

LITERATURE SURVEY

ON

INTERNET of THINGS(IoT)

BATCH : B11-5A1E

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P A P E R	TITLE	AUTHOR & YEAR	KEY WORD	FINDINGS/PROCS/CONS
1	IOT Multitaskin: Design of Smart phone application for systematic execution and scheduling in real time environment	Shaik Asif Hussain, Shekar Ramaiah, J Chinna Babu, M. N. Giri Prasad. & 2019	Task conflicts; Railways Smart phone.	Scheduling plays a vital role in real time embedded systems to prepare a schedule dynamically and share resources effectively. The scheduling algorithms involve priorities in mixed fashion depending on hard and soft deadlines. Real time scheduling systems basically depends on logical computation and time of the results produced. Multitasking involves parallel execution of request and response based on the scheduling algorithm. It brings automation in many areas with reference to performance parameters like reliability and sensitivity. The major use of scheduling is Effective utilization of resources and avoiding task conflicts. In the proposed work the concept of Scheduling in real time systems is applied in transportation system application for efficient service and effective utilization of resources. One of the

				<p>best transportation system in the world is railways, however in present days this transport service is under pressure due to mismanagement of operations resulting in customer complaints and long waiting list of passengers. The proposed system is used to accommodate the passengers based on the request and resource availability. In this work Internet of Things based smart phone application system is designed to introduce automation in addressing the emergency service to the passenger requests in the moving train. The proposed system consists of raspberry pi as a server for maintaining the database and provides wireless communication between the passenger and the ticket collector of train. The aim of this work is to help passengers to have safe and comfortable journey in the train. The user interface designed in each compartment is used to send the request from the passenger to the train employee for allocating the seat in the train in emergency situations. On the request received from the passenger the response is given depending on the resource list loaded in the server. The fair distribution of the seat to the passengers is scheduled using composite scheduling for multitask algorithm based on database resource list. The algorithm defines the task priority as its own unique priority level for every task and assign the same priority to the multiple tasks if more number of tasks are introduced in scheduling then they are either time sliced or work round robin fashion. The results obtained in the proposed work justify the performance parameters in real time for the algorithm used.</p>
2	Failure management strategies for	Francesca Righetti, Carlo	Smart Station,	<p>Railways monitoring and control are currently performed by different heterogeneous vertical systems working in isolation without or with</p>

	IoT-based railways systems	Vallati, Giuseppe Anastasi Giulio Masetti, Felicita Di Giandomenico. & 2020	Smart City, added value services, failure recovery strategies	limited cooperation among them. Such configuration, widely adopted in practical deployments today, is in contrast with the integrated vision of systems that are at the foundation of the smart-city concept. In order to overcome the current fractured ecosystem that monitors and controls railways functionalities, the adoption of a novel integrated approach is mandatory to create an all-in-one railway system. To this aim, new IoT-based communication technologies, like wireless or Power Line Communication technologies, are considered the main enablers to integrate in a very rapid and easy manner existing vertical systems. In this work, we analyse the architecture of future railways systems based on a mix of wireless and Power Line Communication technologies. In our analysis, we aim at studying possible failure management strategies on rail-road switches to improve the level of reliability, crucial requirement for systems that demand maximum resiliency as they manage a critical function of the infrastructure. In particular, we propose a set of solutions aimed at detecting and handling network and sensor failures to ensure continuity in the execution of the basic control functions. The proposed approach is evaluated by means of simulations and demonstrated to be effective in ensuring a good level of performance even when failures occur.
3	Towards the Internet of Smart Trains: A Review on Industrial IoT-	Paula Fraga-Lamas , Tiago M. Fernández-Caramés	IoT; IIoT; internet of trains; railway safety; rail planning	Nowadays, the railway industry is in a position where it is able to exploit the opportunities created by the IIoT (Industrial Internet of Things) and enabling communication technologies under the paradigm of Internet of Trains. This review details the evolution of communication

	Connected Railways	and Luis Castedo & 2017	and schedule -ing; predictive maintenance; WSN; railway enhanced services; freight transportation; cyber security	technologies since the deployment of GSM-R, describing the main alternatives and how railway requirements, specifications and recommendations have evolved over time. The advantages of the latest generation of broadband communication systems and the emergence of Wireless Sensor Networks for the railway environment are also explained together with the strategic roadmap to ensure a smooth migration from GSM-R. Furthermore, this survey focuses on providing a holistic approach, identifying scenarios and architectures where railways could leverage better commercial IIoT capabilities. After reviewing the main industrial developments, short and medium-term IIoT-enabled services for smart railways are evaluated. Then, it is analyzed the latest research on predictive maintenance, smart infrastructure, advanced monitoring of assets, video surveillance systems, railway operations, Passenger and Freight Information Systems (PIS/FIS), train control systems, safety assurance, signaling systems, cyber security and energy efficiency Overall it can be stated that the aim of this article is to provide a detailed examination of the state-of-the-art of different technologies and services that will revolutionize the railway industry and will allow for confronting today challenges.
4	Research on Music Wireless Control Based on Motion Tracking Sensor and Internet of Things	NA PAN & 2021	Wireless music control, Internet of Things, motion tracking, sensors,	With the continuous development of society and rapid economic growth, intelligent music control technology has received more and more attention. At the same time, real-time motion tracking technology has also been developed more and more in the fields of virtual reality and human-machine control. This article is dedicated to developing a wireless music control system based on gesture tracking sensors. First, in the data

