Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X
IMPACT FACTOR: 6.199

IJCSMC, Vol. 9, Issue. 3, March 2020, pg.199 – 205

SMART RAILWAY GATE OBSTACLE DETECTION AND WARNING SYSTEM

Dr. Praveena[1]; P.Keerthipriya[2]; S.Vaijynthi[3]; D.Arvind[4]

[1]Head of the Department
[2,3,4]Students

[1]Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India
[2,3,4]Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India
[1] hodit@siet.ac.in; [2] keerthigreat4u@gmail.com; [3] vaijusuresh1999@gmail.com; [4] arvinddap@gmail.com

Abstract— Recently accidents in unmanned level crossings have been increasing day by day. It is due to the no availability of bridges or tunnels to cross the railway track. And also the train driver is not aware of the obstacle found in the crossing. This system uses sensors to detect the train and it makes the railway gate to open and close automatically and it captures the image of the obstacle detected and it sends to the train driver. So that train driver can operate the train accordingly. It reduces the manual error and unwanted deaths happening due to carelessness.

Keywords— Ultrasonic sensor, Arduino UNO, ESP 32 CAM module, Servo motor, Web server

I. INTRODUCTION

The term railway crossing (also called as level crossing) is a crossing of railway gates without recourse to a bridge or tunnel by a road or by a pathway. Early level crossings had a gateman with the flag in a nearby booth. On the arrival of a train gateman waves a red flag or lantern to stop all traffic and clear the tracks. Manual or electrical closable gates that barricaded the roadways were later introduced and it also paved the way for many railway accidents. Thus, crossing gates, when closed to road users leads to unwanted deaths happening in gates. When opened to allow road users to cross the line, the electric gates were swung across the width of the railway, preventing any pedestrians or animals getting onto the line. In the early days, delaying opening and closing of the gates leads to manual error causing many railway accidents. In 2017-2018 till March there were 75 accidents. In between of April and December it got reduced to 45.In 2014 to 2015 the count is 50 at rural and urban level crossings, In the year 2015 to 2016 the count got reduced to 20.And also during this period 59 were killed and about 100 were injured because the train has entered into the people who were standing near the railway gate watching the dasara festival. After days the accidents have been drastically reduced due to the improvement of technology and scientific technologies.

At present, the automation for opening and closing railway gates has been enhanced. And obstacle detection using ultrasonic sensors and generation of alert signals were implemented.

II. LITERATURE SURVEY

K. Ajith Theja et. al. [2] already focused on skilled workers to operate the railway crossing and also established a model for opening and closing of railway gate without manual power by using Wireless Sensor network (WSN) avoiding accidents due to manual errors.

Any M. Kottalil et. al. [3] proposed a circuit to control the opening and closing of railway gate using ATMEGA 16 to minimize the waiting time of road passengers while waiting for the arrival of the train

In [4], the authors proposed a method which provides the real time uses by automating the gate using IR sensors which reduces the human intervenes to prevent accidents happening due to manual carelessness.This paper also proposes a solution and adds more safety features with the inclusion of IOT.

Sheikh Shanawaz Mostafa et. al. [5] proposed a model for preventing collision with the use of radio links in order to transfer identifications, information of arrival and departing of trains faster to prevent accidents at railway crossings.

In [6], authors did a comparison of Level crossing aimed to embed railway crossing with automatic platform bridges and tunnels to provide automatic level crossing and reducing the wait time to opening and closing of gate with respect to train arrival

III. DRAWBACKS OF EXISTING SYSTEM

Early level crossings had a gateman with the flag in a nearby booth. On the arrival of a train gateman waves a red flag or lantern to stop all traffic and clear the tracks leads to manual errors.

Manual or electrical closable gates that barricaded the roadways were later introduced and it also paved the way for many railway accidents in case of no electricity or power supply. And also the system does not warn the driver about the obstacle in the railway gates and few systems send text messages to the train driver stating that some obstacle has been detected in the railway crossing.

Driver may not be aware of the obstacle whether it is an object or persons and animals. A lot of time is wasted in the existing systems to the manual operation of opening and closing of the gates and also the communication to the driver is lacking because of the usage of wi-fi modules and other simple communication protocols People are not aware about the train crossing the certain pathway unless providing proper intimation to the trespassers and vehicles going along the way.

Some systems use a DC motor which creates more torque and energy requirements are high. The existing system does not use the efficient camera module to detect the obstacle and capture the image regarding the obstacle.

