

Mixed-method evaluative study for understanding the usability of **MIMIC**: A social navigation simulator

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Why we need social simulation softwares?

To train robots in virtual environment. It's like a video game for robots, where they can practice navigating through groups of people. **This practice is crucial for ensuring that robots can share our spaces safely.**

Man crushed to death by robot in South Korea

8 November 2023

By Emily Atkinson, BBC News

Share

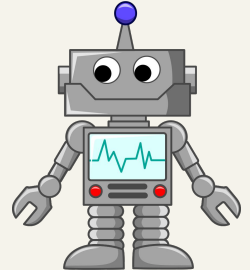
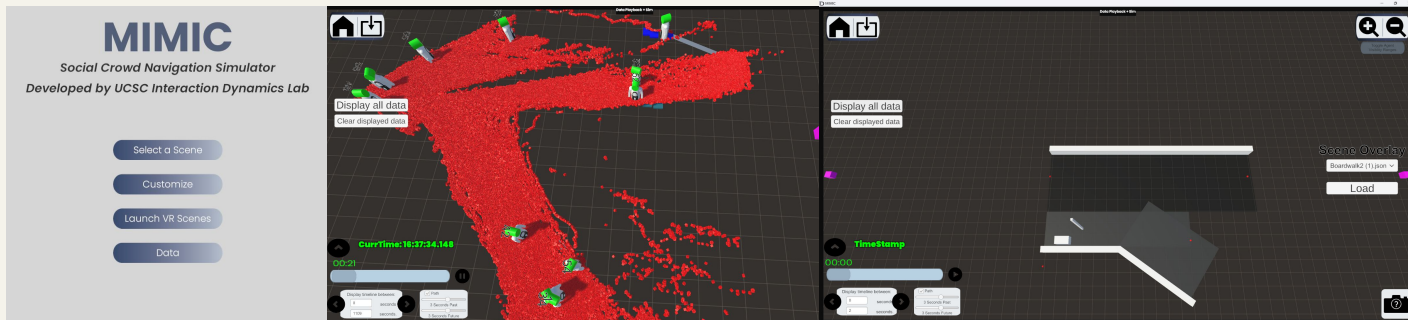


A man has been crushed to death by a robot in South Korea after it failed to differentiate him from the boxes of food it was handling, reports say.

Source: BBC News

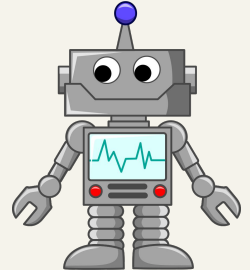
About MIMIC

MIMIC provides a virtual playground where robots can **learn navigational skills within a human social behavior context**, making them better prepared for the real world compared to robots trained in a virtual environment that does not simulate social cues.



AIM

This study aims to evaluate the usability of UI components of MIMIC's data playback feature.



Methodology

Preliminary Research

Define

Initial steps

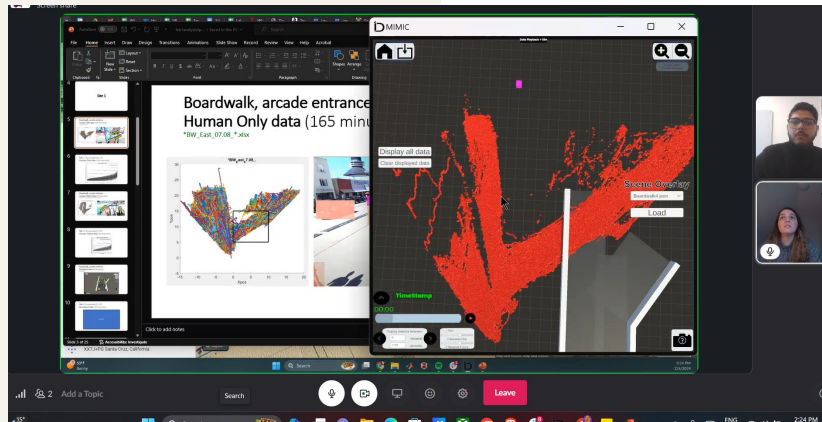
Testing

Analysis

Preliminary Research

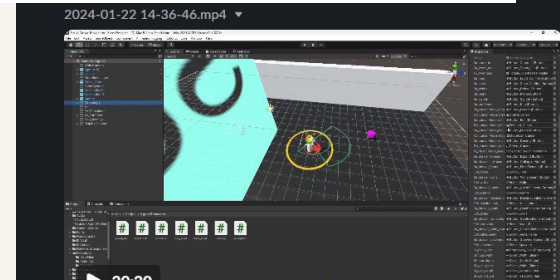
- Preliminary Research and Understanding about the tool
- General discussion with 5-direct and indirect stakeholders (Advisor, Developer, Two PhD students, Masters student)

