## Design of Conveyor System Based on Microcontroller

## Rindi Wulandari[1*], M. Riyad Ariwibowo[2], Taryo[3], M. Dimas N[4]

rindi.wulandari@ugj.ac.id

[1,2,3,4]Department of Electrical Engineering, Faculty of Engineering, Swadaya Gunung Jati University- Jalan Pemuda No. 32, Cirebon, West Java 45132

| Article Information | Abstract |
|---|---|
| | Conveyor is a transport system that can move objects from one point to another. This study aims to make a conveyor system based on mikrokontroller by testing several materials for the conveyor base, and testing the performance of the conveyor system. The microcontroller used is Arduino Uno. The sensor used is an infrared sensor, as a sensor for detecting objects on the conveyor. The research method used is an applied research method with experimental techniques. The first stage is to create a mechanical design for the conveyor, and the second is make an automation design. The results of the study show that the most effective material for the conveyor belt base is a 1.5 cm thick mattress material. The system test results show that the infrared sensor can be used to detect objects on the conveyor. When an object is detected, the conveyor stops for 0.5 seconds and is detected on the LCD monitor in the control box. The range of the infrared sensor is 15 cm – 50cm. |

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## A. Introduction

Along with the progress of the times, industrial development is also increasingly rapid. One of the characteristics of the development of the industrial world is technological progress to help human work. Conveyor is a transport system that can move objects from one point to another [1]. Conveyors are very useful in the industrial world because they really help people make their work easier. There are several conveyor models used in industry, namely: belt conveyor, chain conveyor, screw conveyor, pneumatic conveyor [2]. One that is widely used in the industrial world is the belt type conveyor.

Many studies have been carried out regarding conveyor belts, one of which is the simulation and design of conveyor belts that can optimize production results using MATLAB [3]. Apart from that, there are studies related to the implementation of DC motors with PID control to separate potato harvests based on weight, the conveyor also functions as a potato weighing tool. Other research related to conveyor systems as a means of transporting objects and measuring object dimensions using two ultrasonic sensors and measuring the weight of objects with a load sensor [4] [5] [6].

The working principle of a conveyor is to move objects on the conveyor with ultrasonic sensor input as an object detector, then the conveyor base runs to the other end of the conveyor and drops the object because the conveyor base reverses direction, the conveyor base is moved by a head pulley in the form of a DC motor [7] [8].

This study is related to the manufacture of a microcontroller-based conveyor system by testing several conveyor bases, namely using vinyl, mattress and carpet. The aim of this study is to obtain materials for conveyor equipment that are most effective when making conveyor designs and to test the performance of conveyor systems and conveyor material bases that are effectively used. The microcontroller used is an Arduino Uno which uses an ATmega 328, which has 14 digital input/output (I/O) pins[9][10]. The sensor used is an infrared sensor, as a sensor for detecting objects on the conveyor.

## B. Research Method

This study has two stages, first mechanical belt conveyor design and automation design [11]. The research method used is an applied research method with experimental techniques [12]. The first stage is to create a mechanical design for the conveyor, and carry out trials on several materials for the conveyor base. In general, the research stages are depicted in Figure 1.

The design process is carried out using Sketch Up software to obtain a design for the conveyor system to be created. Next is making conveyor mechanics, conveyor assembly consisting of making the conveyor, installing sensors and motors, designing the wiring scheme, and making the microcontroller code. The testing stage is divided into two parts, namely testing on the conveyor bed based on existing materials, testing on the conveyor system as a whole after selecting the most effective material to use.
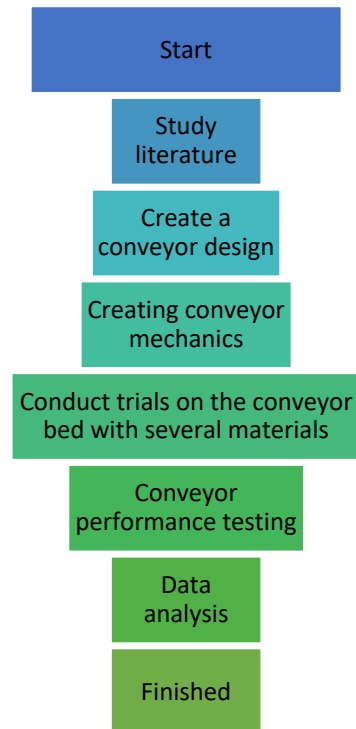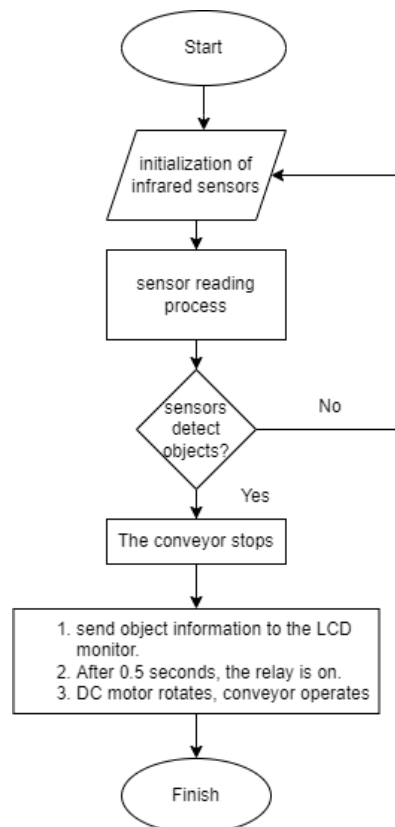
**Figure 1.** Step of the Study

The second stage is to create an automation design using Arduino Uno, the flowchart of the automation system on the conveyor is shown in Figure 2.



