Project Report

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INTRODUCTION

1. INTRODUCTION

1.1 PROJECT OVERVIEW

SMART SOLUTIONS FOR RAILWAYS is to manage Indian Railways is the largest railway network in Asia and additionally world's second largest network operated underneath a single management. Due to its large size it is difficult to monitor the cracks in tracks manually. This paper deals with this problem and detects cracks in tracks with the help of ultrasonic sensor attached to moving assembly with help of stepper motor. Ultrasonic sensor allows the device to moves back and forth across the track and if there is any fault, it gives information to the cloud server through which railway department is informed on time about cracks and many lives can be saved. This is the application of IoT, due to this it is cost effective system. This effective methodology of continuous observation and assessment of rail tracks might facilitate to stop accidents. This methodology endlessly monitors the rail stress, evaluate the results and provide the rail break alerts such as potential buckling conditions, bending of rails and wheel impact load detection to the concerned authorities.

1.2. PURPOSE

Internet is basically system of interconnected computers through network. But now its use is changing with changing world and it is not just confined to emails or web browsing. Today's internet also deals with embedded sensors and has led to development of smart homes, smart rural area, e-health care's etc. and this introduced the concept of IoT . Internet of Things refers to interconnection or communication between two or more devices without human-to-human and human-to-computer interaction. Connected devices are equipped with sensors or actuators perceive their surroundings. IOT has four major components which include sensing the device, accessing the device, processing the information of the device, and provides application and services. In addition to this it also provides security and privacy of data . Automation has affected every aspect of our daily lives. More improvements are being introduced in almost all fields to reduce human effort and save time. Thinking of the same is trying to introduce automation in the field of track testing. Railroad track is an integral part of any company's asset base, since it provides them with the necessary business functionality. Problems that occur due to problems in railroads need to be overcome. The latest method used by the Indian railroad is the tracking of the train track which requires a lot of manpower and is time-consuming

LITERATURE SURVEY

2. LITERATURE SURVEY

2.1 EXISTING SYSTEM

In the Existing train tracks are manually researched. LED (Light Emitting Diode) and LDR (Light Dependent Resister) sensors cannot be implemented on the block of the tracks]. The input image processing is a clamorous system with high cost and does not give the exact result. The Automated Visual Test Method is a complicated method as the video color inspection is implemented to examine the cracks in rail track which does not give accurate result in bad weather. This traditional system delays transfer of information. Srivastava et al., (2017) proposed a moving gadget to detect the cracks with the help of an array of IR sensors to identify the actual position of the cracks as well as notify to nearest railway station . Mishra et al., (2019) developed a system to track the cracks with the help of Arduino mega power using solar energy and laser. A GSM along with a GPS module was implemented to get the actual location of the faulty tracks to inform the authorities using SMS via a link to find actual location on Google Maps. Rizvi Aliza Raza presented a prototype in that is capable of capturing photos of the track and compare it with the old database and sends a message to the authorities regarding the crack detected. The detailed analysis of traditional railway track fault detection techniques is explained in table

2.2 REFERENCES

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6. R. A. Raza, K. P. Rauf, A. Shafeeq, “Crack detection in Railway track using Image processing”, IJARIIT, Vol. 3, pp. 489-496, Issue 4, 2017.

7. N. Bhargav, A. Gupta, M. Khirwar, S. Yadav, and V. Sahu, “Automatic Fault Detection of Railway Track System Based on PLC (ADOR TAST)”, International Journal of Recent Research Aspects, Vol. 3, pp. 91-94, 2016

2.3 PROBLEM STATEMENT DEFINITION

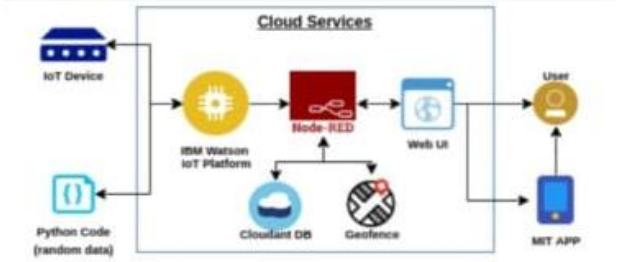
Among the various modes of transport, railways is one of the biggest modes of transport in the world. Though there are competitive threats from airlines, luxury buses, public transports, and personalized transports the problem statement is to answer the question “What are the problems faced by the passengers while travelling by train at station and on board”