IV. PROPOSED SYSTEM

The proposed system uses ultrasonic sensors to detect the arrival and departure of the trains. Ultrasonic sensor - 1,2 are placed at one end of the railway gate(i.e at the arrival point of the train) and the ultrasonic sensor -2,3 are placed at other end of the railway gate(i.e at the departure of the train).The distance between the sensor u1 and u2 is 50m and also the same for u3 and u4.The sensor detects the arrival of the train once the object(train) has detected in both the sensors for more than 10 seconds (considering the average length of the train)that have been placed in the distance of 50m each. This avoids detecting the objects crossing the sensors other than the train.

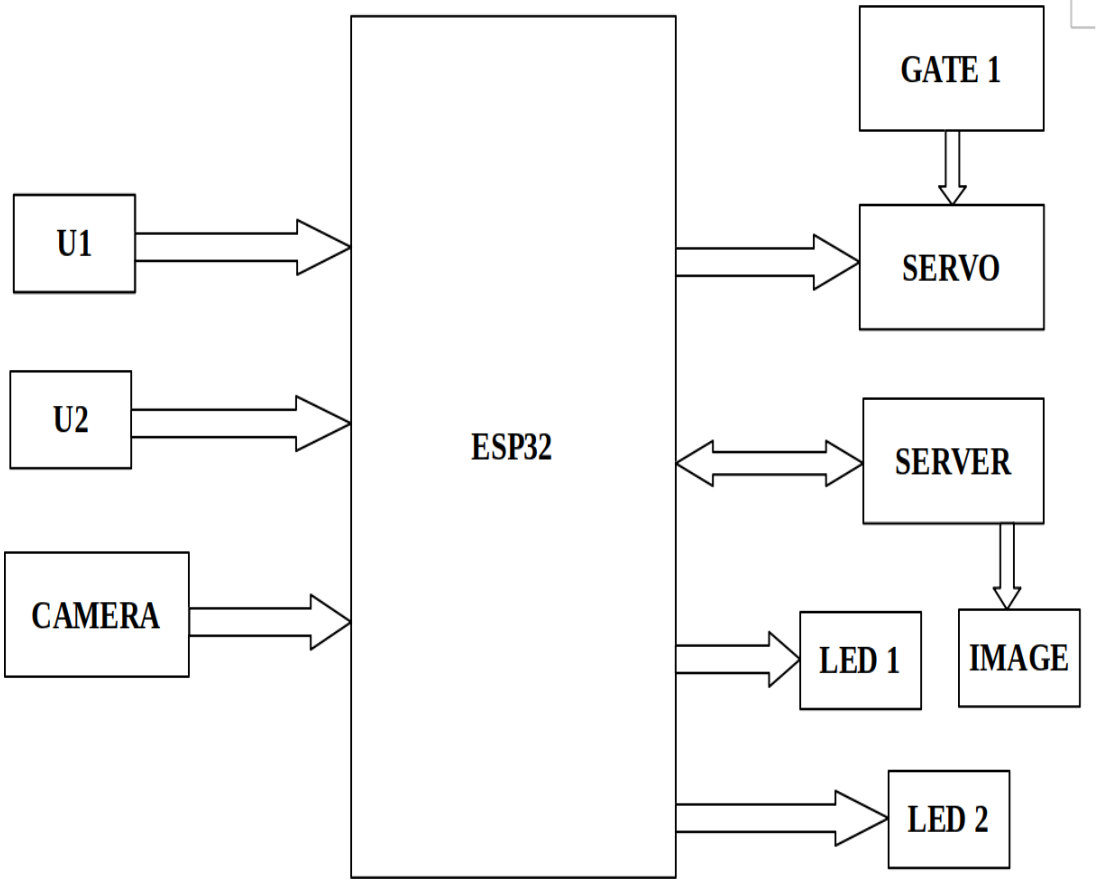
One side of the gate is operated by the arduino and the other side of the gate is operated by ESP-32 CAM module. Once the sensor detects the arrival of the train it receives an input and sends it to the Arduino and ESP-32 module which has been placed at the railway gate crossing. Arduino and ESP-32 receive the input from the sensor and it gives to the servo motor. The servo motor being connected with the Arduino and ESP-32 drives the motor to rotate.

Servo motor operates in both forward and reverse direction according to the input. When the train arrives Arduino makes the servo motor to operate in the forward direction which makes the railway gate to get opened and once the train has departed (i.e no signal in the sensor has been detected for a period of time) Arduino makes the servo motor to rotate in reverse Direction.

