IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 6, June 2021

DOI 10.17148/IJARCCE.2021.10656

PREVENTING LIVING BEINGS FROM TRAIN ACCIDENTS USING VIDEO SURVELLIANCE SYSTEMS

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ABSTRACT: The primary goal of this project is to discuss measures to prevent occurring of accidents on rail systems, to outline an approach for death prevention on rail systems. Based on existing literature and analysis of data obtained from the Indian railway research, it was found that most deaths occur near station platforms and near access points to the track. Most of the incidents occurred most frequently when relatively more trains were in operation and in areas of high population density. Moreover, prevention measures, such as surveillance in this pamphlet surveillance system using Analog camera are described. The surveillance system using IP camera will be used. We put forward an approach, first of its kind, to collectively address conservation of living beings by preventing their death being overrun by trains and monitoring the integrity on the rail track. It utilizes a unique method for deterring the animals and the humans using cameras on turns of the rail track. Here we use the IP camera technology for detecting them, and Web socketing, open source APIs.

KEYWORDS: Video Surveillance System, accidents & causes, Ip camera technology, living beings, esp32 AI thinker board, Web socketing, Live streaming.

INTRODUCTION:

This project presents some existing and emerging technologies, which have good potential for application to the monitoring and tracking of species on rail tracks. Here we are doing the project by using the arduino software. Our project is developed by using the C++ language.
To run this we should have two major hardware requirements

- Esp32 AI thinker Board
- Li battery.

Here we keep surveillance cams at some particular measurable distance in order to track the species. The primary goal of our project is to outline an approach to identifying, selecting and implementing. Here we use the IP camera technology for detecting them. And Web socketing, Open source APIs and lot more mechanisms are used here. Railway suicides may account for only a small percentage of deaths, but the numbers of deaths and the effects from these events are still significant.

LITERATURE SURVEY:

LORA (low range Antenna) is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology. Semtech's LORA devices and wireless radio frequency technology is a long range, low power wireless platform that has become the de facto technology for Internet of Things (IOT) networks worldwide. Here we are going to implement a surveillance based system over the tracks which are capable of live streaming over the local network up to a range by using Lora technology. This technology stands foremost in the field of forecasting and IOT. We also use web socketing to transfer the live video frames from camera to the end user. By using this the train driver can see the tracks ahead of 5KM before itself so if there is any suspicious happening on the track there is still a safe distance from the train to scene of action so the driver can take necessary action based on the scenario i.e, either to move forward or go slow or stop. In our prototype that we have built has a capacity range of about 250M and works on WIFI with LORA antenna embedded.

EXISTING SYSTEM:

Till now there are different existing systems and innovative ideas were there on railway projects. One of the

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Approaches is that Indian Railways launched 'Plan Bee' to prevent elephants getting hurt on rail tracks, thereby reducing the elephant death toll. Bee sounds can be heard from 600 metres away, as the train approaches the vulnerable gangway**.** But this solution didn't Solved the problem completely**.**
There is no Proper Surveillance Systems on tracks. Many researches are going on to save the lives, but no particular system was developed. There are some existing systems like track detection, reservation surveillance... etc. The problem with sensors is, the data from sensors is treated as a time series, where data are produced continuously or periodically, or a sequence of readings where data is generated ad hoc, for example, generated every time a train passes. The data can be monitored by searching for thresholds (triggers), known problem signatures (classification), identifying unknown events (short-term analysis using outlier detection).

DRAWBACKS OF EXISTING SYSTEM:

- The noise of buzzing bees being played over a loudspeaker will fail to deter elephants from getting near or crossing railway tracks as they will get used to it.
- The problem with Installation of Infrared sensors is, the data from sensors is treated as either a time series, where data is produced continuously or periodically.
- Loco pilot cannot notice if there is any track failure.
- Relatively expensive.

PROPOSED SYSTEM:

Here we are going to implement a surveillance based system over the tracks which are capable of live streaming over the local network up to a range of about 5-7KM by using LORA technology. This technology stands foremost in the field of forecasting and IOT. We also use web socketing to transfer the live video frames from camera to the end user. By using this the train driver can see the tracks ahead of 5KM before itself so if there is any suspicious happening on the track there is still a safe distance from the train to scene of action so the driver can take necessary action based on the scenario i.e., either to move forward or go slow or stop. In our prototype that we have built has a capacity range of about 250M and works on WIFI with LORA antenna embedded.