IDEATION AND PROPOSED SOLUTION

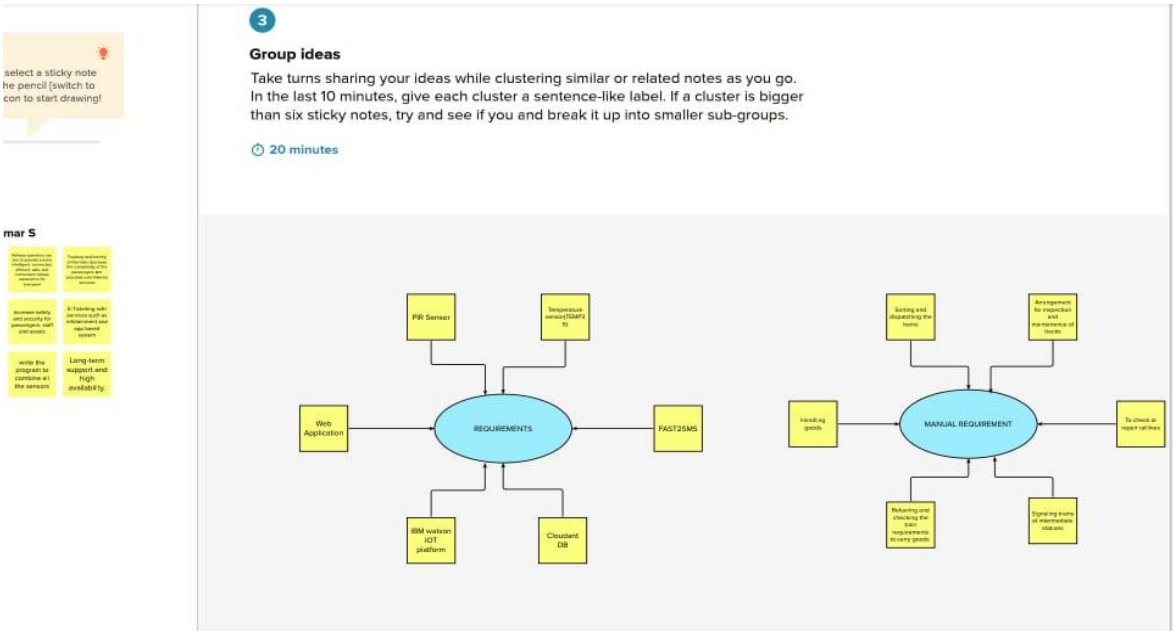
3. IDEATION AND PROPOSED SOLUTON

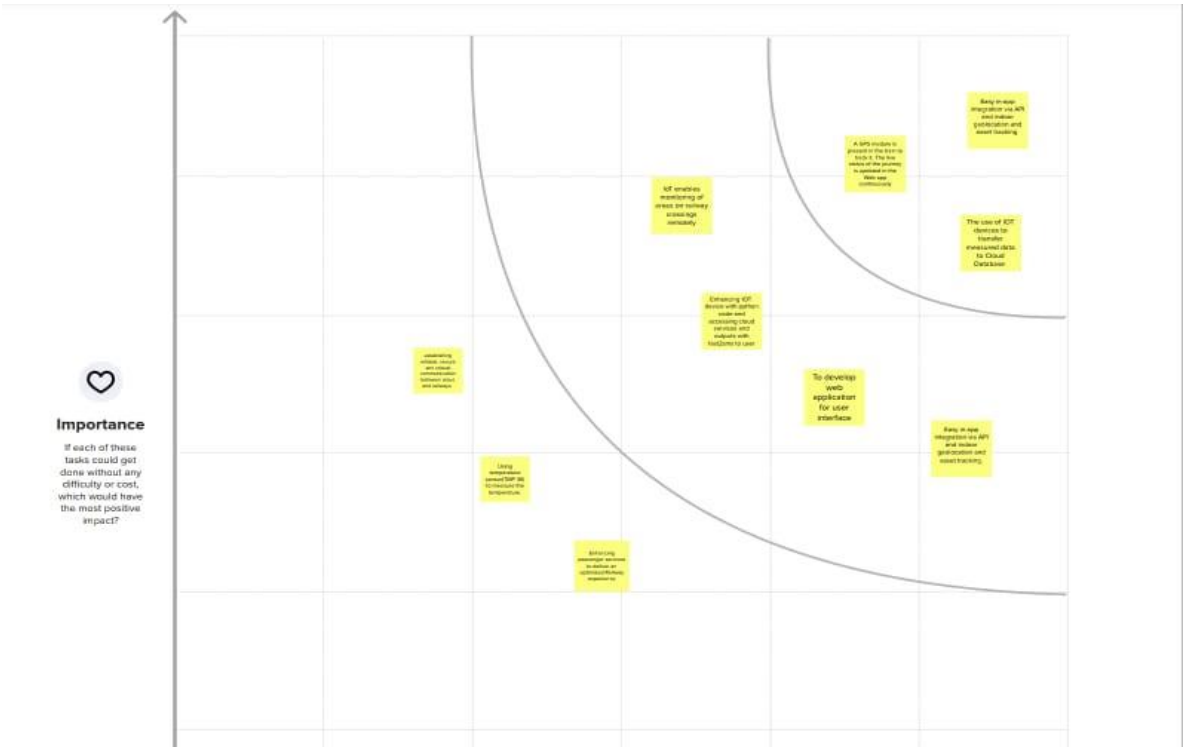
3.1 EMPATHY MAP CANVAS

EMPHATHESIS FOR SMART SOLUTION FOR RAILWAYS



3.2 BRAINSTORMING


select a sticky note
he pencil (switch to
con to start drawing!
mar S
3
Group ideas
Take turns sharing your ideas while clustering similar or related notes as you go.
In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger
than six sticky notes, try and see if you and break it up into smaller sub-groups.
20 minutes
PIR Sensor
Temperature sensor(TEMP2 11)
Web Application
REQUIREMENTS
FAST2SMS
IBM watson IOT platform
Cloudant DB
Sorting and dispatching the trains
Arrangement for inspection and maintenance of trucks
Handing goods
MANUAL REQUIREMENT
To check at repair railways
Refueling and checking the train requirements to carry goods
Signaling trains at intermediate stations


Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
IOT wireless monitoring of areas on railway crossings remotely
To develop web application for user interface

4. PROJECT DESIGN PHASE

4.1 Problem Solution Fit

4.2 Proposed Solution

Project Design Phase-I
Proposed Solution
Template

Date	29 September 2022
Team ID	PNT2022TMID08784
Project Name	Project-Smart Solution for Railways
Maximum Marks	2 Marks

Proposed Solution Template:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Creating an application for developing app for GPS tracking and ticket booking. In this mode of application we have planned to accommodate with IBM Watson platform, node red, WEB UI, cloudant DB these are the platform used for storing the database. Finalizing with QR code for making it more easier