			particle swarm algorithm	collection part, an infrared sensor module based on the Internet of Things is used to automatically detect whether someone is approaching. When detecting that someone is approaching, the motion tracking sensor module captures and detects gestures and counts them through a counter. Then, the IoT data transmission module sends the acquired gesture information from the sending end to the receiving end. Finally, the particle swarm algorithm performs algorithmic intelligent processing and judgment on the transmitted data to realize wireless control of background music. After software and hardware debugging, a wireless music control model based on motion tracking was finally successfully established. The system has undergone a complete test, and the test results show that the system has strong stability. Users can easily control music equipment and achieve high accuracy of music control information.
5	Securing Digital Ledger Technologies-Enabled IoT Devices: Taxonomy, Challenges, and Solutions	ANASTASIOS N. BIKOS 1, SATHISH A. P. KUMAR & 2022	Blockchain, decentralized, IoT, IOTA, direct acyclic graph (DAG), Tangle, cybersecurity, privacy, confidentiality.	With the faster maturity and stability of digitization, connectivity and edge technologies, the number of the Internet of Things (IoT) devices and sensors is flourishing fast in important junctions such as homes, hotels, hospitals, retail stores, manufacturing floors, railway stations, airports, oil wells, warehouses, etc. However, in this extremely connected world, the security implications for IoT devices are getting worse with the constant rise in malicious cyberattacks. The challenge is how to secure IoT sensors, services and data. The blockchain technology, a prominent distributed ledger technology (DLT), is being pronounced as the way forward for safeguarding IoT devices and data. The Directed Acyclic Graph (DAG)-based DLT

				<p>has the inherent potential to realize the benefits of blockchain with better performance. IOTA is a DAG-based blockchain implementation for the IoT era. The Tangle, the IOTA's network immutably records the exchange of data and value. It ensures that the information is trustworthy and cannot be tampered with nor destroyed. In this work, we depict a thorough analysis of the existing security studies for IOTA. Then, we identify the gaps and the limitations of these security solution schemes, and finally, propose future security research recommendations that can potentially fill these gaps to secure DLT-enabled IoT devices.</p>
6	Research on Adaptive Iterative Learning Control of Air Pressure in Railway Tunnel With IOTs Data	YINJUN ZHANG 1,2, JIANHUA SU1 , MENGJI CHEN & 2020	Train in tunnel, pressure fluctuat-ion, Internet of Things, adaptive iterative learning control.	<p>When a train enters a tunnel, the passengers in the train will feel tinnitus. The main reason is that the pressure in the tunnel enters the vehicle through the adjusting system of the train, which will cause discomfort to the passengers. In this paper, according to the quasi-periodicity and repeatability of mass data in the process of train running in tunnels, a control method based on the IOTs big data is proposed, and an adaptive iterative learning control algorithm based on the IOTs big data is established. The fan operation frequency of ventilation system is regulated by adaptive iterative learning control algorithm, and can adjust the new air and exhaust gas of the ventilation system in real time to restrain the pressure fluctuation in the train. Finally, the simulation results show that the adaptive iterative learning control algorithm based on the Internet of Things can significantly reduce the amplitude of pressure fluctuation in the tunnel and the change rate of the ventilator, and improve the passenger comfort program. Moreover, the real-time measured data also</p>

