The 6TH International Conference on Science, Technology and Interdisciplinary Research (IC-STAR) 2020
FACULTY OF ENGINEERING LAMPUNG UNIVERSITY
Jl. Prof. Sumantri Brodjonegoro No. 1 Bandar
Lampung 35145 Telp. (0721) 704947,

Bandar Lampung, 25 August 2020

YE Putra[1] , SR Sulistiyanti[1] , and AS Samosir[1]
Department of Electrical Engineering, Universitas Lampung, Indonesia

RE: ACCEPTANCE AND INVITATION LETTER

Dear Authors,

Thank you for your submission to The 6th International Conference on Science, Technology and Interdisciplinary Research (IC-STAR) 2020, held in Bandar Lampung, Indonesia on 20-21 October 2020.

We would like to inform that initial screening and review is in favour of your submission.
Paper ID# : ID#62
Authors : YE Putra, SR Sulistiyanti, and AS Samosir
Title : Characteristics of Ultrasonic Velocity of Eggs Using HC-SR04 Module

On behalf of the Scientific Committee, we are pleased to notify the acceptance of your paper submission. Accordingly, we also invite you to present the work during IC-STAR 2020. However, a review process on the paper is currently done. We will send notes of the review as soon as possible.

Kindly submit the full paper in a .doc file (NOT in .pdf) through easychair system and please consider the important dates. It is suggested to process your registration for your presentation soon. **The early bird of registration due is August 31, 2020**. If you are a student, you have to pay ***Rp. 200.000*** only (or 40 USD for International student participant). Also you can get a 20% waive if you joined the previous IC-STAR Conference or you are belong to BKS PTN Barat University. Other information regarding the conference will be updated through our website, http://ic-star.unila.ac.id/. Should you have any inquiry, please contact us through email: khairudin@eng.unila.ac.id.

The Organizing Committee would like to congratulate you for the acceptance and thank you for participating in IC-STAR 2020. We are looking forward to see you in Virtual Room of IC-Star 2020 !

Best Wishes,

Khairudin, S.T., M.Sc., Ph.D.Eng
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17 dari 89

IC-STAR 2020 Notification for paper 62 ABSTRACT

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Dear Yudi Eka Putra,

The abstract of your paper title : Characteristics of Ultrasonic Velocity of Eggs Using HC-SR04 Module
Paper Number : 62
Author(s) : Yudi Eka Putra, Sri Ratna Sulistiyanti, Ahmad Saudi Samosir

We are pleased to inform you that your above-mentioned abstract submission has been accepted for the conference with the comments of review at the bottom of this email, if any.

For inclusion in the conference, we require that you submit the full paper of your manuscript by 25th September 2020 (for you who do not submit it yet). The manuscript will be reviewed and the result will be notified by 5th October 2020. Submission is online through the website (Easychair). Guidelines for manuscript preparation are available on the Conference website at http://ic-star.unila.ac.id

Please follow the instructions and use the paper template provided. Please note that we limit the maximum number of pages for the manuscript to 6 pages, otherwise you will charge an additional fee of: 10 USD for International Participant or 100.000 IDR for Local Participant per page. If you have uploaded your full paper, you could update it following the paper instruction above. Please send us a notification, if you intend to do so.

Should you require assistance on submitting the full paper, please contact the Conference General Chair at: khairudin@eng.unila.ac.id or khairudin@ieee.org

We appreciate your participation and look forward to receiving your full paper and welcoming you to The 6th International Conference on Science, Technology, and Interdisciplinary Research in October 20 - 21,2020, in virtual conference room.

Best regards,

IC-STAR 2020
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The Conference will be held virtually on

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Characteristics of Ultrasonic Velocity in Eggs Using HC-SR04 Module

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Abstract. This article discusses abaout characteristics of ultrasonic wave propagation in eggs. The objects used are three types of eggs; Broiler eggs, domestic eggs and ducks. The method of determining the egg characteristics used ultrasonic waves. Ultrasonic wave can propagate on objects, materials and components. The HC-SR04 is used as ultrasonic wave transmitter and receiver. Ultrasonic waves are transmitted to the surface of the eggs. The distance between the eggs and the HC-SR04 module is 5 cm and 10 cm. The testing process is carried out on 10 eggs, of each type. The distance and time propagation parameters are used as information to produce the ultrasonic velocity of the egg. The testing and calculation process shows that duck eggs have the highest speed value.

