SMART CITY TECH TO FIX RAILROAD CROSSING TRAFFIC: A REVIEW

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ABSTRACT-

Railroad crossings represent critical intersections where vehicular and pedestrian traffic intersect with the transportation of goods and passengers via railways. However, the management of traffic at these crossings often poses significant challenges, leading to congestion, safety concerns, and inefficiencies. This thesis explores the application of smart city technology to address these issues, proposing innovative solutions to enhance the management of railroad crossing traffic. By integrating various technological advancements such as IoT sensors, AI algorithms, and data analytics, this research aims to optimize traffic flow, improve safety measures, and enhance overall efficiency at railroad crossings within urban environments. Through a comprehensive analysis of existing challenges and the potential of smart city technologies, this thesis provides insights into the transformative impact of technology on modern transportation infrastructure.

KEYWORDS-

Direct Torque Control, Induction Motors, Transient Response, Switching Table.

1. INTRODUCTION

Railroad crossings serve as vital intersections between road and rail networks, facilitating the seamless movement of both goods and people. These crossings are crucial components of urban transportation infrastructure, linking industrial centers, residential areas, and commercial zones. However, they also present unique challenges in traffic management, safety, and operational efficiency.

Overview of Railroad Crossings: Railroad crossings, also known as level crossings or grade crossings, are points where roads intersect with railway tracks at the same level. They play a critical role in urban transportation by providing access to essential destinations, including workplaces, schools, and recreation areas. Despite their significance, railroad crossings pose inherent risks due to the potential for collisions between trains and vehicles, as well as incidents involving pedestrians and cyclists.

Challenges Associated with Traffic Management: Managing traffic at railroad crossings presents several challenges for transportation authorities and road users alike. Congestion frequently occurs as passing trains intermittently block crossing points, leading to queues of vehicles waiting for clearance. Safety hazards are prevalent, with accidents occurring due to collisions or near-misses between trains and vehicles, often exacerbated by inadequate warning systems or reckless behavior by road users.

Introduction to Smart City Technology: Smart city technology offers innovative solutions to address the challenges associated with traffic management at railroad crossings. By leveraging advanced sensors, communication networks, and data analytics, smart city initiatives aim to enhance safety, efficiency, and sustainability in urban transportation systems. These technologies enable real-time monitoring of traffic conditions, predictive analysis of congestion patterns, and adaptive control of traffic signals.

Potential Applications of Smart City Technology: Smart city technology holds immense potential for improving traffic management at railroad crossings. Integrated sensor networks can provide early detection of approaching trains, enabling proactive signaling and coordination with traffic lights to minimize delays and congestion. Furthermore, data-driven insights derived from smart city platforms facilitate evidence-based decision-making, enabling transportation authorities to prioritize investments, optimize

infrastructure, and enhance safety measures at railroad crossings.

Project Objectives

In summary, railroad crossings play a crucial role in urban transportation, but they pose significant challenges in traffic management and safety. Smart city technology offers promising solutions to address these challenges by providing real-time monitoring, predictive analysis, and adaptive control of traffic flow. By harnessing the power of data and technology, cities can enhance the efficiency, safety, and resilience of their transportation networks, ensuring seamless mobility for residents and commuters.

Safety Enhancement: Develop and deploy advanced warning systems and safety measures at railroad crossings to reduce the risk of accidents and ensure the well-being of commuters, pedestrians, and cyclists.

Congestion Reduction: Implement intelligent traffic management solutions to optimize the flow of vehicular traffic at railroad crossings, minimizing congestion and improving overall traffic efficiency.

Operational Efficiency Improvement: Upgrade existing infrastructure and signaling systems to enhance the operational efficiency of railroad crossings, reducing downtime and improving reliability.

Smart Technology Integration: Integrate sensor networks, real-time monitoring systems, and data analytics platforms to enable proactive monitoring and management of traffic conditions at railroad crossings.

Sustainability Promotion: Incorporate sustainable practices into the project design and implementation, such as energy-efficient lighting, eco-friendly materials, and reduced emissions from transportation activities.

2. LITERATURE REVIEW

1:Automatic railway gate and crossing control based sensors and microcontroller.

Author : Zuhairi mahdi

Objective: Automatic railway gate and crossing control based sensors and microcontroller.

Methodology: Al-Zuhairi,"Automatic Railway Gate and Crossing Control based Sensors and Microcontroller", International Journal of Computer Trends and Technology (IJCTT) – Volume 4, Issue 7, July 2013.

Conclusion: There are many Railways crossing which are unmanned due to lack of manpower needed to fulfill the demand. Hence many accidents occur at such crossing since there is no one to take care of the functioning of the railway gate when a train approaches the crossing..