2.	Idea / Solution description	Even with the greatest ideas to overcome solutions for railway ticket generating this is a time consuming process for checking the tickets generated. Even much resources available fraudulent may not be rectified. This project provides the solutions generating the QR code for tickets and verified easily
3.	Novelty / Uniqueness	Creating a website and develop into a QR code for easier way for tracking train and updating a location
4.	Social Impact / Customer Satisfaction	Customer can easily track the train location and prepare accordingly.By this way human's can save their time and increasing of machine work.
5.	Business Model (Revenue Model)	Business model makes a major impact on economic level by this project man can improves in technology as well as reduce their expense
6.	Scalability of the Solution	Tracking of train location `app acquires minimum of memory which makes installation easier and eco-friendly with the user

4.3 Solution architecture

SOLUTION ARCHITECTURE

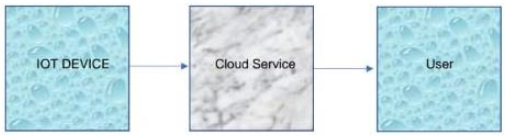
Design:

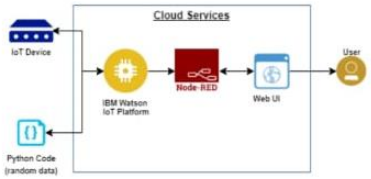
- Even with the greatest ideas to overcome solutions for railway ticket gathering this time consuming process for checking the tickets generated.
- Even much resource available fraudulent may not be rectified
- This project provides the solution generating the QR code for tickets and verifies easily.
- In this project IOT device is connected and a python random code is generated and cloud services include(IBM Waston Platform, Node RED, WEB UI, Cloudant DB which stores the database of the applied tickets)
- All booking details of customer is stored in the cloud database with an unique ID and they can be retrieved back when the ticket collector scans the QR code.
- Finally architecture connects with user and Fast2SMS application to send message to user.
- A GPS module is present in the train to track.
- The live status of the train is uploaded in the web app continuously

