

Introduction

Project 2 focused on developing a Human-Robot Interaction (HRI) solution for hospitality services. Our team created "Tom," an AI assistant for theme park visitors that helps with navigation, emergency response, and access to information. We approached this with a strong emphasis on human-centric design, ensuring our solution addressed real user needs while being practical to implement.

Project Description

The project required us to:

- Observe and interview users to identify scenarios where a voice agent/chatbot could facilitate hospitality services
- Construct a Point of View (POV) and brainstorm ideas
- Create a working prototype of the conversation part of our HRI solution
- Compile a video demo and conduct usability testing
- Present our solution in class

Empathize

We conducted interviews with people who had recently visited theme parks to understand their pain points:

- **Navigation challenges:** Difficulty finding attractions and facilities in large parks
- **Information access:** Trouble getting real-time information about shows, wait times, and services
- **Emergency concerns:** Anxiety about what to do in case of lost items, missing children, or medical emergencies
- **Crowd management:** Frustration with crowded areas and long wait times

The human-centric approach in our research revealed that theme parks create a unique environment where visitors experience heightened emotions—excitement coupled with stress from navigation, time management, and safety concerns.

Here are some interview insights:



Interview with a recent theme park visitor

Scenario Appropriateness

Theme parks emerged as an ideal scenario for HRI implementation because:

- 1. High information needs:** Visitors constantly need up-to-date information about attractions, wait times, and events
- 2. Complex navigation environment:** Large, crowded spaces with changing conditions
- 3. Multiple touchpoints:** Various situations where assistance is needed (emergencies, planning, wayfinding)
- 4. Diverse user groups:** Families, international visitors, and people with accessibility needs
- 5. Existing technology infrastructure:** Theme parks already employ digital systems that could integrate with an AI assistant

Ideation

After identifying key user needs, we brainstormed potential solutions focused on addressing real human challenges:

We constructed our POV statement:

"Theme park visitors need a real-time, location-aware assistant that helps them navigate efficiently, responds to emergencies, and enhances their overall experience because large parks can be overwhelming, stressful, and difficult to navigate."

Prototype Development

We developed "Tom," an AI assistant with the following key features:

1. Intelligent Navigation

- Location-aware directions
- Real-time crowd monitoring
- Alternative route suggestions

2. Emergency Management System

- Protocol for lost children
- Medical emergency response
- Lost item reporting

3. Information Access

- Attraction details
- Show schedules
- Facility information

We implemented the prototype using:

- Azure OpenAI for natural language understanding
- Speech-to-Text and Text-to-Speech for voice interaction
- Graph-based navigation system for pathfinding
- State management for tracking user context

Practicality Assessment

We ensured our solution remained practical by:

1. **Leveraging existing technology:** Using established APIs and services rather than requiring new hardware
2. **Focusing on highest-value interactions:** Prioritizing the most critical user needs
3. **Designing for seamless integration:** Creating a system that could work with a theme park's existing digital infrastructure
4. **Balancing capabilities with limitations:** Acknowledging the constraints of current NLP technology in the design

Testing and Results

We conducted usability testing with participants who were not part of our team:



Screenshot from usability testing session

User Feedback

Through our testing sessions, we gathered valuable insights from participants who interacted with our prototype:

Key Strengths Identified:

- **Emergency Response:** Users particularly appreciated the clear protocols for emergencies, especially the lost child feature. One participant noted, "I would feel much more secure with this system in

place."

- **Navigation Accuracy:** The ability to provide efficient routes while considering crowd levels was highlighted as especially useful. A tester commented: "Being able to avoid crowded areas would save so much time."
- **Information Accessibility:** Users found it intuitive to get information about attractions, schedules, and facilities. "It's much easier than looking at a map or searching through an app," said one participant.
- **Response Time:** Testers were impressed with how quickly the system processed requests and provided relevant information.

Areas for Improvement:

- **Voice Output Quality:** Several users mentioned that the AI responses sometimes sounded unnatural or robotic, which disrupted the conversational experience.
- **Complex Query Handling:** When users asked multi-part questions or provided vague requests, the system sometimes struggled to provide comprehensive answers.
- **Contextual Understanding:** Some participants wanted the system to better remember previous interactions to avoid repeating information.

Learning and Execution Process

Technical Implementation

We programmed the chatbot to handle various scenarios, implementing sophisticated conversation flows for each use case:

1. Basic Information Queries

- Natural language processing to understand various ways users might ask about attractions
- Context-aware responses that consider user location and time of day
- Integration with theme park database for up-to-date information

2. Navigation Requests

- Graph-based pathfinding algorithm that considers distance, crowd levels, and accessibility
- Visual and verbal directions with landmarks
- Real-time updates to routes based on changing conditions

3. Emergency Scenarios

- Priority-based response system that elevates urgent situations
- Location tracking to dispatch assistance when needed
- Specialized protocols for different emergency types (medical, lost items, missing persons)

4. Location Awareness

- Context tracking to maintain awareness of user's current position
- Proactive suggestions based on location (e.g., "The parade is starting nearby in 10 minutes")

Design Process Appropriateness

Our design process followed a systematic approach:

- 1. Human-centered research:** Starting with real user needs rather than technology capabilities
- 2. Iterative prototyping:** Building progressive versions with user feedback
- 3. Cross-functional collaboration:** Combining expertise in UX, programming, and content design
- 4. Ethical considerations:** Addressing privacy concerns and emergency protocols early
- 5. Context-specific design:** Creating solutions tailored to the theme park environment

Use of AI

We used AI tools in several ways during this project:

- Generated test cases for our chatbot using ChatGPT
- Refined our prompt engineering for better responses
- [Link to AI tool usage documentation](#)

Presentation and Feedback

Our in-class presentation focused on:

- Demonstrating the human-centered design process
- Showing our video demo with real user interactions
- Presenting results
- Discussing future improvements

The class feedback highlighted the strengths of our emergency protocols and navigation features, while suggesting improvements for voice naturalness.

Personal Contributions and Achievements

My primary contributions to this project included:

- Designing the emergency response protocols
- Prompt engineering for the chatbot
- Iterating the pathfinding algorithm with LLM
- Conducting 3 user interviews to gather initial requirements
- Creating test cases to verify different aspects of the chatbot
- Participating in the usability testing and documenting feedback

Personal Reflection

Working on this HRI project taught me valuable lessons about designing conversational interfaces:

- 1. Context matters:** The assistant needs to remember previous interactions to be truly helpful. I learned techniques for state management that allow an AI to maintain conversation history

effectively.

2. **Error handling is crucial:** Users don't always express themselves clearly, so robust error handling is essential. I developed fallback strategies that gracefully handle misunderstandings without frustrating users.
3. **Voice vs. text:** What works well in text doesn't always sound natural when spoken. I discovered the importance of optimizing prompts differently for voice output, focusing on shorter sentences and more conversational phrasing.
4. **Empathy in design:** Understanding user anxiety in emergency situations helped us design more compassionate responses. I researched best practices in crisis communication to inform our emergency protocols.

I found the emergency protocol development particularly interesting, as it required balancing efficiency with empathy. The positive user feedback about this feature was especially rewarding, confirming that we had successfully addressed a real pain point for theme park visitors.

For future improvements, I would focus on making the AI responses sound more natural for voice output, which was the main criticism in our user testing. I would also explore incorporating more personalization features that remember user preferences across multiple interactions.