The Robotic Docent

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Abstract

The main purpose of this project is to address the current concerns regarding COVID-19 with the limit to the number of participants and employees in the space. ADA museum guidelines will also be addressed to accommodate visual and auditory needs. This project intends to develop a functioning general use guidance robot with general navigation and collision avoidance to assist in various museum information delivery with mobile and web user interfaces for museums to modify their exhibits in the Reno-Tahoe area with a focus on those in the University of Nevada, Reno

Main Goals

In the Robotic Docent project, the team aims to improve accessibility for museum users as well as introduce new social dynamics for museum tours while also minimizing contact considering the COVID-19 pandemic. In addition, the project also focuses on supporting the museum staff by providing museum analytics and data and offloading museum directors from providing tours themselves. This project also establishes a foundation for a bigger project, which is expected to last 3-5 years.

Web Interface Features

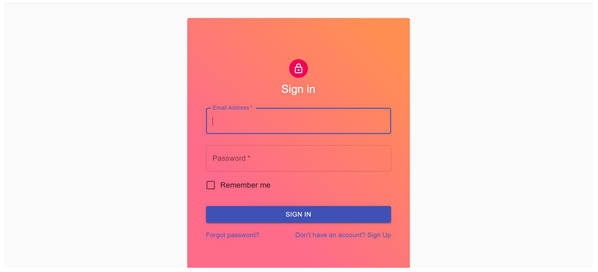

Fig. 1: The login interface requires users to first login before accessing any page on the web interface

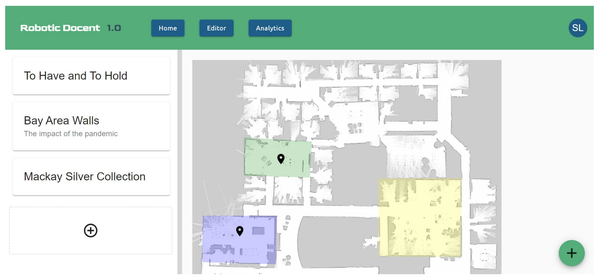

Fig. 2: The editor page allows users to add, modify, and delete on a dynamic map of the museum layout.

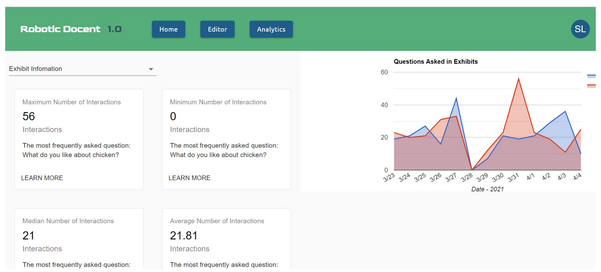

Fig. 3: The analytics page gives users a wide array of information ranging from exhibit interaction, log history, and robot interaction.

Robot Interface Features

- The Robotic Docent provides tours that can be triggered by time.
- Once a tour is triggered, the robot queries piece information based on a hashed tour ID.
- If the robot is interrupted, the robot will attempt to reroute to its destination. If it can't find a route, it will request manual assistance.
- The robot employs text-to-speech in order to verbally communicate with museum-goers

Architecture

The web application is built in React with the Material UI framework. The backend uses Python Flask to handle the server routes for communication between the web interface, robot, and mobile application. The robot functionality is built in ROS. The robot behavior modelling is done through the *actionlib* library. The robot employs multiple redundant states in order to aid in troubleshooting.

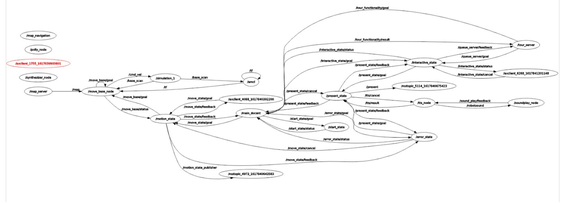

Fig. 4: The RQT graph indicates the different states the robot can enter.

Future Work

Future development ensures that the map editor platform is accessible for distinct museum staff personnel along with different screen sizes as well as provide impactful graphics and data visualizations to understand trends within the museum space. The robot interface plans to give more dynamic feedback and communication with museum goers, change the cosmetic appearance to be more appealing in a museum, and improve the error handling logic.

Conclusion

The Robotic Docent is an asset for museum personnel because it allows for an engaging, socially distanced museum experience. The automated tours and interactive mobile app provide museum goers with a great way to go to museums with minimal human contact, and the web app allows museum personnel to create their own database for exhibits and get analytics.

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