Software and system required:

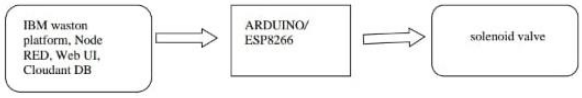
- Arduino IDE
- Embedded C
- 4GB processor and OS-Windows/Linux/MAC

Block diagram:

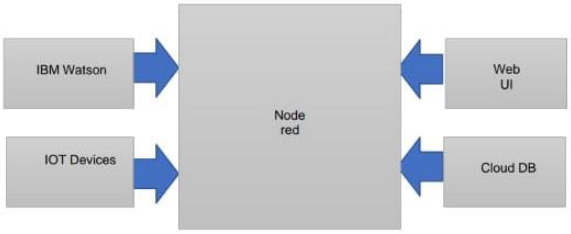




IOT Device



Cloud Service



5 PROJECT DESIGN PHASE II

5.1 Customer Journey

PHASES	Motivation	Information gathering	Analyzes various products	Choose the efficient product	Payment
Actions	Electronic display of tickets is used and encouraged in order to reduce the colossal wastage of paper.	Search for the train and Seat availability	Customer chooses the preferred seat	The chosen seat is reserved and asked for confirmation.	Makes the Payment for the preferred Ticket.
Touch Point	The passengers and most importantly environmentalists would be excited and welcome this new system whole heartedly.	If dedicated crime teams is being set up, then travelers would don't have to worry about their confidentiality.	The user is entertained by a variety of new possibilities offered.	As even bank transaction is also digitalized nowadays, the passengers won't have to worry about the safety of their wallets and tickets.	Since QR code of ticket is directly sent to the travelers and that's enough for the travel, travelers would welcome this system.
Customer Feeling					
Customer Thoughts	Easy handling and support all operating system	Less complexity for searching the seat availability	Show the available seats closest to the preference.	A web application with simple interface	Availability of numerous payment options and simple process
Opportunities	Travel experience for the passengers and travels can be improved if ticketing system is digitalized.	After installation, customers could have a complete track on their travel history and there are some other unclear benefits with security risks	Because of this system, travelers would be aware of the various booking sites available instead of relying on website is using paper tickets that's existing now.	One of the advantages of using QR codes is that it facilitates instant payments. Applications installed with QR would have a interesting user experience.	Ticket booking and verifying process would be fastened by implementing this application.

5.2 Data flow diagram

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a s
right amount of the system requirement graphically. It shows how data enters and leaves the syst
data is stored.

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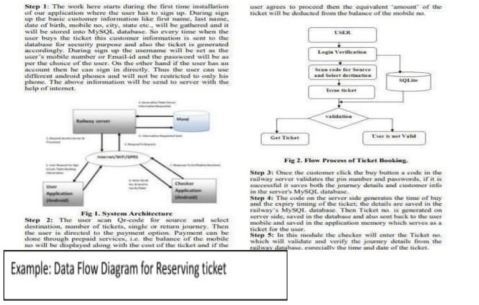
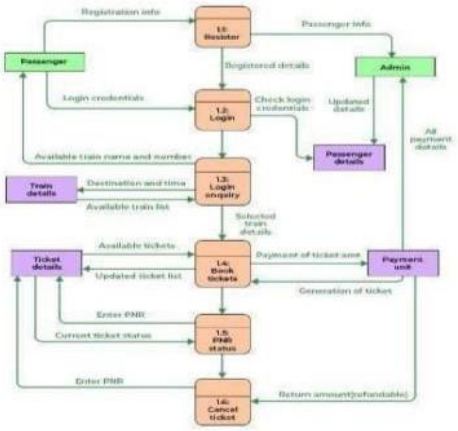


