Name: Srisatya Jayakrishna Vaddi

Professor Name: Tejaswi Linge Gowda

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Autonomous Path Exploring and mapping Vehicle

Introduction

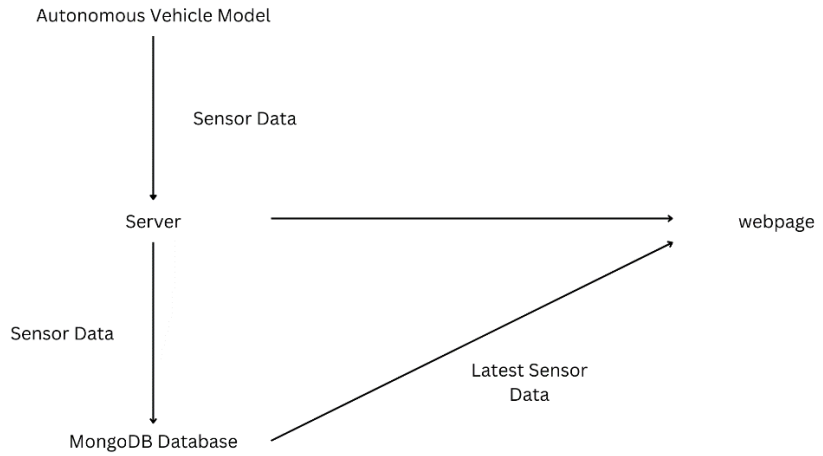
This Project is an object detection and environmental mapping vehicle model. Utilizing the Raspberry Pi as its central controller the model is capable of detecting objects in its vicinity through the use of three ultrasonic sensors. The uniqueness of this model lies in its ability to transmit the collected data to a web server, which is then visually represented on a webpage. This visualization is achieved through the innovative use of ThreeJS, a JavaScript library that renders 3D graphics, allowing for a dynamic and interactive display of the vehicle's surroundings. Additionally, the project harnesses the power of NodeJS and ExpressJS for robust server-side functionality, ensuring seamless data flow and efficient handling of web requests.

System Architecture and Dataflow

Data Gathering and Transmission

The autonomous vehicle model, equipped with a Raspberry Pi controller, is at the heart of our project's system design. This model includes three ultrasonic sensors, which are critical for detecting objects in the vehicle's surroundings. The Raspberry Pi, the vehicle's brain, evaluates sensor data to calculate the distance and relative location of adjacent objects. Once collected, this data is sent to a central server. The transmission mechanism is meticulously engineered to enable

continuous and uninterrupted data flow, which is required for real-time object detection and mapping.



Server Processing and Data Storage

The server, powered by NodeJS, takes on the duty of processing the data received from the vehicle model. Vital parameters such as distance readings, object coordinates, and time stamps are included in the processed data. This processed data is subsequently saved in a MongoDB database, reflecting our dedication to efficient data management and scalability. The flexible structure of MongoDB, as well as its strong handling of massive data volumes, make it a perfect alternative for storing continuously entering sensor data.

Web Interface and Data Visulization

The data visualization and user interface are the final components of our system architecture. An HTML page in our server's public folder is tasked with retrieving the most recent data from the MongoDB database. This is accomplished through a well-structured API that ensures data retrieval is efficient and accurate. After the data is retrieved, ThreeJS is used to present it in a

dynamic and interactive fashion. This JavaScript package allows us to display sensor data in 3D space on the webpage, resulting in an intuitive and visually appealing representation of the vehicle's surroundings.

Conclusion

The "Autonomous Path Exploring and Mapping Vehicle" project, which was heavily impacted by class readings and workshops on IoT architecture, is a watershed moment in my journey into autonomous vehicle technology. This hands-on experience, particularly with the Raspberry Pi and ultrasonic sensors, has switched my research focus to advanced autonomous systems, with a specific emphasis on SLAM implementation. Future improvements will involve the integration of LIDAR and RGB cameras, as well as the use of sophisticated algorithms to improve navigation and environmental mapping. This project not only captures an IoT and autonomous car learning journey, but it also lays the groundwork for future study and development in this dynamic industry.

Works Cited

https://threejs.org/docs/index.html#manual/en/introduction/Creating-a-scene

https://nodejs.org/en/guides