[2] Advanced railway accident prevention system using sensor Networking

Objective: Advanced railway accident prevention system using

sensor Networking
Methodology: Advanced rail accidents prevention system using sensor networks, international journal and advanced research in computer and communication engineering.
Conclusion: this system make used of IR sensors, zigbee and embedded system which prevent accidents. This sensor makes the system more stronger and more efficient to prevent the railroad accident.
[3] Pop, Alexandru; Stan, Ovidiu "Control a 6DOF Anthropomorphic Robotic Structure with Computer Vision as MEMS Input"

[3[: To avoid the human error that could occur during operation of gate.
Author: Karthik krishna murthy monica bobby, vidya v, Edwin baby
Objective: To avoid the human error that could occur during

operation of gate sensors is being used. Methodology = international journal of advanced research in computer engineering and technology (IJARCET) volume-4, Issue-2, Feb. 20015.
Conclusion: reducing human involvement for closing and opening the railway gate which avoids cars and human from crossing railway tracks. Hence, automating the gate can bring about a ring of surety to controlling the gate.

:Smart railway gate system using internet of things.
Author: Vishwanatha CR, Vidyashree PV Sujit Kumar
Objective: He research on Smart railway gate system using internet of things.
Methodology: Smart railway gate system using internet of things (IOT) research in international journal of advance research in computer. Engineering and technology (IJARCET) volume-4, Issue-3, March 2018.
Conclusion: Automation of crossing gate make easy and secure to control the gate in order to avoid accidents and save time of the road users.

[4] Vishal Kumar,Qiang Wang "Computer vision based object grasping 6DoF robotic arm using picamera"
In this paper present our experience with 6 DOF articulated robotic manipulator and 3D vision systems. We developed a robotic arm which can perform multifunctional tasks with the help of computer vision. It performs some different functions by focusing all axes of the manipulator to a desired objects and unload at a desired location.
[5] Andhare, Pratiksha; Rawat, Sayali "Pick and place industrial robot controller with computer vision"
Most of the methods of visual grasping of objects are using technique of camera mounted on a robot. In this work, camera is mounted not on robot, but independently above the area of interest. For that purpose, there is need to convert camera coordinate into world co-ordinate. While performing this transformation, projective geometry and properties of 2D transformation such as scaling, rotation, translation plays an important role.

[6] MuhammedJabir.N. K1, Neetha John2, MuhammedFayas, Midhun Mohan4, Mithun Sajeev5, Safwan.C.N"Wireless Control of Pick and Place Robotic Arm Using an Android Application"
In this work they made a Pick and place robot controlled by an Android application. they know that the whole the digital devices in the world are transformed in to Android OS based systems, as it is more versatile, flexible and easy to control and it is an open source software. Here The Pick and place robot is controlled wirelessly by an Android application called Blue control through a blue tooth module. The Android OS as well as Arduino software are open-source soft wares. The main feature of this pick and place robot is the soft catching arm or soft catching Gripper. They know that when handling the explosive items like bomb it should be handled carefully. Excessive pressure will cause explosion. Suit is very essential to have a soft catching arm. This robot has microcontroller based electrical pressure sensor which has higher sensitivity than mechanical pressure sensors.

3 METHODOLOGY

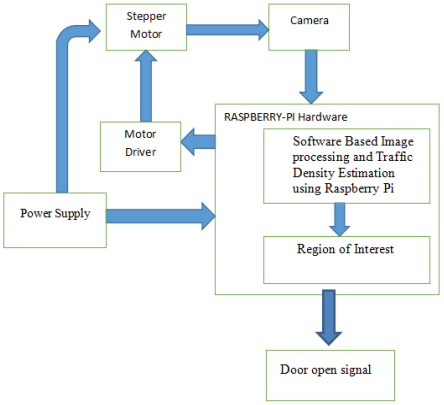

Figure 1 System General Block diagram

We are going to monitor traffic at railway crossing and have tried to eliminate it.

We will use camera for the image capturing.

We select the spot where camera going to fix.

After installing camera we will define the area from where we want to eliminate vehicles.

That area is called region of interest (ROI). This area is on both side of the track. Our main objective is to detect vehicles on ROI after red light signal at crossing.

If there any vehicle on ROI area after the red light then an audio will play to notify them that they are on wrong side and please move your vehicles backward and make that area clear for the other side of vehicles.

After an audio signal if vehicles remains at their initial place then boom barrier (railway crossing gate) will remain closed and red light signal will be continue to glow.

4. CONCLUSION

Traffic volume distribution and congestion are similar with the theoretical principle. Traffic volume has the morning and evening peak period for almost all approaches on the four intersections or junctions. Similarly, traffic congestion during morning and evening peak period are congested and during

midday it is relatively uncongested.so our system solves and is real to consider the situation in real time.

Raspberry pi is a mini computer which is in our system used as microcontroller to

Allocate specific time period of the traffic flag.

Control the stepper moto

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. Image processing has three phases i.e. Image acquisition (pre-processing), Image processing (image enhancement and display) and information extraction.

- There are different image processing tools and environments like MATLAB and Open CV. To implement our proposed system we choose Open CV due to
  - Faster in competition
  - Low system resources i.e. low RAM usage
  - Cost free(free software)

The main purpose or objective of this project was to solve the current traffic load problem and in terms of achieving the specific objective

- Interfacing a web camera with and controlling stepper motor using RASPBERRY-PI was successful.

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