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ATC railway intelligent network system

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Abstract: This paper introduces application examples of information technology as it is applied in several fields of the railway system, namely transportation and safety, service, maintenance and the Internet. This paper shows that safety, efficiency and convenience have been improved in the areas of railway use, operations and maintenance Traditionally, equipment used by railways have been grouped in vital and non-vital equipment. Vital equipment shall work in a fail-safe way. Interlocking and level crossing units are examples of vital equipment, and the train dispatching panel is an example of non-vital equipment. These factors are related to the introduction of new technologies and equipment, the design of interoperable railway networks in Europe, and the new strong competition in the market of railway products. This paper presents LIVE (Low-Intrusion Validation Environment), the validation environment developed at ANSALDO CRIS to experimentally evaluate the dependability of the new families of computer-based railway control systems. It is obvious that ATC system which focuses on adjusting train movements has a really high priority. Safe and comfort travels, improving speed characteristics and also reduction of crashes which occur due to human mistakes are some of considerable merits of ATC systems. In this paper during introducing ATC systems, some of disadvantages of traditional ATC system and also ATC system developments will be assessed. Finally an intelligent algorithm for train automatic control system will be introduced which is in accordance with the future indexes of ATC system

KEYWORDS: Technology, Interlocking, Automatic Control, ATC System

1. Introduction

The first transportation system between the towns of Liverpool and Manchester Railway in 1830 England prop. After that the signaling system to increase security and perform ancerail And also raise the possibility of rail traffic, and technology emerge with the advancement of communication technology ad Waspromoted to electronics.In1841 ad, the elementary signaling system at both ends of a tunnel Was used and aims to prevent the entry of two trains into the tunnel. In fact this system beginning of fixed block signaling system to prevent trains from collisions with each other. Its first train along the track could as distinguishing the position in 1872 was invented. In 1921, Japan implemented various experiments to better control the movement since of trains out. Accordingly, the first warning equipment cabin, the

father or automatic train supervision system to account for in 1954 on the YAMA note Line and Tohoku was installed. In (ATS) 1962 following the fatal accidents that occurred in Japan line [1]. Automatic braking capability earlier (which only had the ability to alert the operator) was added the emergence of automatic train control system and use the old system Three decades there has solved many problems and signaling systems. But as Mentioned before, Increased growing demand in the field of public transport, especially transport rail (due to the unique characteristics of the system, including passenger easy to live and safety compared and with Other public transport system and also

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has various strengths such as reducing consumption energy, reduce pollution, reducing noise and pollution) And also the need to control the world today Onto the train, rail transport systems effective operation, reducing travel time and reach the other To quickly out of its traditional mold ATC features a modern.transport,causedthe system Digital processing, radio, communication [2]

2. Method work ATC

Generally, ATC includes devices and equipment with the cab driver. The signal generator is a device with the carrier wave signal ATC and wave through the rail carrier wave signal is produced. (ATC) signal proportional.tothe current circumstances by the combination of relay circuits selected and then sent by the transmitter through protection rails. As soon reducing the speed of the train, the brakes are released so speed train steadily declared will not exceed the permissible speed [3]

3. Genesis connection system from cabin warning system to AT:

Using the cabin warning system continued until the creation of massive traumatic at the station and Mica (Horn of to horn train collided in 1962) was decided that the all national railway lines in Japan to be equipped with a system of ATC automatically fails [3]

4. Automatic train stop (ATS)

The drive must always obey the signal, but the possibility of human error can cause serious accidents. Two rail accidents with serious loss of life in the early 1960 resulted in the installation of the so called automatic train stop (ATC) system throughout japan. In the ATS system, an alarm sounds in the cab when the train approaches a stop signal, warning the driver to stops. The train automatically (figure1 shows the operation of the ATS system used by the JRS). The ATS system uses ground coils installed on the track some distance before signals.if a train passes a coil when the signal aspect is stop, an alarm is sent immediately to the driver, regardless of the train speed. If the driver is not stop within 5 seconds after the alarm is received, the emergency brakes are applied automatically to stop the train.in other words, the emergency brakes are applied automatically to stop the train. In other words, the emergency brakes are not applied if the driver applies the brakes and presses the button. however, this means that if the driver stops at the ground coil, the train can still proceed under his control through a stop signal.so called absolute stop ground coils that do not depend on driver acknowledgement are installed in stations and at start signals to prevent any possibility of an accident occurring due to the driver moving ahead by mistake [3]