UNIQUENESS OF THE PRPOSED SYSTEM:

- Live streaming is continuously visible to the end user including day and night.
- Unauthorized users cannot access the video streaming

TECHNOLOGIES USED TO DEVELOP THE PROJECT:

- Operating system: Windows 7
- Coding language: C++
- IDE: Arduino Ino
- Web socketing

BENEFITS OF THE PROJECT:

- Avoid animals from being hit by trains on tracks
- Loco pilot will have view of tracks before he reaches the place where camera is available and so he will be able to notice if there was any works related to tracks are going. This also avoids most of the train accidents where trains accidentally collide at the junctions or crossing on the railway tracks
- Can notice if there was any track failure
- The size of camera is very small and cost efficient(in prototype, may vary in real world implementation)
- The cost of implementation is also low while compared to other technologies.

PROCESS MODEL:

The model that is basically being followed is the WATERFALL MODEL, which states that the phases are organized in a linear order. First of all the feasibility study is done. Once that part is over the requirement analysis and project planning begins.

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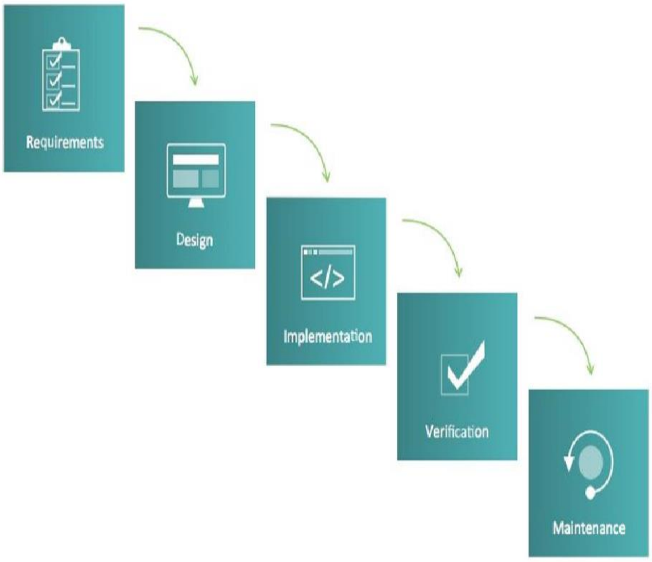
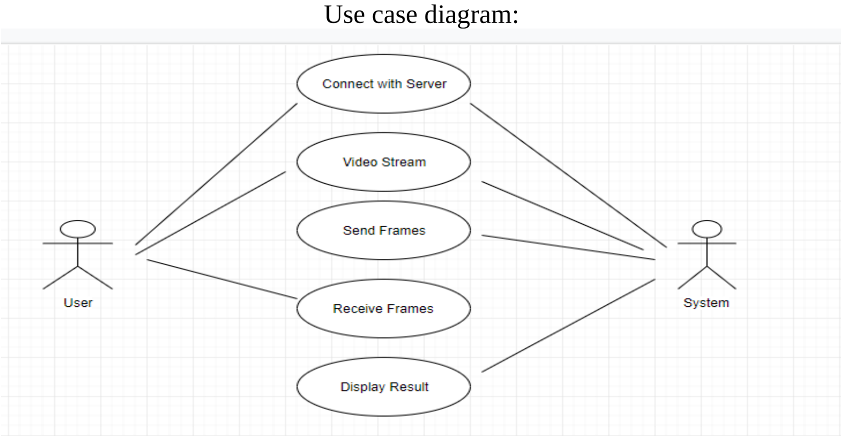
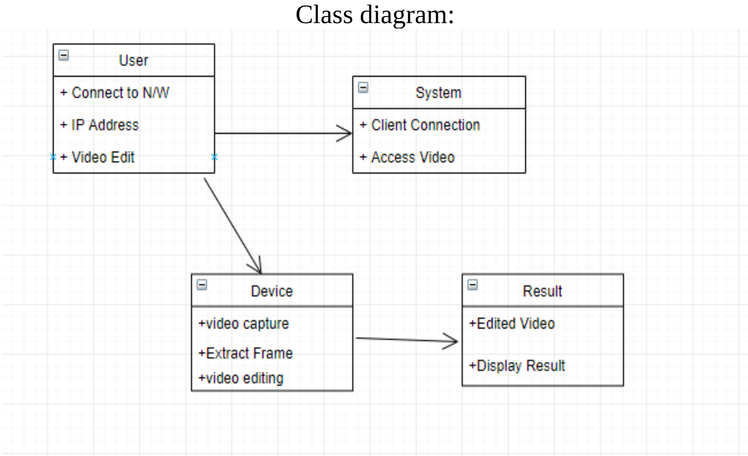


