Paper-01: **An Automated Technology for IoT based Rail-Track Inspection to Locate Surface Flaws by Robotics and Neural Networks**

B Uma Maheswari; P Nithya; Sreeja Vijay; K. Tamilarasi; Anitha G; N. Muthukumaran

Inspecting railroad tracks by hand takes a lot of effort and time.Inspecting railroad tracks by hand takes a lot of effort and time.Robotic and machine vision techniques are currently used for track inspection, although each has limitations of its own.This research suggests a robotic system with image processing and machine vision as a solution. There are two types of railway track defects: internal and superficial, brought on by problems with heat and humidity and the roughness of high-speed trains.In this proposed system,a robot will take pictures of both ends of the track to inspect any flaws in the railway.It employs a Deep Convolutional Neural Network, or DCNN, to extract characteristics and patterns from visual input after the camera has taken pictures.The robot discerns abnormalities in the image. It stores the position and sends the photos and location to the cloud if an anomaly is found. The suggested system assessed the suggested technique using a grayscale dataset.The system achieved 97% accuracy and precision of 96.9% in detecting surface flaws using a 2D CNN.

Paper-02: **A Real-Time Model for Pedestrian Flow Estimation in Urban Areas based on IoT Sensors**

Kaveh Khoshkhah; Mozhgan Pourmoradnasseri; Amnir Hadachi

Understanding real-time pedestrian flow in cities is crucial for various aspects like safety, urban planning, and traffic management.It's challenging to model pedestrian flow due to complex factors like user preferences and weather conditions.This paper presents a cost-effective method for estimating hourly, city-wide pedestrian flow between districts using limited sensor data.It combines a network-based approach with real-time calibration using data from pedestrian counters.This method allows for route choice simulation based on the estimated flow.The architecture of the suggested system consists of three phases.First, discover all feasible paths between each district pair.The chance of pedestrians using each route is then calculated, taking into account characteristics such as walkability and points of interest.Secondly Determine the average number of times a random route encounters a sensor. Use this estimate to scale the initial trip distribution matrix, resulting in an initial OD-matrix.Third, compare the expected number of sensor hits to the actual sensor readings for each sensor. Solve the optimization problem to obtain the final OD-matrix indicating the estimated pedestrian traffic across districts.The proposed system was used to predict pedestrian traffic in Tartu, Estonia.After three phases, we calculated pedestrian trips in a district with 97% accuracy compared to manual counts.

Paper-03: **Near-Ultrasonic Communications for IoT Applications using Android Smartphone**

Yann Hornych; Javier Cañada Toledo; Boyang Wang; Won-Jae Yi; Jafar Saniie

Traditional wireless communication uses electromagnetic waves, which may pose health risks.This paper explores using near-ultrasonic waves for communication between Android smartphones.First method is Frequency Response Analyzer which analyzes the frequency response of the smartphones to find the optimal communication range. Two cellphones, positioned anywhere between five cm and ten meters apart in a calm environment, are used in a frequency response analysis experiment. The results showed that there was a rapid reduction in response beyond 16.8 kHz, but otherwise there was good and continuous frequency response up to 16.8 kHz. Data transmission and reception were still viable up to 19.7 kHz despite higher frequency limits.The second approach is Near-Ultrasonic Chat Messenger, which uses frequency-shift keying (FSK) and amplitude-shift keying (ASK) to transmit data.Successful data transfer at 5 cm with some errors using ASK modulation.At ten meters, performance drastically decreases.Nearly error-free data transmission at 5 cm was accomplished with FSK modulation.Compared to ASK modulation, FSK modulation needed more processing power but provided more dependable data delivery. Following these tests, the greatest communication distance was 10 meters, and the usable frequency range was 18–20 kHz.