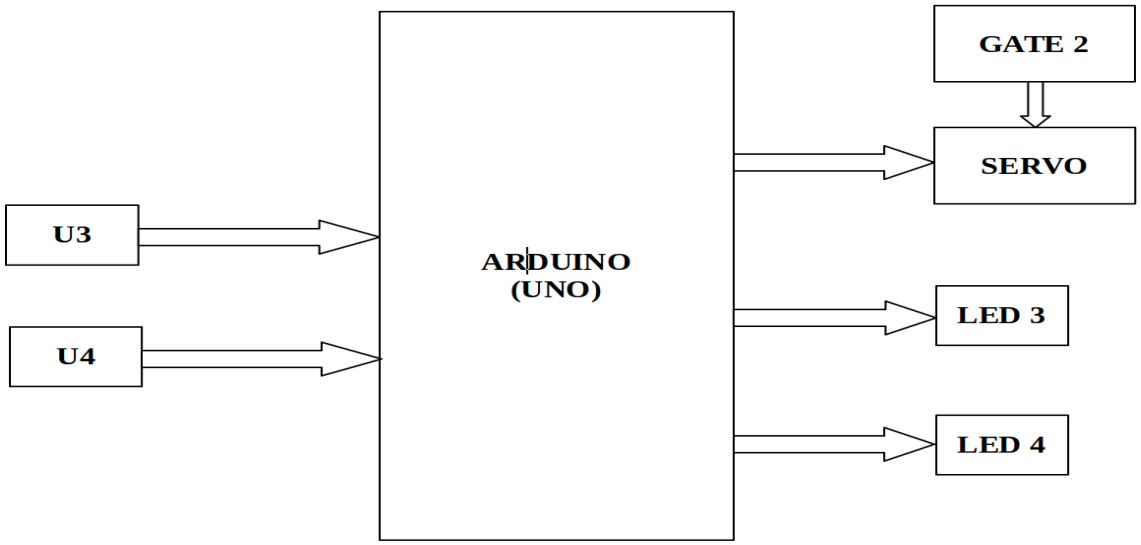
on the other end ESP-32 cam module is used to capture the image of the obstacle that is detected. It captures the image and sends it to the driver through a web server which is operated by ESP-32 module.Cp2102 TTL driver is used in coding the ESP32 module and according to the obstacle detected train driver can operate the train accordingly preventing the accidents.

V. BLOCK DIAGRAM

A) Functioning of railway gate 1:



B) Functioning of railway gate 2:



VI. COMPONENTS AND MODULES

1) Arduino UNO

Arduino UNO is an open-source, hardware and software-based platform. It is an open source microcontroller based on the microchip AT mega328P.Here arduino is used for operating one side of the gate by receiving input from the ultrasonic sensors U3 and U4 as referred to in the block diagram.

2) Servo Motor

Servos are used in controlling elevators, rudders, controlling grippers. Servo are small, but they have very good size capacity. Here it is used for operating railway gates both in reverse direction and forward direction by rotating itself on its own after receiving the input from the Arduino and ESP-32 module. The key goal of servo motors is to close the railway gates, because the train approaches it, so as to forestall vehicles from crossing the road. PWM (Pulse Width Modulation) is the principle behind the servo motors.

3) Ultrasonic Sensors:

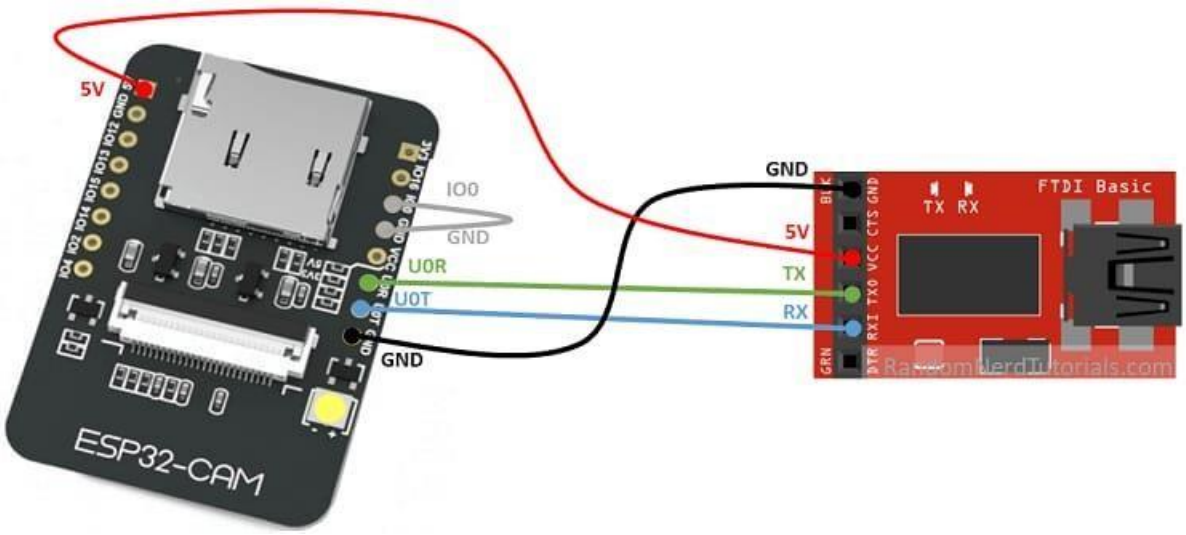
This is based on the Theory of Outline and Detection. It uses ultrasonic waves to calculate the distance between the objects. The head of the sensor emits an ultrasonic wave and absorbs the waves to detect the object. Here we uses ultrasonic sensors to detect the arrival and departure of the train and sends the signal to arduino and ESP-32 module for opening and closing of gates.