MIMIC: A Social Navigation and Crowd Studies Tool for Authoring and Playing Social Simulation Instances and Validating Social Navigation Algorithms



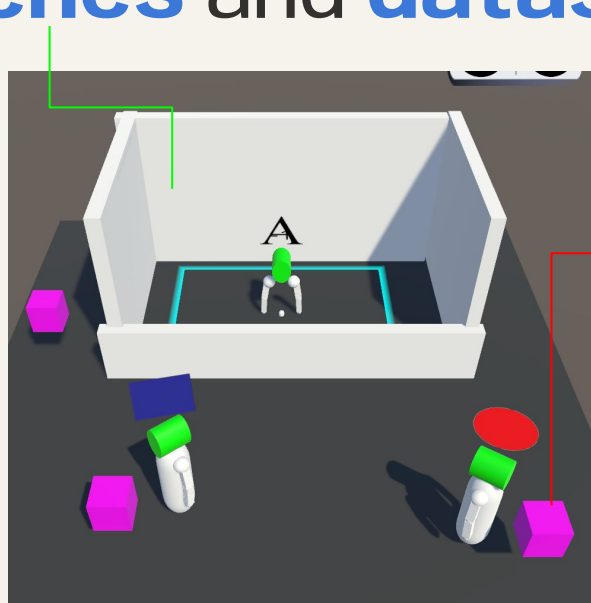
A huddle happened 2:01 PM
You, Katy Grasse, and Adam Carter were in the huddle for 1h 21m.

Social Navigation Simulation and Data Collection



Define

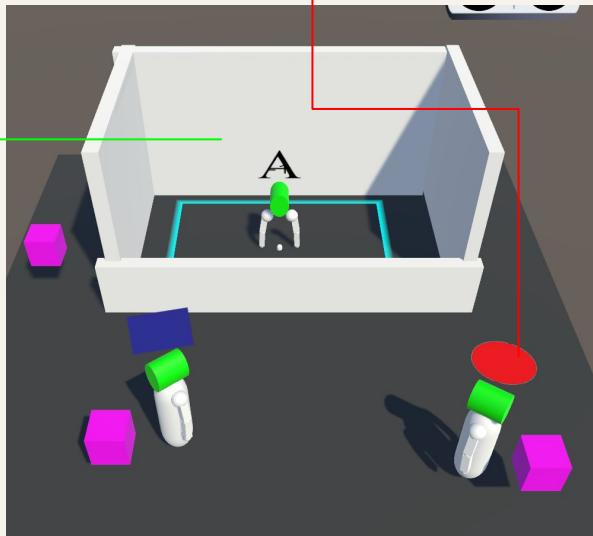
User experience of MIMIC revolves around visualizing **scenes** and **datasets**.