DESIGN PHASE:

Use case diagram:



Class diagram:



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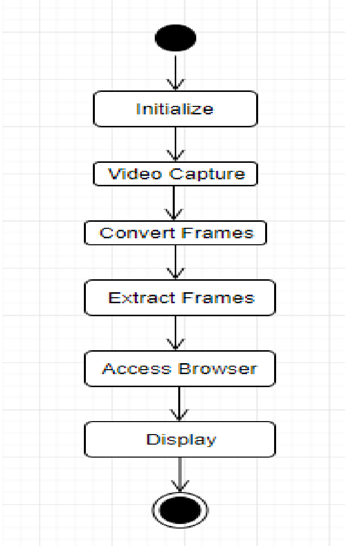
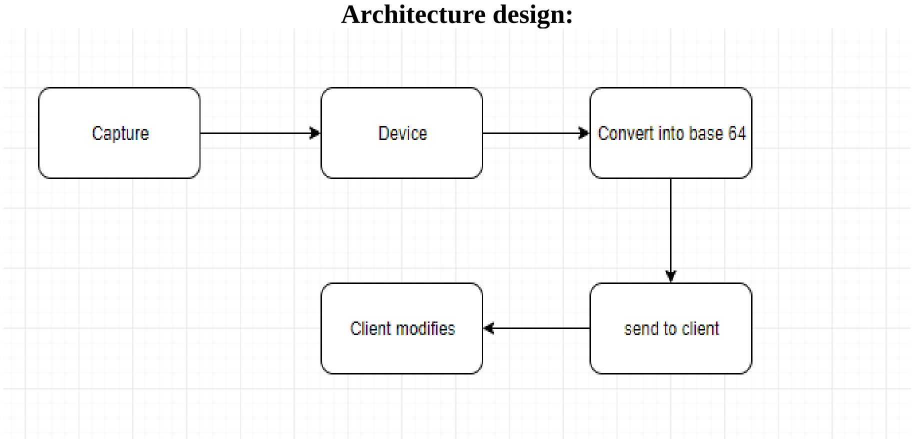
Activity diagram:



Architecture design:



Algorithmic Design:

Step-1: Start / Initialize the device and network
Step-2: Configure camera
Step-3: Setup the server mode
Step-4: Wait for client request
Step-5: Respond if client request for video
Step-6: The live video is broken into frames
Step-7: The frames are converted into base 64 Encoded format
Step-8: Base 64 Encoded string is sent to client as a response from server
Step-9: Client Modify the encoded video
Step-10: Stop.

Implementation process:

Web Socket is a computer communication Protocol providing full-duplex communication channels over a single TCP connection. The WebSocket protocol was standardized by the IETF as RFC 6455 in 2011, and the WebSocket API in EDL is being standardized by the W3C. WebSocket is distinct from HTTP. Both protocols are located at layer 7 in the OSI model and depend on TCP at layer 4. Although they are different, RFC 6455 states that WebSocket "is designed to work over HTTP ports 443 and 80 as well as to support HTTP proxies and intermediaries," thus making it compatible with HTTP.To achieve compatibility, the WebSocket handshake uses the HTTP Upgrad header[r[1]] to change from the HTTP protocol to the WebSocket protocol.