				show that the proposed closed-loop adaptive iterative learning control algorithm based on the Internet of Things is obviously superior to active control.
7	Internet of things for high speed railways.	Guidong Zhong. Ke Xiong. Zhangdui Zhong. Bo Ai & 2021	Internet of things, High speed railway, High speed train, Intelligent high-speed railway.	As a new generation of application infrastructure and strategic emerging technologies, the internet of things is an inevitable trend to be integrated into the rapid development of high-speed railways (HSR). This article first introduces the concept and key technologies of the HSR IoT, and then analyzes the HSR's requirements for the IoTs. Based on these concepts, a system architecture of the HSR IoT is proposed to expand the in-depth applications of IoT in various fields of the HSR industry. Finally, future development trends of the HSR IoT are discussed. This article is expected to provide some useful insights into the study and evolution of HSR IoT.
8	3D-LIDAR Based Object Detection and Tracking on the Edge of IoT for Railway Level Crossing.	CRISTIAN WISULTS CHEW, GABRIEL MUJICA, JOSE MANUEL LANZA-GUTIERREZ, JORGE PORTILA. & 2021	Edge computing, embedded software, energy efficiency, Internet of Things, LIDAR, object detection, object tracking, railway level crossing, sensor systems	Object detection is an essential technology for surveillance systems, particularly in areas with a high risk of accidents such as railway level crossings. To prevent future collisions, the system must detect and track any object that passes through the monitored area with high accuracy, and this process must be performed fulfilling real-time specifications. In this work, an edge IoT HW platform implementation capable of detecting and tracking objects in a railway level crossing scenario is proposed. The response of the system has to be calculated and sent from the proposed IoT platform to the train, so as to trigger a warning action to avoid a possible collision. The system uses a low-resolution 3D 16-channel LIDAR as a sensor that provides an accurate point cloud map with a large amount of data. The element used to

			and applicati- -ons.	process the information is a custom embedded edge platform with low computing resources and low-power consumption. This processing element is located as close as possible to the sensor, where data is generated to improve latency, privacy, and avoid bandwidth limitations, compared to performing processing in the cloud. Additionally, lightweight object detection and tracking algorithm is proposed in this work to process a large amount of information provided by the LIDAR, allowing to reach real-time speciation's. The proposed method is validated quantitatively by carrying out implementation on a car road, emulating a railway level crossing.
9	Internet of Things in the Railway Domain: Edge Sensing System Based on Solid-State LIDAR and Fuzzy Clustering for Virtual Coupling	GABRIEL MUJICA, JAVIER HENCHE, JORGE PORTILA & 2021	Edge nodes, Internet of Things, LIDAR sensing, railway applicat-ion, wireless sensor networks.	Recent advances in wireless communication, sensing and processing technologies are fostering novel research and innovation opportunities in areas such as Industry 4.0, Smart Cities and Intelligent Transportation Systems. In particular, the railway domain is envisioned to have important breakthroughs in terms of cost-ef_ciciency, self-management, and reliability in the operation of the rolling stocks and infrastructures. Some of these key objectives are been addressed by the concept of Railway Virtual Coupling, which is a promising solution where the capacity of the tracks is highly improved by means of reducing the distance between adjacent trains, and the physical connection between train's compositions, through accurate Vehicle-to-Vehicle communication systems. In this work a new approach towards supporting the information dynamically exchanged by the trains is proposed, with the design and implementation of a Solid-State LIDAR based sensing system to provide an accurate, robust and low-latency on-board distance

				<p>detection system between trains. The combination of a long-range distance sensor, an Internet of Things edge hardware platform and a fuzzy clustering approach for distance detection of the object of interest allows obtaining very accurate results to support the virtual coupling maneuvers. The system implementation has been tested in a real railway scenario, where several coupling and distance detection maneuvers have been performed to verify the operation of the proposed system in an actual application context. This represents one of the first dedicated distance detection tests of this kind under real dynamic conditions documented in the literature towards railway virtual coupling.</p>
10	A Secure Railway Crossing System Using IoT	<p>E.Amarnath Reddy, Ilaiah Kavati, K Srinivas Rao, G Kiran Kumar</p> <p>&</p> <p>2017</p>	<p>Railway Gate, Internet of Things, Railway Crossing, Micro Controller, Arduino, Sensors.</p>	<p>The aim of this paper is to develop a prototype that control the railway gate using the micro-controller. Whenever train touches base at the sensor, caution is activated at the railway crossing so that the general population get instruction that entryway will be shut. At that point the control module initiates and shuts the gates on either side of the track. Once the train crosses, this module naturally lifts the gate. For mechanical operation of a gate DC adapted engines are utilized. We are utilizing an installed controller worked around the 8051 family (AT89C52) for the control. As per the instructions produced at the microcontroller, the proper action (i.e., shut or lift) will be made. This logic was implemented in Embedded C and dumped to the Raspberry PI. This prototype was tested and successfully shuts the gate at the time of train arrival and lifts after train crosses other end.</p>