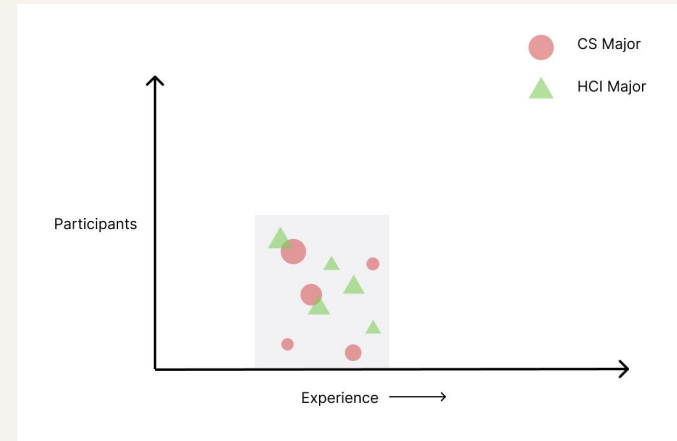
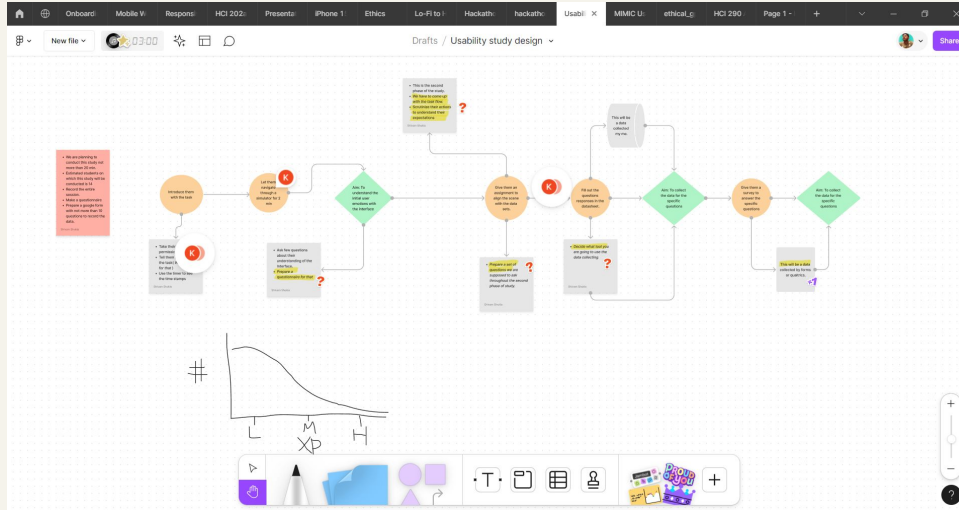
Define

Scenes and **datasets** became a theme to evaluate the usability of MIMIC.



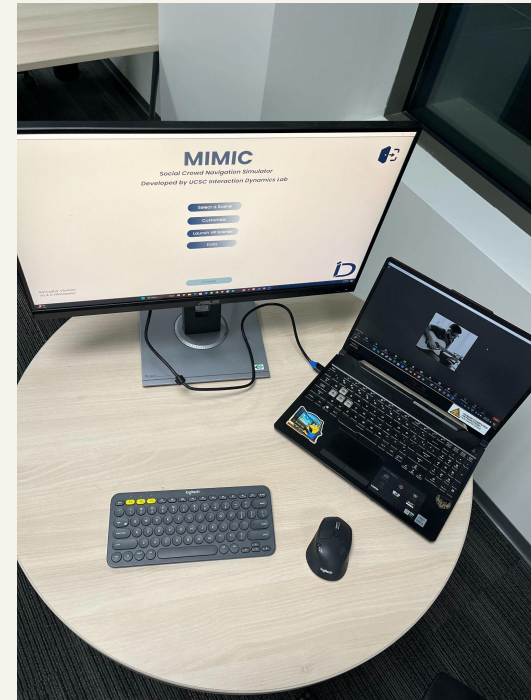
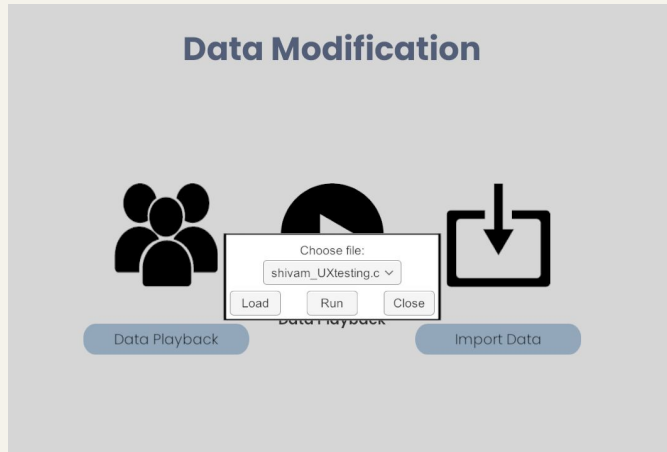
Initial steps

- Figjam study design a collaborative approach
- Participant recruitment
- Finalizing tools and data collection methods