The WebSocket protocol enables interaction between a web browser (or other client application) and a web server with lower overhead than half-duplex alternatives such as HTTP polling, facilitating real-time data transfer from and to the server. This is made possible by providing a standardized way for the server to send content to the client without being

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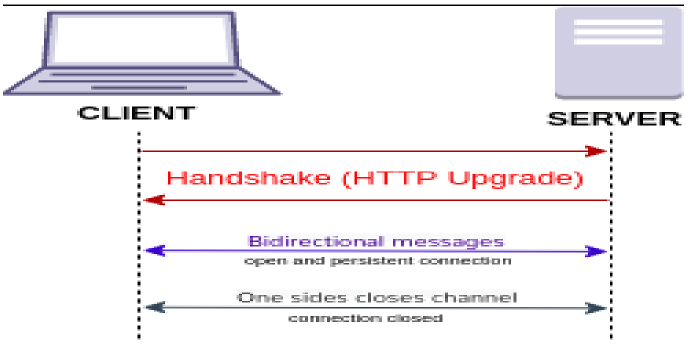
first requested by the client, and allowing messages to be passed back and forth while keeping the connection open. In this way, a two-way ongoing conversation can take place between the client and the server. The communications are usually done over TCP port number 443 (or 80 in the case of unsecured connections), which is beneficial for environments that block non-web Internet connections using a firewall. Similar two-way browser-server communications have been achieved in non-standardized ways using stopgap technologies such as Comet. Most browsers support the protocol, including GoogleChrome, Firefox, Microsoft Edge, Internet Explorer, Safari and Opera. Unlike HTTP, WebSocket provides full-duplex communication.[2][3] Additionally, WebSocket enables streams of messages on top of TCP. TCP alone deals with streams of bytes with no inherent concept of a message. Before WebSocket, port 80 full-duplex communication was attainable using Comet channels; however, Comet implementation is nontrivial, and due to the TCP handshake and HTTP header overhead, it is inefficient for small messages. The WebSocket protocol aims to solve these problems without compromising the security assumptions of the web.



ESP32 is a series of low-cost, low-power system on a chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. The ESP32 series employs a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. ESP32 is created and developed by Espress if Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using their 40 nm process.[2] It is a successor to the ESP8266 microcontroller.

Implementation steps:
Step-1: Start / Initialize the device and network
Step-2: Configure camera
Step-3: Setup the server mode
Step-4: Wait for client request
Step-5: Respond if client request for video
Step-6: The live video is broken into frames
Step-7: The frames are converted into base 64 encoded format
Step-8: Base 64 encoded string is sent to client as a response from server
Step-9: Client Modify the encoded video.

Implementation procedure:
Here first we have to open the command prompt, we have to initialize the device and network. Next we have to configure the camera and setup the server mode. Then we have to wait for the client request form server. If client sends request then the server will respond for the client request for video. Then the live video will be broken into the frames, and will be sent to the base64 format for extracting frames.

The Converted base64 encoded string is set to the client as a response from server. The client will get the frames as a video, the client modify the encoded video. The client will also be able to perform the different operations on received frames. Here we use the websocketing for implementation of this project. The esp32 is used to capture the frames.

CONCLUSION:

Accidents occurring in railway transportation systems cost a large number of lives. Many people die and several others get physical and mentally injured. Accidents are the major causes for traumatic injuries. There is certain need of advanced and robust techniques that can not only prevent these accidents but also eradicate all possibilities of their occurrence. Wireless sensor network which continuously monitors the railway track through the sensors and detect any abnormality in the track. The sensor nodes are equipped with sensors that can Show the video of the track at particular distance so the train can be stopped before it hitting anything.

The complete process is needed to be real time in nature and should meet the deadlines. Optimization of the communication protocol and real time working network with minimum delay in multi hop routing from the nodes to the

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train using a static base station is needed, so that the decision making can be done and the decision is forwarded to the train without any delay

FUTURE ENHANCEMENT:

In the future, even more data will be collected from railway infrastructure and vehicles. This inevitably leads to a requirement for the railway industry to develop standards for data collection and processing encapsulate railway data and ensure consistency for transmission and processing. Different systems and different companies can then share data using a consistent interface. As more and varied condition monitoring systems are developed, then there is a further requirement of standardization of presentation of decisions and information across these systems for consistency and to allow integration of multiple systems. Equally, many condition monitoring algorithms are "black boxes" providing little or no explanation of decisions. We also had an idea to include AI in this field which help in real time detection and alert the driver by making some sounds or alarms, and also send alerts to nearby station so that they will be able to clear the problem as soon as possible. This also can be used in the detection in track failure of the railway tracks and alert both the loco pilot and the nearby station officials.

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