Name: Jeya Suriya M
reg: 950321104022

IOT_Phase_4

Overview

In the fourth phase of our project, we continued to develop our Traffic Management System, focusing on enhancing vehicle detection and congestion analysis. We made significant progress by implementing Ultrasonic sensors, Arduino boards, and simulated traffic lights to improve our system's functionality and efficiency.

Vehicle Detection

Our Traffic Management System employs Ultrasonic sensors to detect the presence of vehicles on the road. The principle behind this detection method is straightforward: when a vehicle passes by, the distance reading from the sensor decreases. In contrast, when no vehicles are nearby, the distance reading remains high (at its maximum). This way, we determine the degree of congestion.

Pivots

We decided to pivot and utilize the Wokwi platform due to our familiarity with it. Wokwi simplified the development process for us and made it more accessible. This transition allowed us to streamline the integration of our components and data flow.

In a move towards simplicity and cost-effectiveness, we shifted from our initial idea of using Raspberry Pi to utilizing Arduino boards. This change allowed us to maintain a cost-effective approach without compromising functionality. Additionally, we introduced LED simulations of traffic lights, which enhanced our system's capabilities. We felt that it will be effecient to control traffic lights near our board instead of connecting to cloud and again controlling the lights just a few distance away from our arduino board.

Congestion Density

While our system counts the number of vehicles, it's important to note that the readings don't provide a precise count of nearby vehicles. Instead, they offer an abstract score of congestion density, which serves as an indicator of traffic conditions in the area.

Three Key Components

Our project comprises three main components:

1. IoT Component

This component consists of Arduino boards, Ultrasonic sensors, and simulated traffic lights. It's responsible for vehicle detection and counting.

2. Cloud Integration

We integrated Wokwi as our cloud platform to send and receive data. The cloud component receives data on congestion levels, processes it, and stores the information. This data is then visualized, allowing us to gain insights into congestion patterns.
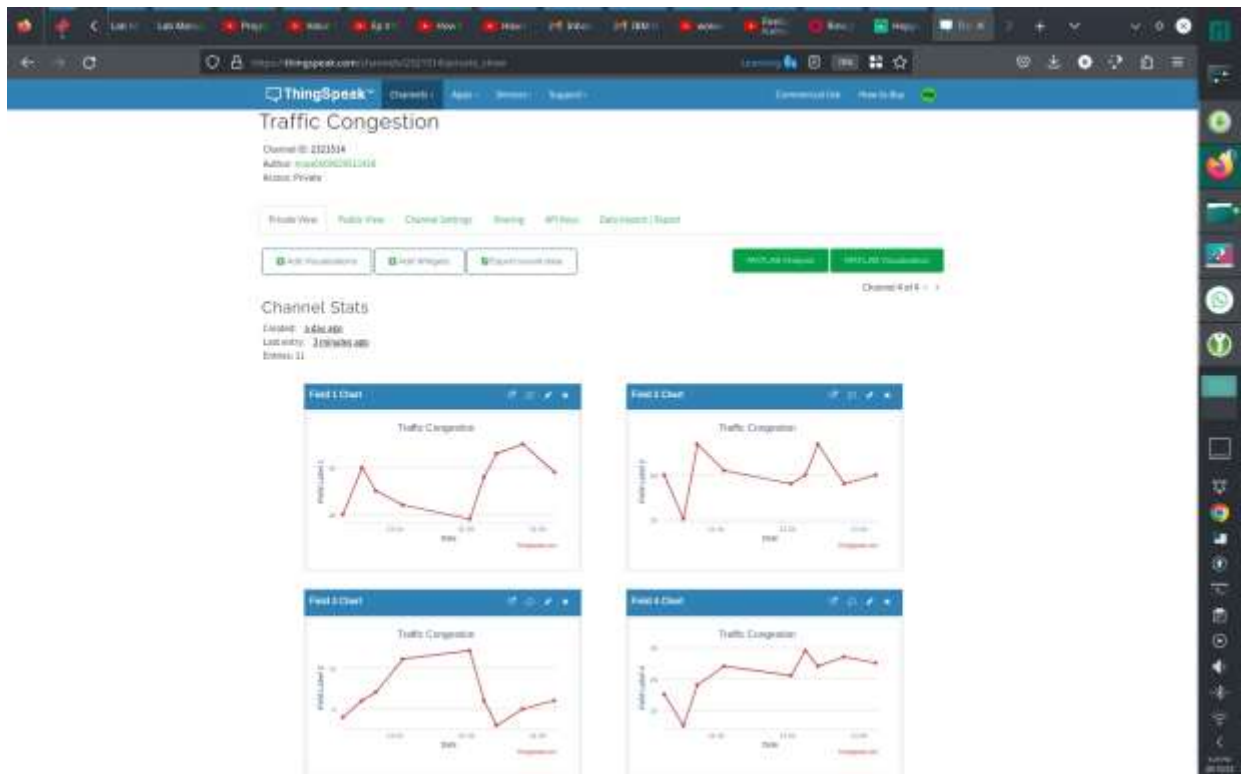
3. Client-Facing Application

A Dart-based client application has been developed to provide end-users with access to congestion information. This application retrieves real-time congestion data from Wokwi based on the latest updates from our IoT component. Users can make informed decisions about their routes and travel plans based on this up-to-date congestion data.

Data Flow

The IoT component detects and records vehicle numbers, which are then transmitted to the Wokwi platform. The cloud component processes this data and provides a clear visualization of congestion patterns. Simultaneously, the Dart application periodically queries Wokwi for the latest congestion data, enabling users to make well-informed decisions based on real-time information.

In this phase, we made substantial progress in enhancing our Traffic Management System by improving vehicle detection, transitioning to a more accessible platform, and ensuring the efficient analysis of congestion data. The incorporation of traffic light simulations and the client-facing application also contribute to the system's overall effectiveness.

The above Picture depicts vehicle congestion readings from wokwi platform.

This shows the wokwi simulation we created. It also sends data to thingsspeak