Jurnal Mantik
Volume 4, Number 1, May 2020, pp. 825-829 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik

Design of Automatic Carriage Doorstop With Arduino

Resa Wahyu Adi Pujianto[1], Septi Andryana[2], Ira Diana Sholihati[3]

Program Studi Informatika, Fakultas Teknologi Komunikasi dan Informatika, Universitas Nasional
Jl. Sawo Manila, Pasar Minggu, Jakarta Selatan, 12520

Email: [1]resawahyu35@gmail.com, [2]septi.andryana@civitas.unas.ac.id, [3]iradiana2803@gmail.com

ARTICLE INFO

Article history:
Received: 04/04/2020
Revised: 20/04/2020
Accepted: 30/05/2020

Keywords:
Arduino Uno;
Railway,
Prototype,
Ultrasonic Sensor

ABSTRACT

The train is a means of transportation that is still in demand by most of the population of Indonesia at this time. But the contribution of the railway itself to national transportation is still very low, accidents because this transportation often occurs because there is still insufficient infrastructure and facilities. Accidents due to trains in general often occur at the doorway of railway crossing this can be caused by the negligence of the officers or attitudes of the other riders who are still very undisciplined. Thus the author finds an idea or idea to create an automatic doorway system. The design in this prototype is by using the pro-tower servo motor, project Board Mini, and the SR-04 ultrasonic sensor, which will be processed with the Arduino UNO microcontroller.

1. Introduction

The rapid development of technology in the field of transportation at this time is not something strange anymore. In fulfilling its interests, the community needs a very fast transportation to help its mobility to move places or locations. Examples of transportation that is still quite attractive and used by the community to this day is the train. This is because in addition to being easy to reach, trains can also quickly help the community to drive them to move locations without tirelessness. However, in this mode of transportation it also does not rule out the possibility of an accident, either because of the actions of other transportation drivers who do not comply with regulations or are still found where the railroad crossing is not equipped with maximum protection, so that accidents can still be found in this type of transportation. Therefore, in this case a simple prototype of the railroad crossing gate is needed that can open and close automatically which will be driven by a pro tower servo motor, a mini project board and an ultrasonic sensor that will be processed by an arduino microcontroller.

2. Theoretical basis

2.1. Railroad Crossing Doorstop

A railroad crossing is a level crossing between a railroad track and a road. The doorstop here is used as an additional security used to close the railroad crossing if the train crosses the crossing. The design rules for the train door itself can be shown in the following picture.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

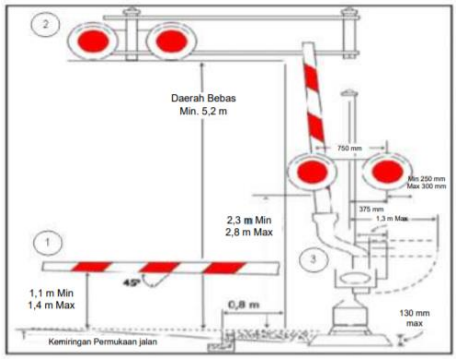

Fig 1. Design of railroad crossing rules.

a. Miniature Crossing Railroad

Miniature is an imitation of an object in a small shape and can be seen from all directions. In making this train doorstop miniature which will be driven by a servo motor.

b. Arduino Uno

Arduino is an open source microcontroller board based on the ATmega328P microchip. On this board there are also digital input and output pins that can be connected to various expansion boards and other circuits. Arduino here as a microcontroller which will later be connected to a computer or laptop to be given programming through the Arduino IDE software.

Fig 2. Arduino Uno Board

b. Sensor

HC-SR04 sensor is an ultrasonic sensor commonly used in distance measurements. On this sensor there is a pair of ultrasonic transducers, where one sensor has a function as a receiver that has the task of receiving ultrasonic wave signals, and the other serves as a transmitter which has the task of converting electrical signals into ultrasonic wave signals with a frequency of 40KHz. This sensor will later be used as a detection of train arrival.

Fig 3. SR-04 Sensor

c. Servo Motor

Servo motor is an electronic component in the form of a motor that has a feedback system to provide information on the actual rotation of the motor which will be forwarded to the microcontroller control circuit. Servo motors have 2 types namely standard and continuous servo motors, the difference is that standard servo motors only rotate. 180 degrees while the continuous can rotate up to 360 degrees. This servo motor will be used as a crossing railroad crossing.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Fig 4. Servo Motor

3. Research methods

The process of collecting data on railroad crossing problems is carried out using the field research method and the research and development method. The field method is carried out directly (observation) by searching and collecting data relating to the problems of the railroad crossing. General information is obtained based on direct observations such as general description, accident rate, and railroad crossing system used at this time. While the second method is carried out in order to produce the latest system, and test the effectiveness of the new system.