**Picture 2.** Flowchart of conveyor system

Next, the conveyor design is depicted in Figure 3. The parts contained in the conveyor are the control box, conveyor belt, object information LCD and storage box.
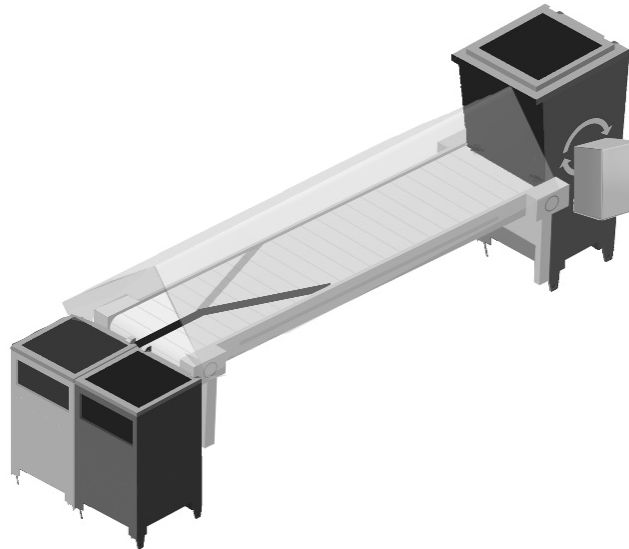


**Figure 3.** Conveyor system design

## C. Result and Discussion

Figure 4 shows the design results of an Arduino Uno-based conveyor system with an infrared sensor without a conveyor base.



**Figure 4.** Design and Build of a conveyor system without a base

Testing of conveyor bed materials is carried out to find out what materials are most effective to use for the conveyor system being built. Table 1 shows the test results for conveyor bed materials.

**Table 1.** Conveyor bed material testing

| No | Material | Thickness | Result |
|----|----------|-----------|--------|
| 1 | Vynil | 1,5 cm | Not moving |
| 2 | Carpet | 1,5 cm | Not moving |
| 3 | Mattress | 1,5 cm | Move |

The test results show that material from a 1 cm thick mattress can be an effective conveyor base for moving. The vinyl material is too slippery so the DC motor screw cannot grip the vinyl material and causes the conveyor not to rotate. Meanwhile, the carpet material is too rough to be used as a conveyor base so the DC motor cannot operate. Figure 5 shows the conveyor bed testing activities. Figure 5(a) is the material of the carpet and 5(b) the base material is made of the mattress.


(a)
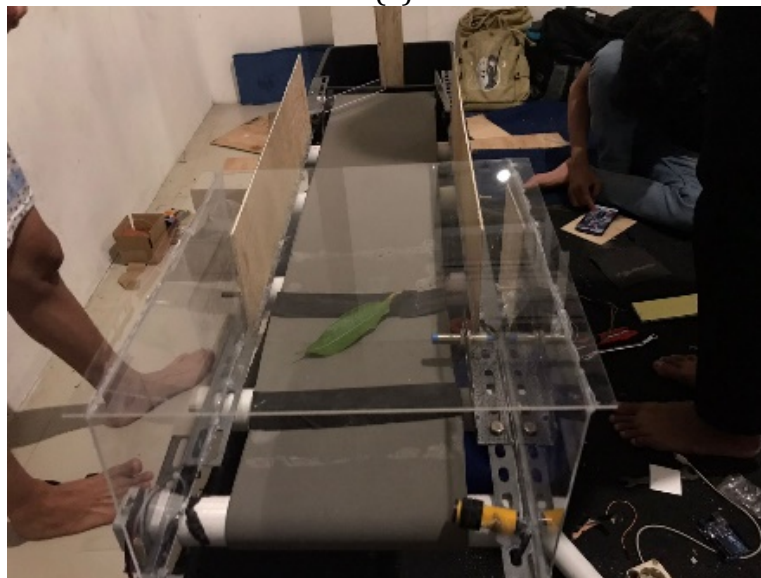

(b)
**Figure 5(a).** carpet material **(b).** mattress material

Next, testing was carried out on the performance of the conveyor with a mattress base that was 1.5 cm thick. This test aims to measure the accuracy of whether an object is detected or not. Apart from that, when an object is detected, the conveyor must first stop for around 0.5 seconds according to the program created. The test was carried out by varying the rotation speed of the DC motor, shown in table 2.

**Table 2.** Conveyor system test

| No | Speed variations | Voltage (Volt) | Current (Ampere) | Stop time (seconds) | Status LCD Monitor |
|----|------------------|----------------|------------------|---------------------|--------------------|
| 1 | Slow | 3.31 | 0.15 | 0.5 | detected |
| 2 | Currently | 3.30 | 0.16 | 0.5 | detected |
| 3 | Fast | 3.31 | 0.13 | 0.5 | detected |

The tests in table 2 show that the infrared sensor can be used to detect objects on the conveyor, and when an object is detected, the conveyor stops for 0.5 seconds and is detected on the LCD monitor in the control box. The range of the infrared sensor is 15 cm – 50cm.

### D. Conclusion

This study concludes that it has succeeded in design of conveyor system based on microcontroller using ultrasonic sensors. In the material testing process for the conveyor belt base, material from a mattress with a thickness of 1.5 cm can be used for the conveyor system effectively. The results of the next test show that the infrared sensor can be used to detect the presence of objects on the conveyor, and when an object is detected, the conveyor stops for 0.5 seconds and is read on the LCD monitor in the control box. The range of the infrared sensor is 15 cm – 50cm.

### E. Acknowledgment

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