15	V4	3	2	4	2
00:20	V5	2	2	4	1
00:25	V6	2	3	4	2
00:30	V7	3	4	4	2
00:35	V8	1	2	4	1
00:40	V9	2	4	4	2
00:45	V10	3	3	4	1
00:50	V11	4	2	3	2
00:55	V12	2	2	2	2
01:00	V13	2	2	3	3

The next step is the formation of fuzzy set values (fuzzification), input and output variables will be divided into several sets.

Table 7. Fuzzy Set Formation

Function	Criteria	universe of values
Input	Up, Left, Right, Front	1 – 6
Output	Motor Movement	1 – 4

Tabel 8 Fuzzy Rule Values

V1	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V2	= (0.5 x0.666667) + (0.5 x 0.75) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0,375 + 0.5 + 0.25 = 1,458333333
V3	= (0.5 x1) + (0.5 x 0.5) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V4	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25

	= 1.283
V5	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V6	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V7	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V8	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V9	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V10	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283
V10	= (0.5 x0.666667) + (0.5 x 1) + (0.5 x 1) + (0.5 x 0.5) = 0.3333 + 0.5 + 0.5 + 0.25 = 1.283

Testing on the Pir sensor is carried out to determine the feasibility of this sensor in research. Testing of the Pir sensor is carried out when the sensor detects an object.

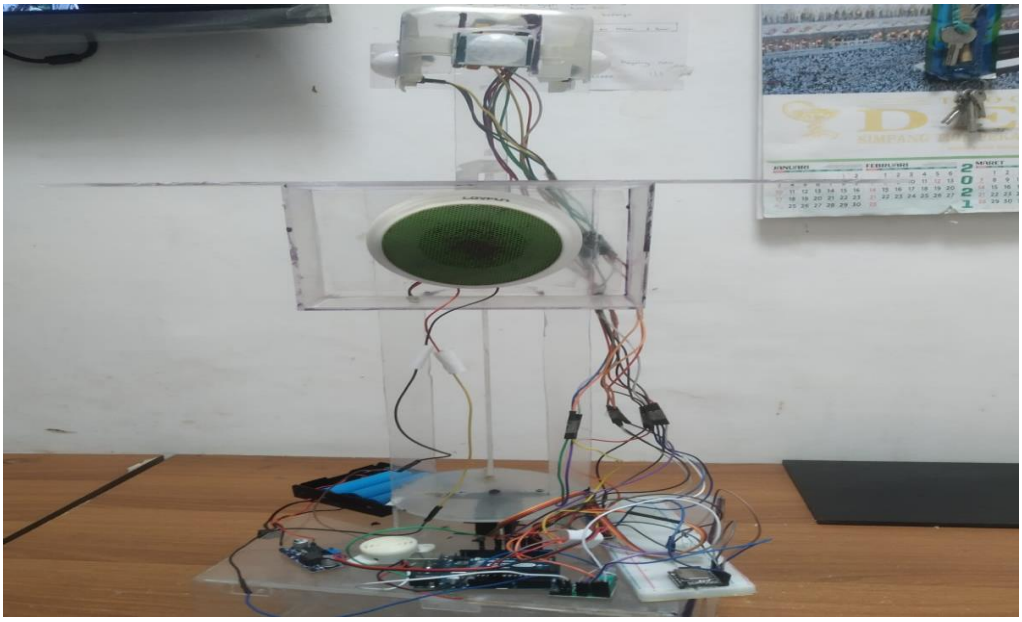

Figure 2. Pear Sensor Testing

4. CONCLUSION

Based on the discussion and analysis of rice-eating bird repellents in the fields, it can be concluded that with this system or tool, it is hoped that it will facilitate the work of farmers in maintaining their rice fields which manually become automatic, prototype systems or tools can work according to what the researcher wants. The results of the ultrasonic sensor test can detect an approaching object.

THANK-YOU NOTE

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