Keywords: Eggs, Ultrasonic Wave, HC-SR04, Ultrasonic Velocity.

1. Introduction

Non Destructive Testing (NDT) is one of the methods of testing or technical assessment. Specifically can provide information on an object, material, and component without damage. NDT methods are image processing, near infrared (NDI), X-ray, gamma and ultrasonic. In this articel, ultrasonic technology is used to carry out non-destructive testing of eggs. Ultrasonic technology is one of the non-destructive testing methods that is popular. Food quality assessment using ultrasonic-based techniques is often preferred over other techniques because it is cheaper, device portability, and environmentally.. In addition, low-energy ultrasonic signals in non-destructive testing (NDT), do not have negative effects on the physical and mechanical properties of biomaterials [1].

Ultrasonic technology was chosen in this study because it is known that its penetration strength exceeds NIR, and lower investment costs. Ultrasonic waves has been widely used in various fields, such as in the construction industry, to find out material defects in the concrete and metal production process. In the health sector, to determine the condition of the fetus, organs, and body tissues, as well as several applications in agriculture and the military. The identification process is often done using a manual process so that it will require more accuracy than the people who carry out the identification.. Manual detection requires high labor intensity and time consumption. In addition, the detection results are subjective and their accuracy cannot be guaranteed [2].

Therefore, the process of detecting fertile eggs before incubation using ultrasonic technology is expected to improve efficiency and quality of production results and bring substantial economic benefits [3].
This research is a preliminary study to look for opportunities to use ultrasonic waves for non-destructive evaluation of eggs. The vision of this research is to be able to develop non-destructive evaluations in determining fertile and infertile eggs. When ultrasonic waves are propagated through the egg, there are various aspects that determine the characteristics of the propagation, such as: the geometry and dimensions of the egg, the characteristics of the shell, egg white and yolk [4]

This study learn about the characteristics of egg types (broilers,domestic,and ducks) on the parameters of ultrasonic velocity. It very important to knows internal condition eggs, while general method used is the conventional. We need a new method that is using an ultrasound device. The vision of ultrasonic is to become an alternative method to find out the condition of fertile eggs that are accurate and friendly use. It is expected that the results obtained in this study, can be used as initial information for making and developing non-destructive egg identification systems using ultrasonic waves at a relatively cheaper cost and easy to use.

2. Material and Method

The test was carried out using three types of eggs, as broiler, domestic, and duck eggs. Each consists of 10 items. Eggs used for average 1-3 days. The variables discussed in this study were the distance , time, and ultrasonic velocity of egg. The ultrasonic parameter measurement method is the signal transmission using ultrasonic module.

Ultrasonic waves (40Khz) are repetitively generated with a transducer that is triggered from microcontroller. The transmitter and receiver is a HC-SR04 sensor with a working frequency of 40KHz. The test begins with the giving of signals transmitted by ultrasonic sensors to objects (eggs). Tests using HC-SR04 sensors are fired on the surface of the egg. HC-SR04 will send waves from the transmitter, if the waves hit the surface of the eggs Buzzer ON as a notification and then the reverse wave will be received by the receiver.

The design of this egg testing device uses C programming. Programming is implanted in the Arduino Uno R3 microcontroller through the Arduino IDE software. The design of the testing device starts from the initialization of the pin by Arduino Uno R3 for the HC-SR04 module, buzzer, and LCD, after that the transmitter on the HC-SR04 will send waves towards the object (the egg). If the wave touches the surface of the egg the buzzer ON as a notification. After that the value of the distance and the time of reflection will be displayed on the LCD. Following the flowchart programming system in Figure 2.

