On Board Railway Assistant with Emergency Drone Support

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***Abstract*—Railway systems are the lifeline of India. Railways are the most used method of public transportation after local bus systems. More than a million people travel everyday using the train services. Many accidents can be avoided by just identifying the problems through data like signal failure. If any sort of accident takes place, then this data can be used for further analysis of the cause of the accident. The Centralized server will also store the data and if any situation occurs where data is not received or train is in trouble, message can be sent to the nearest inspection drone team to send a drone and clear the image of trouble caused for further actions.**

***Keywords*- Railway assistance, accident prevention, accident diagnostics, data processing, communication**

I. INTRODUCTION

Railway systems are one of the most used method of transport, by more than half of the population of India. Railways are the most used method of public transportation after local bus systems. More than a million people travel everyday using the train services. Due to this reason, if the train gets involved in any type of accident, the loss of life will be very high. Hence it becomes an important aspect of the travel industry and also of the railway administration to ensure the proper safety of the passengers on the train as well as the safety of the operating crew and other staff of the train, such as assistants, co-pilots etc. There are a very few systems that exist today that guarantee the full safety of the railway passengers and staff as well as other aspects like the area and environment around the rail-tracks. Safety is a very important concern in case of rail-way transit or any other type of transit services for that matter. The safety of these people can be ensured if a system which is capable of assessing the environmental factors and accordingly detect any problem or discrepancy accurately and inform or alert the railway authorities about any incident/mishap that might take place with a high level of accuracy. Such systems can be very useful to railway authorities and other disaster management organizations for anticipating any kind of mishap and also can give them an insight to what they must prepare and how they must prepare at the time of the mishap or when a future incident that may cause damage to the train and its surrounding might be detected. These systems are designed with sensors and other electronic components which are highly accurate and give the most accurate data about the environment the train travels through such as the outside temperature or the amount of fog in the environment the train is travelling through.

[1]These systems can also detect the speed of the train and alert the loco pilot/driver if the train has exceeded its speed limit or if the train is going below the devised speed limit, which if ignored by the loco pilot , can cause serious amount of damage. Drones can also be integrated into the system as well.. Drones can be used as a way of assessing a situation in case of any hazard or any accident may occur or if any accident has occurred already

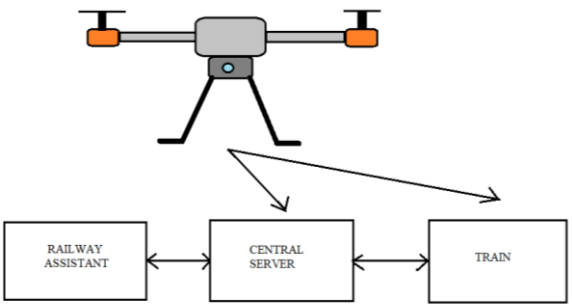
II. BACKGROUND

[1]The main elements of this system are the railway Assistant, a central server and surveillance UAVs. The railway assistant is placed in the locomotive i.e the drivers cabin in the train. This assistant has various sensors attached to it which are responsible for collecting various type of data such as environmental data like the amount of fog in the area in which the train is currently travelling through. Fog is a direct result of a lower temperature and a high amount of humidity in the surrounding air. Fog can be quite hazardous for the train pilot and the passengers as the visibility of the pilot is severely compromised which can lead to the train crashing into foreign objects or can cause the entire train to derail. To help the train driver to detect any foreign obstacles that may appear in front of the track, a set of ultrasonic sensors are used to detect these foreign objects. These objects can range from small debris like uprooted plants or hanging branches to large obstacles like elephants crossing the rail track or humans crossing the rail tracks or other trains which can enter into the path of any other train which can cause serious damage if they both collide. An ultrasonic sensor is also attached to the behind of the train, which will help detect any obstacle behind the train, as it can also collide with the train and cause serious damage. This kind of obstacle is usually another train or any sort vehicle that may enter into the tracks. A speed measurement sensor is also used to measure the speed of the train, and the assistant also gives appropriate alerts to the locomotive pilot, based on the speed sensor's reading,

if the train is moving too fast or too slow i.e beyond or below its prescribed speed limits. Systems which are already in use are fully compatible with the assistant to provide accurate data and assistance.

The central server is the heart of the system, as it is the main communication medium between the railway assistant and the UAV & its pilot. [1]The server is mostly used to process the data. This data usually comes from the assistant's various sensors which are spread all throughout the railway system. The data from the assistant's sensors is sent using a GSM module. The main advantage of using a GSM module is the amount of coverage and range it can offer, without using any form of repeaters. The server processes the received data and subsequently stores it. The copy of this data is also stored in the assistant's memory storage, which in fact acts as a black box for the train. The processed data is then analyzed further, and if any abnormal reading is detected or if the assistant has generated any alerts, based on the sensor's readings, then these reading or alerts are sent to the UAV's pilot. Based on these readings, the pilot can decide whether to assess the situation and take further action. If there is any emergency or discrepancy on the train, the pilot can then send the drone or the UAV to assess the train's situations.

III. DRONE SUPPORT WITH RAILWAY ASSISTANT



Drone provides surveillance and monitoring on regular deployment. It can hover over certain preplanned areas with the help of surveillance points provided through software. It checks for efficient working of railways and its routes. If any emergency alert is generated by either railways assistant or by central server a drone is deployed for both additional information and emergency support. A two way communication can be done through drone if communication loss has happened in between central control room and the loco-pilot. A visual surveillance is available with the help of drone. The communication link has limitations over the range hence long distance surveillance is also possible.

IV. CONCLUSION

This paper shows how an intricate system was designed which was aimed to provide full autonomous assistance to the train driver/pilot. This system was designed using various set of sensors. These set of sensors worked in co-ordination with each other to make a system which will provide appropriate alerts to the train pilot in case of any unexpected emergency or any discrepancy. Any obstacles that interfered in the train's path, like animals and other debris were detected and an appropriate alert was given to the train pilot, and accordingly, an action was taken, based on the situation.

The surveillance drone detected any discrepancies or any obstacles beforehand, i.e before the train departed from its depot or the train station. Routine monitoring of rail tracks through drone helped in prevention of accidents. Each and every activity of the assistant and drone system was tracked and recorded to create a local database and help for future analysis.

REFERENCES

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