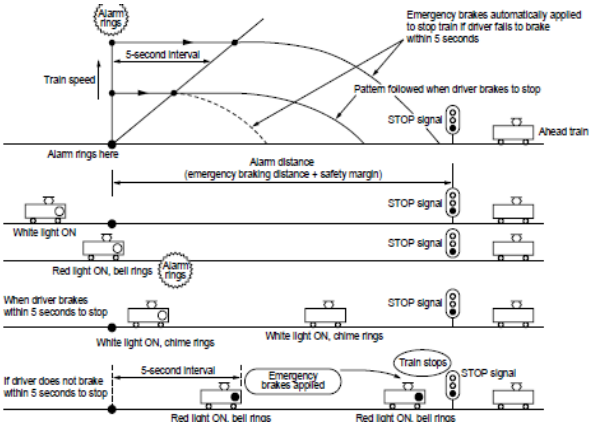

Figure1: Operation of ATS-p system

Anew ATC-p type of system that is not depends on driver acknowledgement has been installed recently, mostly in the Tokyo and OSAKA regions. Ground coils communicate between the grand and the trains (fig 2) and train braking patterns ensure that the trains stop before stop signal. If a train exceeds the speed permitted by the braking patter n, the service brakes are applied automatically to stop the train. The train can then proceed again, but only in accordance with instructions received form the next coil. This system offers higher safety levels, because it is not depend on driver accept acknowledgement .private railways in JAPAN have levels, because is not depend on driver accept .private railways in japan have installed throughout most of their networks. This capability and, since it can apply train brakes automatically, is not depend on driver acceptgement.in an intermittent control system using coils ,no information is received before the train passes the coil, meaning that signal changes in heavily used sections do not provide a suitable level of compliance. To reduction this problem, the railways have installed a continuous control ATS system for some track sections. This system uses an audio frequency (AF) current to transmit at related information along the track circuit, making it possible to receive information on board the train at any time. This system offers similar ad vantages to the ATC system described below [3]

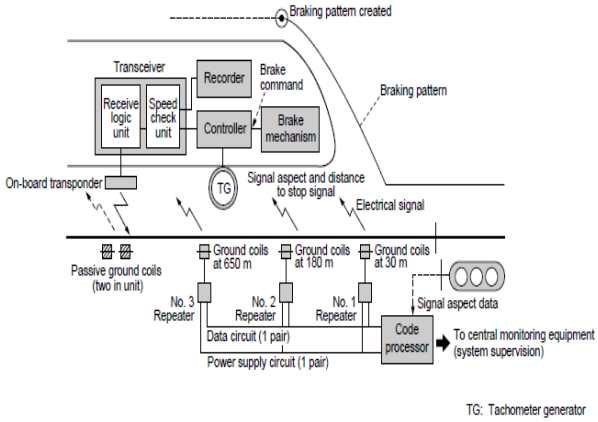

Figure2: Operation of ATS-s system

5.TypesATC

Normal line ATCThisfeature is theabilitto ensurethe perfor mance Ordinary lines with garlic andmovement ATCEven with alot of features neededto controltraffic is heavyAnothe rcharacteristicofofthesystemASYNCHRONOUS, DSB Supply to generate signals atcUsing a network-independent power supply is overhead.[3]

5.1. The high-speed train attack

In these systems, overhead network feeding Haytvst signal is created that System SYNCHRONIZED, SSB System SupplyCall. It flows against the interference caused by the Rolling stock is great resistance. In some lines, atc system is the frequency, ie the frequency of a signal combination unit is to increase the reliability of creation.[3]

