



Metaverse Maintenance

VR Enabled Automotive Diagnostic Tool

Computer Science & Electrical Engineering | Class of 2023



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Problem Statement

Unexpected automotive repairs cause financial and logistical issues for consumers and industry. Moreover, a lack of data on the cause of these issues costs mechanics precious time to repair these vehicles.

Mission Statement

Metaverse Maintenance provides a cross platform diagnostic solution to allow interactive analysis through a digital and real-time predictive maintenance via IoT connectivity.

Solution & Features

Raspberry Pi – On board computation is handled by a Raspberry Pi 3 Model B, which allows communication with the OBD interface, IoT module, and in-car display.



Raspberry Pi 3

OBD II Interface – Interaction with the car is done through a STN1110 chip, which is an OBD to UART interpreter.



PCB Layout

Blues Wireless IoT Module – The IoT module is integrated into the system to provide cellular and Wi-Fi connectivity.



Blues Notecard

Noda.io – Noda's integrated API allows for real-time data visualizations to create a digital twin for any automobile.



Losant – This cloud-based IoT platform allows users to store and track real-time data for thousands of devices.



Process

Step 1: Installation

To use Metaverse Maintenance, a user first installs the OBD port connector and in-car display.



Step 2: Access Portal

Next, a user will create an account using the <https://meta-maintenance.w3spaces.com/> portal.



Step 3: Track Data

Metaverse Maintenance provides 3 separate user interfaces for tracking data: in VR using Noda.io, on a mobile device using the custom portal, and in a cross platform virtual environment, FrameVR.

Final Product



Interfaces

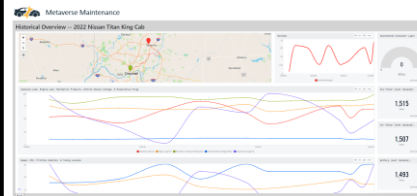
Noda.io:

Noda provides an API to assist with 3D data visualization with a digital twin. Using Noda, we created an environment to provide mechanics and fleet managers with real-time diagnostic data.



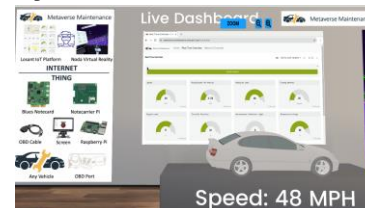
Custom Web Application:

The Metaverse Maintenance portal hosts a users vehicle data for real-time updates and historical tracking. The fully interactive UI components are powered by the cloud-based IoT platform, Losant.



Frame VR:

Through our partnership with Prodigy, we created a multi-platform virtual environment for hosting multiple components of Metaverse Maintenance. This platform was also showcased at CES 2023.



Challenges

Programming the Microcontroller:

Incorrect pin multiplexing and wrong baud rates slowed the development of our OBD interface.

OBD II Communication:

With various communication protocols, initial testing was difficult. However, using the STN1110 chip allowed easier communication over CAN bus, ISO9141, and SAE J1850.

Accomplishments

CES 2023 Exhibitor:

Metaverse Maintenance was honored to be hosted by Prodigy and Blues Wireless as we presented our project for over 100,000 people at CES 2023.



← Live Dashboard

Frame VR →



Future Work

- Reduce size of OBD adapter and make in-car display optional
- Upgrade VR interface with custom models through BabylonJS