**Internet of Things for sustainable railway transportation: Past, present, and future**

* + - * **The** [**Internet of Things**](https://www.sciencedirect.com/topics/engineering/internet-of-things) **(IoT) symbolizes numerous devices which are connected globally through the internet technology and are able to collect and share relevant data.**
      * **The current study performs a comprehensive holistic survey of various IoT technologies that can be used in railway operations, management, maintenance, video surveillance, and safety at level crossings.**
      * **This study also discusses current trends in the IoT, emerging IoT technologies, green IoT applications, and various research studies that have been conducted in the areas related to railway applications.**
      * **Furthermore, various challenges that are associated with the IoT applications are discussed along with potential efforts that can be made to overcome these challenges.**
      * **The outcomes of this work are expected to offer important insights regarding the applicability of IoT technologies for sustainable railway transportation, their future potential, operational benefits to relevant stakeholders and authorities, as well as critical future research needs that have to be addressed in the following years.**

**Enhanced Railway Reservation System using Internet of Things**

* **The developed countries has been implemented smart train using internet of things (IoT), IoT provide exploit the opportunities created by Industrial Internet of Things (IIOT).**
* **In this paper the survey focuses on different communication technologies under the paradigm of IoT. The broad band communication technologies like Global System Mobile Communications- Railway (GSM-R), Long Term Evaluation (LTE), fifth generation (5G), IEEE 802.11 and Wireless Sensor Networks (WSN).**
* **We described the passenger ticket generation, ticket validation, with Unique Identification Authority of India (UIDAI) under the smart train transportation the vision of India 2022 and the experimental result proved that IoT system is effective than well known system**

**IoT based Indian Railway Ticket Booking and Authentication System-A Smart Approach**

* **In this rapidly changing digital world, the use of android application is also increasing and which makes day-to-day tasks more efficient and secure.**
* **Considering the problems occurring during the railway journey right from booking ticket to passenger verification and during journey also we are trying to improve the digitization of ticket booking and verification process of railway using smart devices available around us.**
* **We prepared a system which will overcome all the problem through an app in which QR (Quick Response) code will be generated were ticket information will be stored in encrypted form, user has to scan the QR code from smart phone which will act as QR scanner at the railway station. All the details of the passenger will be directly sent to Railway Central Database.**
* **QR code scanner will be installed at entrance of train coach after the scanning of QR-code passenger’s ticket information will be verified.**
* **This app can also track the location of passenger in real-time and the app will only be able to track a passenger as long as that passenger is traveling in the train maintaining the privacy .**

**IoT Based Ticket Checking System**

* **Internet of things. The term Internet of Things was used by Kevin Ashton in 1999. IOT is like a vehicle used to as a “Smart Devices” and other items like Electronics, softwares.IOT words was Invented from a two words “Internet ”and “Things”.**
* **Internet is a vast network.**
* **The Internet is the global system of interconnected computer networks that use the protocol to link devices.**
* **Internet is used in daily life to communicate, search information etc. things means important information or devices.**
* **In recent days a population is gained day by a day and smart cities have gained popularity. In this paper we present a “IOT BASED TICKET CHECKING SYSTEM”.**
* **This system is consist of an IOT module that is used to check the tickets of passenger in trains. This system describes the whole architecture of a train system**

**Smart Metro Rail Ticketing System**

* Transportation plays a vital role in ones life. The main goal of this paper is to eradicate the day to day and one of the major problems with regard to carrying a ticket during transportation from ones life and make traveling a lot more peaceful.
* For this purpose, we are proposing a biometric-based ticketing system in the metro railway scenario but not limited to the same.
* In order to get a unique identifier for each person, we are considering their fingerprint right away from registration, booking tickets and validating the fingerprint on the day of the journey so he/she can travel on a particular day and on the desired train to his/her preferred destination.
* The fingerprint sensor will be interfaced with Arduino which in turn will store the fingerprint data to the cloud.
* We are proposing a two-way encryption standard for storing the sensitive fingerprint data in the cloud