6.Garlic and move autonomously ,the future for the system

With progress in telecommunication systems and information transfer, and the ability to travel autonomously trains Safe motion according the data path (in the data base system) there. Particularly System installed on the train, the train's position is clear and management. On the other hand, the fashion Intended to stop the train the side of line in the by the system. As a result of train control system speed this company profile by repeated calculations (based on information) that can It is a safe travel. However, with the increased capacity information along the line between the equipment and Improving control systems installed in trains and also bowed to the system and algorithm skills-Intelligent control of the train, with the need to implement is gradually fading. This self-paced To effectively reduces the cost of the entire system (including construction costs and the cost By technical repair service) and improve accessibility system. Therefore, the direction of the world system the more intelligent automatic control system installed on the train to train and Decision-making is decentralized but coordinated between them. These trends in research in other countries [4]

7. Intelligent control a non-the focus Train

Depending on what types of automatic train control system was provided and consider to move This technology to side, PA train journey, at the end of this paper is to introduce anModern and an efficient system of automatic control theory paid which can be used as an option in Automatic discuss the country's transportation system more to seriously study and examined. This system is based on the theory of multi-agent systems have been set up addition to the advantages of a Modern control system also takes advantage of multi-agent systems. Multi-Agent Systems or operating system consists of several subsystems that are smart agents based on The algorithm specified in advance and do a job without human intervention Based on the theory of multi-agent systems, the idea of an algorithm, called algorithm ATC systems that the AS-tail collision between agents of a multi-agent system began its discussion, Depending on what types of automatic train control system was provided and consider to move This technology to side, PA train journey, at the end of this paper is to introduce an Modern and an efficient system of automatic control theory paid which can be used as an option in Automatic discuss the country's transportation system more seriously study and examined. This system is based on the theory multi-agent systems have been set up addition to the advantages of a Modern control system also takes the benefits of multi-agent systems. Multi-Agent Systems or operating system consists of several subsystems that are smart agents based on the algorithm specified in advance and do a job without human intervention. Based on the theory of multi-agent systems, the idea of an algorithm, called algorithm ATC systems that the AS-tail collision between agents of a multi-agent system began its discussion [3]

8. The algorithm presented in a particular case

Here, for simplicity and without the whole issue go away, three trains in between two Station considered to be. As the three train stations and start moving source destination station are stopped after another. As is clear in practice always this number is equivalent to adding more trains middle. As the trains are fitted separately for each ID-ATC control can be seen, after receiving required information (including position and speed the train control and the front and rear of the train) and using an algorithm designed to do a good (including: The braking, traction and constant velocity) will bring about the technical details required in each case for the train Specifies The model simulations were carried out for each train, the motor resistance (using The relation Davis) and arc resistances lope and internal feedback path is applied to the system -Using the ID-ATC will train speed and position feedback, information required controller And controlled by signals received from Balys (similar to Fig. 3) is provided. Performance of the algorithms to recognize that such a procedure is _ tried every train in the distance -Equal from both the front and back of your neighbor, no collision between trains are also available Reliably realization.

Figure3: the parameters required to run the algorithm the algorithm can be provided as follows.

Step 0.Get information about the dynamics of the train, braking and quality.
Step 1. Get information from sensors.
Step 2. Calculation of resisting forces and the forces of motion dependent on slope.
Step 3. Determine the speed and position control of trains and train its front and back.
Step 4. Select the appropriate work area (brakes, traction or fixed speed).
Step 5. send a signal to the brake and traction.
Step 6. Return to step [4]

9. Conclusions:

And undeniable important the role in the prevention of (ATC) The automatic train control systems the impact and incidence of accidents and traffic control systems for rail transport play. Therefore, according to Development of rail transport and increase the volume of traffic demand in the industry, especially in Iran, Automatic control systems with high flexibility and strong and secure more than ever felt. Of the ATC in developed countries this respect, according to the history, growth and promotion systems Japan could guide future needs such as rail transportation system and will open the future direction research and investment in the this field. In this paper, after reviewing the generations In (I D-ATC) ATC smart a non Mt- Center in Japan, the system of the ATC system was introduced to provide a solution for a problem that can autonomously navigate the course and future systems take effect. The final section of this paper, the basic the idea of this method is based on research ATC has been was provided at the School of Railway Engineering.

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