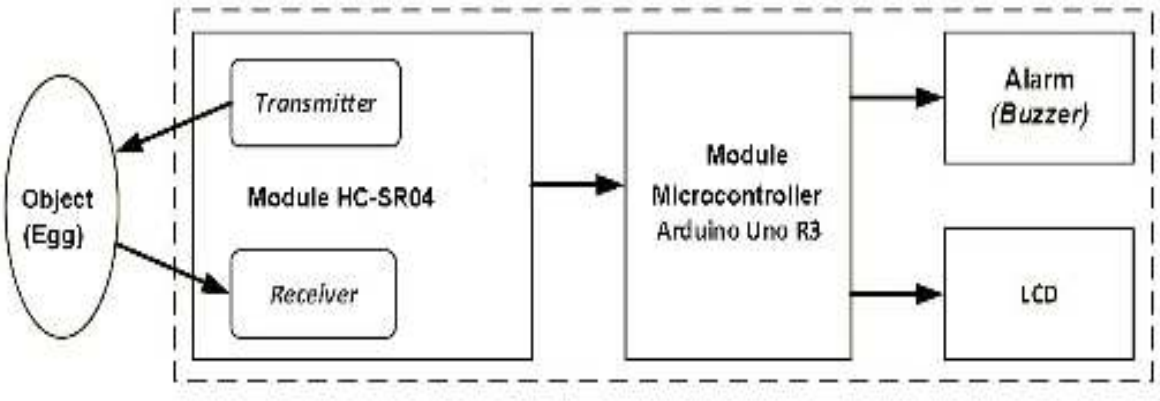

Figure 1. Block Diagram Eggs Testing System

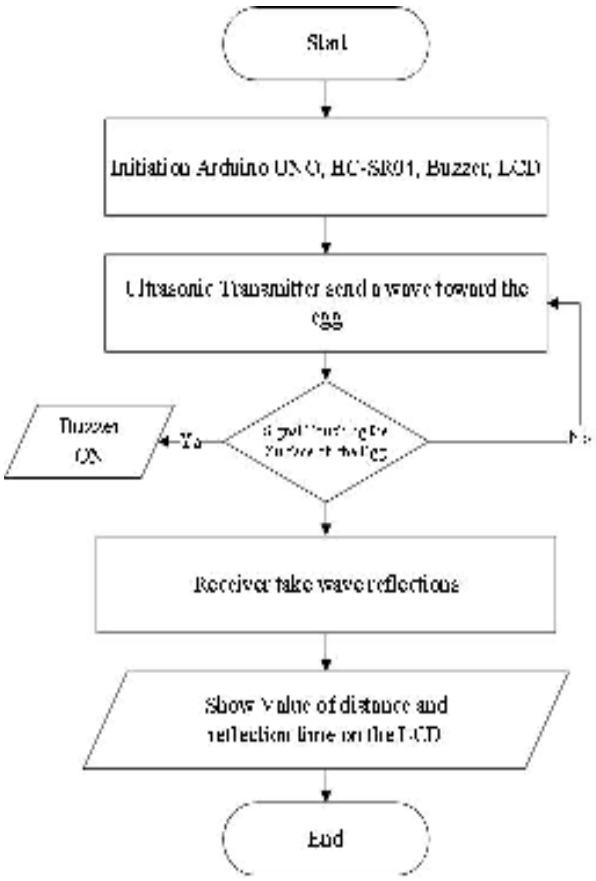

Figure 2. Flowchart Programming System

The egg testing technique has been carried out in 2 stages. The first stage of testing to measure the value of the distance and time reflection when the vertical position. The second stage of testing is measuring the value of the distance and time reflection when the horizontal position. After obtaining the distance data and the time of propagation of the feeding wave will be determined the value of Ultrasonic Velocity with equation (1).

$$\boldsymbol{V = \frac{S}{tof}} \qquad (1)$$

Where :
V is the Velocity (m/s)
s is Distance (m)
tof is Time (s)

3. Results and Discuss

The measurement distance and time reflection on the egg aim to determine the characteristics of ultrasonic velocity. Result in this research, each egg has a different wave reflection time. It is known that changes in ultrasonic velocity can indicate physical change in egg. Table 1 dan 2 menunjukan data hasil pengujian dan perhitungan yang dilakukan pada 3 jenis telur,

