

SubterraView Project Description Summary

Group 4: Lena Tran, Manan Patel, Jay Patel, Ashton Edakkunnathu

Overview

SubterraView is an augmented reality and artificial intelligence-based system designed to improve underground infrastructure management and worker safety. The platform compiles data from public utility records, city infrastructure databases, and crowdsourced field reports to generate a continuously updated underground utility map. Using an AI validation engine, the system cross-references incoming data, assigns confidence ratings, and resolves discrepancies to ensure high levels of reliability and accuracy. SubterraView is intended to serve construction workers, utility technicians, emergency responders, and public or private work organizations. By providing real-time underground visualization and hazard monitoring directly through smartphones, the system reduces reliance on the traditional 811 process, minimizes excavation delays, and helps prevent costly infrastructure damage and worker injuries.

Problem

Underground infrastructure management remains a significant challenge in modern construction and urban development. Current processes rely heavily on 811 notifications and databases which are often inconsistent or outdated. As a result, excavation projects are prone to delays and accidents. Each year, hundreds of thousands of underground utility damages occur, leading to billions of dollars in losses and increased risks to worker safety.

System Design

The SubterraView system is designed around a user-centered architecture that connects multiple stakeholders and data sources. The primary users include construction workers, utility technicians, system administrators, and emergency responders, each with different access levels and responsibilities.

At the core of the system are several key functionalities: viewing underground infrastructure through AR, validating utility records using AI, receiving hazard alerts from connected sensors, accessing an emergency response mode, and submitting crowdsourced infrastructure reports. These features allow users to both consume and contribute data, improving the overall accuracy and usefulness of the system.

The system also integrates with external components such as city infrastructure databases, utility company records, and hazard sensor networks. Data flows from these sources into the AI validation engine, which cross-references and assigns confidence levels before presenting the information to users. This ensures that the displayed infrastructure data is as reliable and up to date as possible.

Technical Approach

The frontend consists of a mobile application that provides the AR interface and user interaction features. The backend handles data integration, storage, and communication with external systems through APIs.

The AI component plays a critical role by analyzing incoming data from various sources, identifying inconsistencies, and assigning confidence scores. This helps ensure that users receive accurate and reliable information. Additionally, the system incorporates sensor data to detect hazards and trigger alerts in real time.

Challenges

One of the primary challenges in developing SubterraView is the reliance on external data sources. Access to accurate and up-to-date infrastructure data is not always guaranteed, and inconsistencies between sources can reduce reliability. Another challenge is achieving high AI accuracy, as real-world infrastructure data can be complex and incomplete.

Sensor reliability and network connectivity also present limitations. Hazard detection depends on the proper functioning of external sensors, and real-time features require stable internet access. While the system is designed to handle some of these issues, they remain important considerations for real-world deployment.

Future

There are several opportunities to enhance SubterraView in the future. Improving the accuracy of the AI validation system would increase user trust and system reliability. Expanding offline functionality would allow the system to operate more effectively in areas with limited connectivity.