Robot Escape Room v2

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Abstract

In this project we worked interdisciplinarily with Interactive Media and Game Development and Computer Science students to create an engaging robot escape room. Participants join the game via a website, where they are informed that they are in an asteroid field on a spaceship and that they must fix the ship in order to escape the field and save the crew. The player must control the robot using a keyboard while the camera feed is shown on the website and navigate through a series of puzzles. This not only tasks the player to think critically, but also demands versatility from the robot and the room in order to make this a fun playing experience. The website links the room and robot together to create a seamless experience for the player using MQTT, with the room keeping track of the player's progress in regards to the puzzles and the robot acting as the physical manipulator of the room. The project examines the combination of real world robotics engineering and the fantastical world of game design.

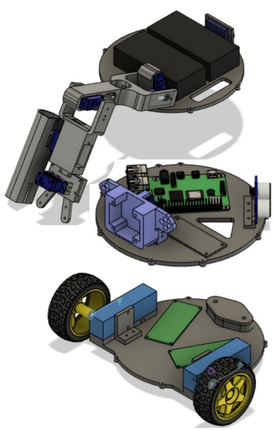
Motivation/Application

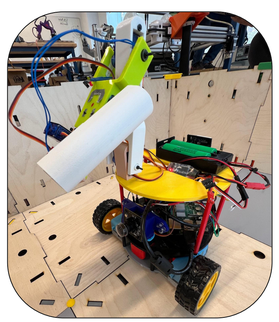
- Enhance initial idea from previous year
- Intensify player's engagement and satisfaction while maintaining a safe and enjoyable experience
- Pandemic proof gaming experience
- Distanced escape room
- Mobile applications

Game

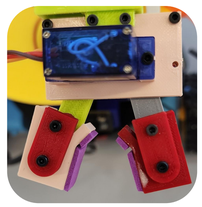
- Single player experience
- On spaceship in asteroid field
- Use robot to repair ship to win
- Mixture of robot telemanipulation and virtual puzzles
- Simon Says puzzle, blacklight word scramble, ArUco marker

Robot Levels

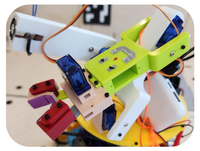




Gripper

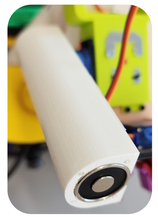


Arm



2-DOF

Magnet



MQTT/Website

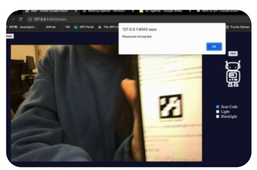
- Used Flask to provide a web application framework in Python in order to merge camera feed and scanning ArUco into one script
- Used as a messaging protocol to provide a connection with the website and the room
- The robot can either publish a message to the website and/or the room or subscribe to a topic it is interested in

Room

- Includes embedded sensor options
- Iterated on physical puzzle design
- Manufactured and iterated on physical constraints
- Developed mechanical actuation for added experience while navigating room

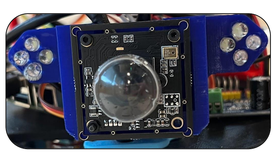
Camera

Live Stream Feed for player perspective

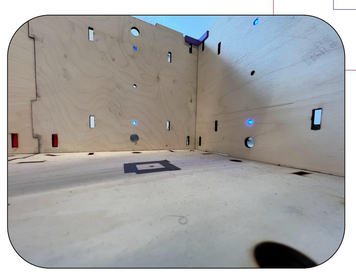


ArUco markers with Augmented Reality

White LED and UV LED to solve puzzles



Simon Puzzle



Puzzle from inside room view

First Puzzle

Blinking Lights

Drive over in sequence to change state

Results

- [x] Include a wider range of puzzles and mechanics
- [x] Create a more immersive player experience
- [x] Add a new way for the player to interact
- [x] Connect room, robot, and website with MQTT protocols

Acknowledgements

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