Table 1. Measurement and testing distance 5 cm

No	Distance (m)	Broiler Eggs		Domestic Eggs		Duck Eggs	
		Vertikal Ultrasonic Velocity (m/s)	Horizontal Ultrasonic Velocity (m/s)	Vertikal Ultrasonic Velocity (m/s)	Horizontal Ultrasonic Velocity (m/s)	Vertikal Ultrasonic Velocity (m/s)	Horizontal Ultrasonic Velocity (m/s)
1	0,05	131,58	157,23	162,34	156,25	169,49	155,28
2	0,05	146,63	166,67	147,06	154,32	162,87	159,24
3	0,05	142,45	146,63	161,81	161,81	147,93	142,45
4	0,05	142,45	138,12	167,22	158,73	166,11	143,68
5	0,05	166,11	167,79	149,7	168,35	161,81	144,09
6	0,05	142,86	161,81	143,68	157,73	160,77	167,79
7	0,05	144,09	164,47	156,25	155,76	154,8	165,02
8	0,05	149,25	150,15	154,8	156,74	169,49	155,76
9	0,05	159,24	151,52	142,45	157,23	157,23	163,93
10	0,05	160,77	153,37	155,28	162,34	155,76	155,28
Average		***148,54***	***155,78***	***154,06***	***158,93***	***160,63***	***155,25***

Tabel 2. Measurement and testing distance 10 cm

No	Distance (m)	Broiler Eggs		Domestic Eggs		Duck Eggs	
		Vertikal Ultrasonic Velocity (m/s)	Horizontal Ultrasonic Velocity (m/s)	Vertikal Ultrasonic Velocity (m/s)	Horizontal Ultrasonic Velocity (m/s)	Vertikal Ultrasonic Velocity (m/s)	Vertikal Ultrasonic Velocity (m/s)
1	0,1	168,07	164,2	168,07	167,5	164,2	158,73
2	0,1	168,63	168,63	166,67	157,73	164,2	180,18
3	0,1	165,84	168,35	166,67	161,29	155,04	158,73
4	0,1	169,78	167,5	161,81	163,67	169,78	162,87
5	0,1	170,07	168,07	160	165,02	162,34	163,93
6	0,1	168,92	175,13	161,29	161,81	160,26	164,74
7	0,1	169,49	176,99	169,49	156,74	162,87	154,8
8	0,1	167,5	170,65	161,81	156,25	166,94	166,94
9	0,1	169,78	166,67	168,07	155,28	168,63	167,5
10	0,1	157,98	159,24	166,67	155,04	166,94	169,2
Average		***167,61***	***168,54***	***165,05***	***160,03***	***164,12***	***164,76***

From the observations, it is known that the distance of the sensor greatly affects the value of ultrasonic velocity on a particular object. The thickness and density of the wave propagation media is also one of the factors that is very influential Test and calculation results with a distance of 10 cm can be seen in table 2. The entire table presented shows that the values from the measurement of eggs are different.

Measurement distance 5 cm and 10 cm to the egg.. Measuring starts from 5cm, because it ideal distance and the sensor can work effective. The sensor is only able to work from a distance of 3 cm to 400 cm. Based on measurements made, at a distance of 5 cm and 10 cm produces a stable value and is easily observable. From each measurement and test at a distance of 5 cm in each egg, the average values are as follows. In Broiler eggs 148.54 and 155.78, Domestic eggs 154.06 and 158.93, and Duck eggs 160.63 and 155.25. Then at a distance of 10 cm; broilers 167.61 and 168.54; domesti165.0 and 160.03, and duck of 164.12 and 164.76. Significant data changes occur when measurements are made at a distance 5 cm. Broiler eggs have the lowest value of ultrasonic velocity while duck eggs have the highest value of ultrasonic velocity. Because the structure of the eggshell and the internal condition of the egg affect the ultrasonic velocity. In general, the more solid an object, the faster the wave is reflected.

4. Conclusion

Based on the measurements, calculations and analysis that have been done, it can be concluded that the characteristics of ultrasonic velocity on duck eggs are the fastest compared to domestic and broilers eggs. The most effective measurements are made at a distance between the sensor and the egg of 5 cm. Although measurements and calculations that have been carried out show differences in the propagation of eggs, there is a need for further development and research using components and equipment that have a higher frequency and accuracy.

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