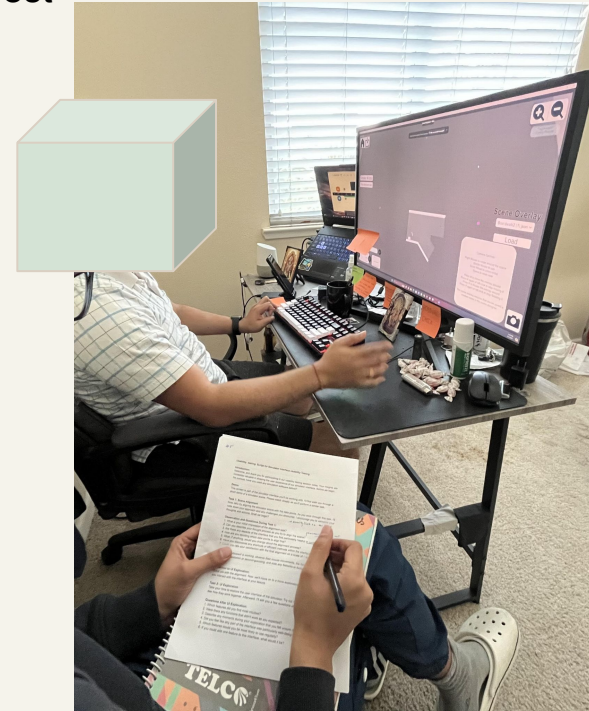
Initial steps

- Usability script preparation
- Development of UX testing scene and data files
- Participant consent form
- Finalizing the testing setup and environment



Participant briefing and warmup

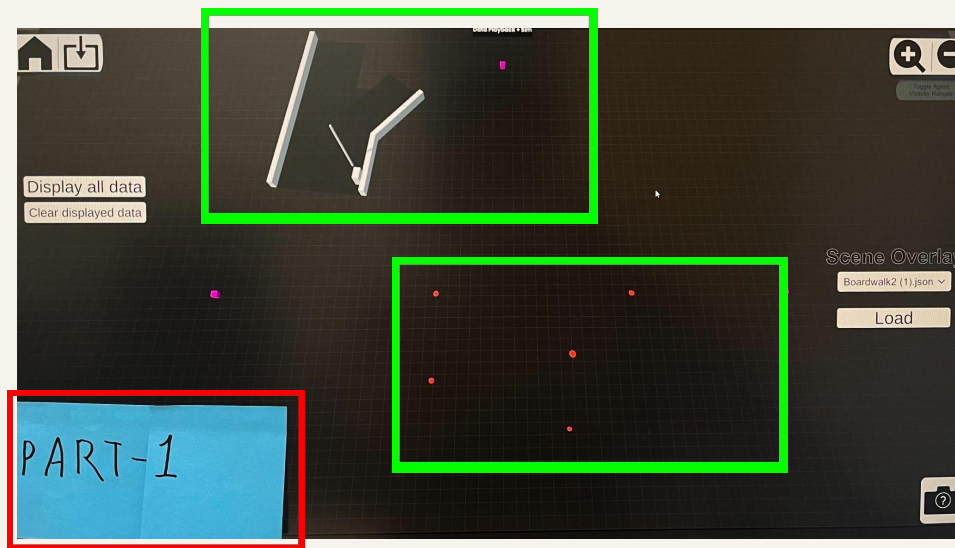
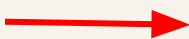
- Introduction to the Simulator
- Explanation of the testing process
- Confidentiality and Data use
- **Semi-Structured Interview** about their technical/gaming/robotics interest