4) Camera

A camera is image capturing instruments. Here the camera is being attached with the ESP-32 module in detecting the image. If any obstacle occurs, it captures the obstacle along with ESP-32 module and sends it to the driver via web servers.

5) ESP-32 module:

It is a Wi-Fi bluetooth module that targets a wide range of applications. Here ESP-32 module is used in receiving input from ultrasonic sensors u1 and u2 and it sends signal to the servo motor to rotate in clockwise and anticlockwise direction. And also ESP-32 along with camera is used in capturing image and sending notification to the driver regarding the detected obstacle via web servers.



VII. RESULT

This results in monitoring of the obstacles in the railway and the picture of the obstacle has been sent to the driver and the driver can operate or slow down the train according to the obstacle detected. Also this results in auto opening of railway gates. The arrival of the train is detected by the ultrasonic sensor and Arduino drives the servo motor to rotate in clock and anticlockwise direction.

VIII. FUTURE ENCHANCEMENT

The Future enhancement for the railway gate automation system can be implemented by detecting the cracks in the railway track using ultrasonic sensors by measuring the distance from the track to the sensor. There will be a particular assigned value, if the distance measure is greater than the above mentioned value, then with the help of this the microcontroller detects the crack and identifies the exact location of the crack in the railway track.

IX. CONCLUSION

The automation in railway obstacle detection and warning systems involves the process of detection of obstacles in the railway track by using ultrasonic sensors. This system further automates the alert signals and image of the obstacle being captured and processed using ESP-32 module and simultaneously sends the notification to the driver via web servers which holds the information about the obstacle being detected.

REFERENCES

[1]. Pradeep Raj, "Increasing accidents in the unmanned level crossing of the railways", 2012.
[2]. Xishi Wang, Ning Bin, and Cheng Yinhang, "A new microprocessor based approach to an automatic control system.", International Symposium on Industrial Electronics, pp. 842-843, 1992.
[3]. Jeong Y., Choon-Sung Nam, Hee-JinJeong, and Dong Shin, "Train Auto Control System based on OSGi". International Conference on Advanced Communication Technology, pp.276-279, 2008.
[4]. Atul Kumar Dewangan, Meenu Gupta, and Pratibha Patel, "Automation of Railway Gate Control Using Microcontroller, International Journal of Engineering Research & Technology, pp.1-8, 2012.
[5]. Gunyoung Kim, Kyungwoo Kang, "Railway Gate Con- trol System at Railroad-Highway Grade Crossing in Korea".Acy M. Kottalil ,Abhijith S, Ajmal M M, Abhilash L.
[6]. AjithBabu., Automatic Railway Gate Control System, International Journal of Advanced Research in Electrical.
[7]. Swati Rane, MayuriPendhari, PoojaPatil, PrakashSakari, YashmithShetty, Automatic Railway Gate Control and Track switching with automated train, International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 4,April 2015 ,pp 1062-1066.
[8]. K. Vidyasagar, P. SekharBabu, R. RamPrasad, Anti Collision and Secured Level Crossing System, International Journal of Computer Applications Volume 107 ,No 3, December 2014, pp.1-4.

[9]. HninNgwe Yee Pwint, ZawMyoTun, HlaMyoTun, Automatic Railway Gate Control System Using Microcontroller, International Journal of Science, Engineering and Technology Research (IJSETR).

[10]. Karthik Krishnamurthi, Monica Bobby, Vidya V, Edwin Baby,Sensor based automatic control of railway gates, International Journal of advanced Research in Computer Engineering and Technology, vol.4,issue 2, Feb2015, pp.539-543.

[11]. Atul Kumar Dewangan, Meenu Gupta, Pratibha Patel,Automation of Railway Gate Controller using Microcontroller, International Journal of Engineering Research and Technology, 2012, pp1-8.

[12]. Saifuddin Mahmud, Ishtiaq erza Lemon,, Md.MohaiminBillah, Automatic Railway gate controlling system, International Journal of Computer trends and Technology, volume 27,no.1 september 2015, pp.1-5.