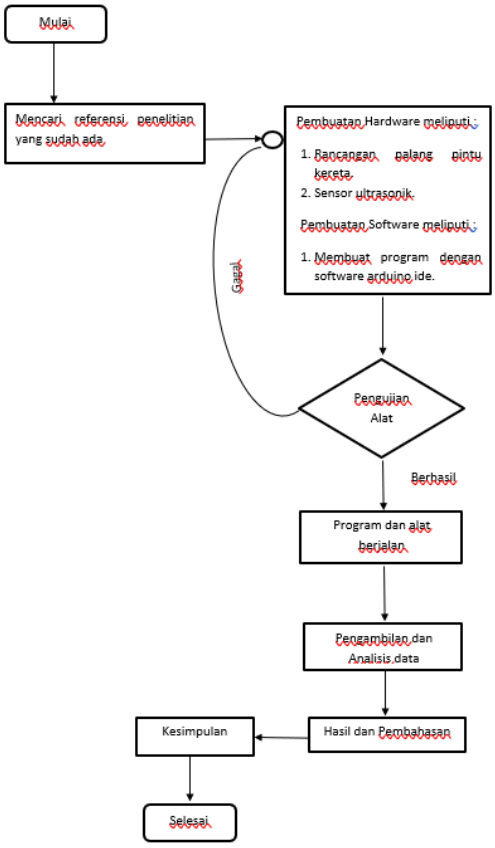

Fig 5. Research flowchart

a. Data Needs Collection and Analysis.

Collecting is done by looking for references from various sources, after the data is collected then do an analysis of the needs of the hardware and software about what needs will be used to make the railroad automatically. The need for hardware (hardware) such as Arduino Uno, servo motor, project board, jumper cable, and ultrasonic sensors. While the software (software) needed is Arduino IDE.

b. System planning

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

The first system design is to design the shape of the device to be made, then adjust the layout of the sensor, arduino and other components which will form the door opening and closing automatically when the sensor is detected. After the tool has been formed, it then designs the program on the Arduino IDE so that the tool can work according to the plan of the predetermined tool design.

c. Testing Tool

Tool testing is done in order to get a performance conclusion from what was done in the previous section. The testing is done, such as:

1) Testing the tool, whether there are errors in the sensor and servo motor.
2) Software testing, whether there is an error in the program created in Arduino IDE.
3) Testing the entire prototype system, whether it can work according to the system and the doorstop can work automatically if a sensor is detected.

4. Results and Discussion

a. Hardware Component Testing

Hardware testing is carried out to test the components in the design of this automatic train doorstop whether the arduino or sensor components still have errors or not.

b. Software Component Testing

Testing on software is done to do testing, whether the programming code on the Arduino IDE is still an error or the program has worked and can be done well by the microcontroller.

The following programs have been made on Arduino IDE:

Fig 6. Program on Arduino IDE

After the program has finished uploading, the program will immediately run and if the LED on Arduino lights up 1 second it indicates that the program is working properly

Fig 7. Testing the Arduino program

5. Conclusion

After the discussion in the previous sub-chapter to overcome the level of accidents due to the lack of maximum safety on the railroad crossing with the design of this draft, the following conclusions can be drawn:

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

a. Sensors are used to detect trains when they arrive. This sensor work system is regulated by Arduino and is programmed through the Arduino IDE.
b. The results of all miniature work tests here function properly. The doorstop that is driven by a sevo motor also has a turning tolerance of 0.45o.
c. The making of this automatic train doorstop with prototype method based on Arduino UNO microcontroller.

6. Reference

[1] K. Krishnamurthi, M.B. Vidya V.E. Baby. "Sensor Based Automatic Control of Railway Gates". International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), vol 4 Issue 2, hlm. 539-543, 2015.
[2] Sunaryo, Sunaryo, and Wawan Hermanto. "Arduino-Based Railway Arrival Detection And Name Detection Design At A Level Crossing." Jurnal Perkeretaapian Indonesia (Indonesian Railway Journal) 1.2 (2017): 139-147.
[3] Gowda, Akshata. 2013. Control 4 Smart Home System using LabVIEW. International Journal of Engineering Science and Innovative Technology (IJESIT).
[4] Davinder, Twinkle, Preet. 2012. "The RFID Technology And Its Applications: A Review". International Journal Of Electrronics. Vol.2, Issue 3. ISSN 2249-684X. Haryana Collage Of Technology & Management. Universiy Of Science And Technology: India.
[5] Lwin, H. H., Khaing, A. S., &Tun, H. M. (2016).Automatic door access system using face recognition. International Journal of Scientific & Technology Research. 4(6) : 210-221.
[6] Firdaus, M. Azzam. Miniatur palang pintu kereta api otomatis dengan menampilkan kecepatan kereta serta waktu tunggu menggunakan arduino. Diss. Universitas Negeri Semarang, 2015.
[7] Jubaedi, Didi, and Devi Sukrisna. "RANCANG BANGUN PROTOTYPE PALANG PINTU KERETA API OTOMATIS BERBASIS ARDUINO UNO MENGGUNAKAN SENSOR HC-SR04." Prosiding Semnastek (2018).
[8] Pratama, Shendy, Ahmad Taqwa, and Irma Salama. "Palang Kereta Api Otomatis Berbasis Arduino Uno." Prosiding SENIATI (2019): 226-229.
[9] Prasetyo, Alfian Adjie, and Arief Hernawan. ALAT PENGAMAN PERLINTASAN KERETA API TANPA PALANG PINTU BERBASIS ARDUINO UNO. Diss. University of Technology Yogyakarta, 2019.
[10] Goslie, Andre, et al. "Sistem Alarm untuk Mendeteksi Kedatangan Kereta Api." Wikrama Parahita: Jurnal Pengabdian Masyarakat 2.1 (2018): 28-32.