Cozmo's Heist

A Feature Project Presentation

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Spring 2023 - Cognitive Robotics

The Mission

Given information about the museum and the cameras, generate a valid path that avoids the cameras and grabs the gem

- Museum
  - 3x3 grid
  - 4 walls, 12 doorways, 9 rooms
- Cameras
  - LightCube 2 and LightCube 3
  - Represents obstacles on the grid
- Gem
  - LightCube 1
  - Its location represents the final destination of the path

The Plan

- Phase 1: Scouting
  - Cozmo explores the museum via a predetermined path
  - Cozmo scans each room upon entry
  - Builds world map
- Phase 2: Data Processing
  - Once Cozmo reaches the final room, data is added to prompt and sent to GPT
  - GPT responds with a path structured as a sequence of coordinates
  - Parse response into 'Up', 'Down', 'Left', 'Right' directions list
- Phase 3: Heist
  - Cozmo follows the directions
  - When path is done, pickup LightCube 1

The Plan (cont.)

The most interesting aspect of the plan is…

Parametric GPT Prompt

- Cozmo uses the data collected from his scouting and **combines** it with the engineered prompt
- Current iteration only includes 2 obstacles and 1 goal

GPT Response to FSM

- GPT response is translated to FSM instructions to reach goal

Results - Demo

Results

What worked?

- GPT
  - Parametric prompt led to consistent output format
  - [Testing Conversations](#)
- Scouting
  - In ideal conditions, Cozmo was able to navigate entire museum
  - Correctly recorded locations of objects
- Directions
  - Consistent format of output from GPT used to parse coordinates

What didn't work?

- GPT
  - GPT not the best for path planning…
  - Certain configurations resulted in invalid paths
  - Paths would go out of bounds
  - Paths would make illegal moves (diagonal)
  - Attempted to have GPT output directions…always made path invalid
- Scouting
  - Glare from clear tape on Aruco markers confused Pilot
  - StartCollides errors (possibly due to small room size)

Future Heists

Cozmo, along with a team of professionals, could...

- Further engineer the prompt to get more valid paths
- Introduce more obstacles and goals to the prompt for complex environments
- Use ChatGPT to create paths to a dynamic environment
  - Moving cameras
  - True conversation between Cozmo and ChatGPT
- Introduce voice commands as an override when GPT gives an invalid path