11	Internet of Things for Smart Railway: Feasibility and Applications	Ohyun Jo, Yong-Kyu Kim, Juyeop Kim. & 2017	Internet of Things, Smart railway, Condition based mainten-ance, Power consumpt ion.	The explosively growing demand of internet of things (IoT) has rendered broadscale advancements in the fields across sensors, radio access, network, and hardware/software platforms for mass market applications. In spite of the recent advancements, limited coverage and battery for persistent connections of IoT devices still remains a critical impediment to practical service applications. In this paper, we introduces a cost-effective IoT solution consisting of device platform, gateway, IoT network, and platform server for smart railway infrastructure. Then, we evaluate and demonstrate the applicability through an in-depth case study related to IoT-based maintenance by implementing a proof of concept and performing experimental works. The IoT solution applied for the smart railway application makes it easy to grasp the condition information distributed over a wide railway area. To deduce the potential and feasibility, we propose the network architecture of IoT solution and evaluate the performance of the candidate Radio Access Technologies (RATs) for delivering IoT data in the aspects of power consumption and coverage by performing an intensive field test with system level implementations. Based on the observation of use cases in interdisciplinary approaches, we figure out the benefits that the IoT can bring.
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12	Condition Monitoring Platform in Railways Based of IoT.	Gulsah Karaduman Mehmet Karakose Erhan Akin & 2017	catenary, rail system, Fault diagnosis, pantogr-aph,	With the increase of railway transportation in the world, the safety, security and comfort of the railways have gained great importance. Nowadays, the use of Internet of Things (IOT) in condition monitoring of systems is quite common. On this basis, in this study a method for condition monitoring of railways using IOT is proposed. In this method, images taken from the cameras monitoring the railways are transmitted to a central computer using IOT. Image processing techniques are applied to these images. The processed images are analyzed and meaningful data are extracted in the central computer. The necessary precautions are taken from the results of the analysis. Thus, contactless fault diagnosis is performed.
13	An IOT Based Smart Medical Systems in Trains for Passengers	Dr.K.Helen Prabha, Badhepudi Thanmaya, Gandavaram Gnana Jasmitha, Gavarla sandhya. & 2020	IOT, Microcon troller, Heartbeat Sensor, Respirat -ory Sensor, Ventilat -or Mechanis m, CPR Mechanis m, Arduino	Among different modes of transportation, railway transportation offers excellent energy conservation, environmental protection and reduced time period. Invariably, this mode of transportation plays a serious role not only within the transportation of products, but also of passengers. Even many technological developments arise within the field of railways: healthcare remains not in concern. This paper proposes a controller based technique to offer care support to the emergency patient and therefore the details are going to be transferred to the loco pilot by implementing this system to save lots of the lifetime of emergency patient in travel. This paper approach an IOT based healthcare services during a medical emergency situation while travelling in train.

14	AN MULTIPURPOSE MONITORING SYSTEM FOR RAILWAYS USING IOT	P.Vinothkumar, J.Shrividyaalakshmi, M.Manimegalai, R. Ilango, K.Nandhakumar & 2020	IOT, Sensor, Arduino mega board.	Nowadays 25% of the accidents are due to trains. The train accidents which causes people death and injury that cannot be retrieved. Any error mistakes from control room board, it makes causes the train accidents. By using the intelligent secure system in this project, we can overcome the possibility of train accidents. It is very important to implement a new automatic system. All the departments needed the automation system especially for railways stations. Automatic train operating systems can be useful when the driver in the sleepy mode or in any emergency conditions. The contemplated system is a driverless metro & normal train and which eliminates the need for awaiting staff and build the complete autonomous train. This system is mainly used to make less any Human error. In our project, microcontroller has been acts as a CPU, used to control & processing all devices. The ultrasonic sensor has implementation the train collision avoidance system, to transmit and receives the ultrasonic signal, mainly used to identify the distance from one to another train.
15	Geophone-Based Energy Harvesting Approach for Railway Wagon Monitoring Sensor With High Reliability and Simple Structure	WEI HE , WEIZHONG SHI , JIANWEI LE , HUI LI , RUNZE MA. & 2019	Energy harvest-ing, Internet of Things, vibration.	Freight train positioning and axle safety monitoring are the key to railway traffic supervision, which can be achieved by sensors based on Internet of Things technology and the energy harvesting technology is the best solution to those sensors due to neither electrical power nor communication system is available on railway wagons. This paper proposes a self-powered railway wagon monitoring sensor solution based on the geophone, which has the characteristics of mature technology and simple structure, and can convert mechanical vibration of wagons into electrical energy. Since the vibration is so weak that the voltage

				<p>induced by the geophone is very weak, hence, this paper proposes an electromagnetic generator constructed by geophone matrix and an energy management interface to convert the induced potential into the voltage that can drive the circuit system of sensors. In this paper, the implementation and performance of EMI will be focused on, and the energy harvesting system analysis prior to developing prototypes. The design principles and prototypes of EMG and EMI are proposed based on the parameters of vibration profiles collected by a data logger, and the performance of the SpRWMS prototype is evaluated on a trial run freight train. Experimental results show that the proposed EMI can extract the energy generated by EMG more effectively and increase the voltage across the storage capacitor from 2V to 3.3V, that is, our proposed EMI and EMG can convert the railway wagon vibrational energy into the electrical energy form required by the circuitry of sensors.</p>
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