Example: Data Flow Diagram for Reserving ticket



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Reserving ticket	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
Customer (Mobile user)	Reserving ticket	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
Customer (Mobile user)	Reserving ticket	USN-3	As a user, I can register for the application and enter the details for reserving the ticket.	I can register & access the dashboard with Facebook Login	Low	Sprint-2
Customer (Mobile user)	Dashboard	Users	The details will be stored safely	I can access it using database	Medium	Sprint-3
Customer (Web user)	Reserving ticket	User	Enter the details and click submit button to book ticket	I can use the QR code which is been generated	High	Sprint-1
Customer Care Executive	Connecting the service provider	Customer	Connects with the service by logging in	Can get connected with the server	Medium	Sprint-3
Administrator	Provides the services	Admin	The data is given by the user	Can add or update the data provided by the user	High	Sprint-1

5.3 Solution requirement

The Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**User Requirements**	1.Mobile Phone
		2.Internet
		3.QR Code Scanner
FR-2	**User Registration**	1.Manual Registration
		2.Registration through web page
		3.Registration through Application
FR-3	**User Confirmation**	1.Confirmation via Phone.
		2.Confirmation via Email.
		3.Confirmation via OTP.
		4.Confirmation via SMS.
FR-4	**Payment Options**	1.Net Banking/UPI.
		2.Credit/Debit/ATM Card.
		3.Digital Wallet.
FR-5	**Application**	1.Free Installation via Play Store and App store.
	Installation	2.Website is available for free and will function always.
FR-6	**Application Feedback**	1.Through Web page
		2.Through Phone calls

Non-Functional Requirement

The Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	1.Have a Simple and Efficient application demo
		Video.
		2.Easier to use.
		3.If a Traveller has a Mobile Phone,they may
		easily Understand the procedure and make
		Reservations.
NFR-2	**Security**	1.Two-step authorization is required to secure the application.
		2.Username and password will be assigned in accordance with
		user requirements.
NFR-3	**Reliability**	1.Periodic updates should be made to websites and
		applications.
		2.If the booking process is interrupted by an internet outage,
		we offer an offline mode to complete the detail process.
NFR-4	**Performance**	1.The user interface of the web application must be
		user-friendly.
		2. Payment methods should be quick and easy.
NFR-5	**Availability**	1.Provided with the proper train location.
		2.Databases are maintained for passenger history.
		3.Anytime and Anywhere for online ticket booking

5.4 Technology stark

CODING AND SOLUTIONING

4.CODING AND SOLUTIONING

7.1. FEATURE 1

- IOT device
- IBM Watson platform
- Node red
- Cloudant DB
- Web UI
- Geofence
- MIT App
- Python code

7.2. FEATURE 2

- Registration
- Login
- Verification
- Ticket Booking
- Payment
- Ticket Cancellation
- Adding Queries

TESTING

5. TESTING

8.1.TEST CASES

RESULTS

6. RESULTS

9.1. PERFORMANCE METRICS

ADVANTAGES &DISADVANTAGES

7. ADVANTAGES &DISADVANTAGES

10.1. ADVANTAGES

- Openness – compatibility between different system modules, potentially from different vendors;
- Orchestration – ability to manage large numbers of devices, with full visibility over them;
- Dynamic scaling – ability to scale the system according to the application needs, through resource virtualization and cloud operation;
- Automation – ability to automate parts of the system monitoring application, leading to better performance and lower operation costs.

10.2. DISADVANTAGES

- Approaches to flexible, effective, efficient, and low-cost data collection for both railway vehicles and infrastructure monitoring, using regular trains;
- Data processing, reduction, and analysis in local controllers, and subsequent sending of that data to the cloud, for further processing;
- Online data processing systems, for real-time monitoring, using emerging communication technologies;
- Integrated, interoperable, and scalable solutions for railway systems preventive maintenance.

CONCLUSION

8. CONCLUSION

Accidents occurring in Railway transportation system cost a large number of lives. So this system helps us to prevent accidents and giving information about faults or cracks in advance to railway authorities. So that they can fix them and accidents cases becomes less. This project is cost effective. By using more techniques they can be modified and developed according to their applications. By this system many lives can be saved by avoiding accidents. The idea can be implemented in large scale in the long run to facilitate better safety standards for rail tracks and provide effective testing infrastructure for achieving better results in the future.

FUTURE SCOPE

9. FUTURE SCOPE

In future CCTV systems with IP based camera can be used for monitoring the visual videos captured from the track. It will also increase security for both passengers and railways. GPS can also be used to detect exact location of track fault area, IP cameras can also be used to show fault with the help of video. Locations on Google maps with the help of sensors can be used to detect in which area track is broken