Part-1: Scene alignment with Data Points

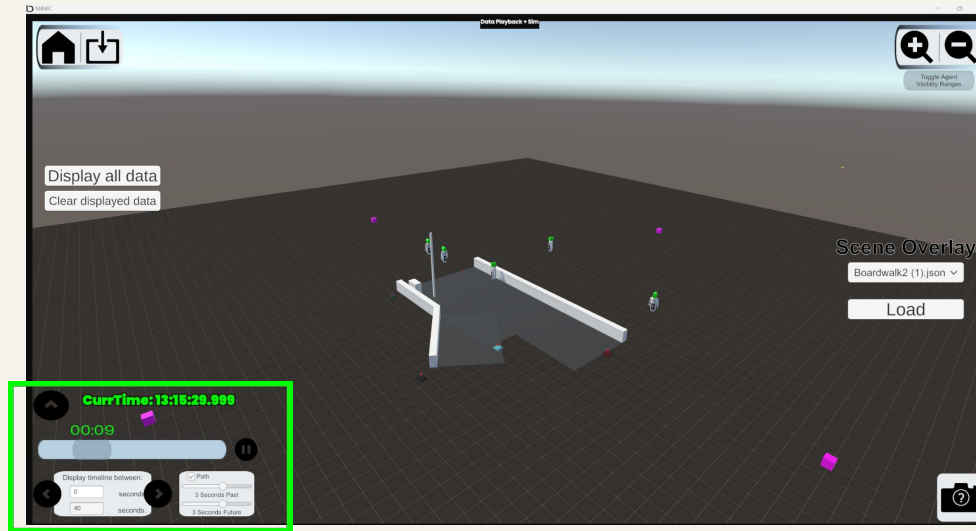
- Participants were instructed to **think aloud** as they attempted the alignment, providing real-time insights into their thought process, challenges faced, and the intuitiveness of the task.

UI for next task
obscured



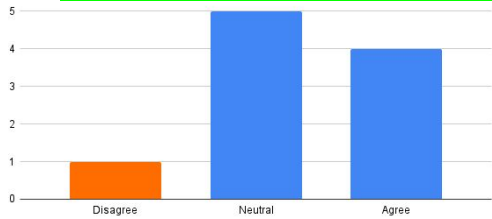
Part-2: UI Exploration and Interaction

- Participants were asked to **verbalize their thoughts and reactions**.



Part-3: Survey

Count of The process of matching the simulator scene with the data points felt intuitive and easy to understand.



10 responses

Simulator Interface Usability Survey

Questions Responses 10 Settings

View in Sheets

Accepting responses

Summary Question Individual

nmanvi@ucsc.edu < 8 of 10 >

Responses cannot be edited

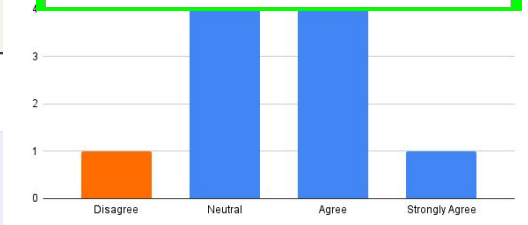
Simulator Interface Usability Survey

Hello and thank you for participating in our usability testing session! Your insights are incredibly valuable to us as we strive to enhance the user experience of our simulator interface. This survey consists of a series of questions that will help us understand how you found the interface in terms of ease of use, efficiency, and overall satisfaction.

Please take a few moments to reflect on your experience with the simulator and answer the questions below. All responses will be kept confidential and will be used solely for the purpose of improving our product.

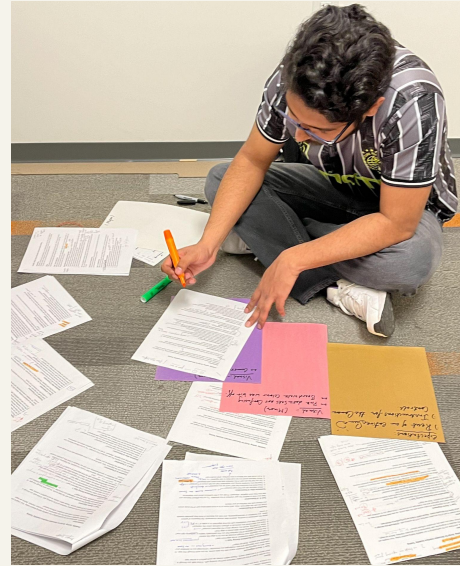
We appreciate your honest and thoughtful feedback!

Count of Based on my experience, I believe that the simulator interface would be easy to use for other people with similar




Data analysis and findings


- Thematic analysis
- Statistical analysis
- Survey analysis




→ Unable to identify how to rotate and move the scene.




"I have tried mouse and keyboard both but I am unable to identify how to move the scene."



"Honestly, I don't think so, I'll be able to find out the way to rotate the scene. "

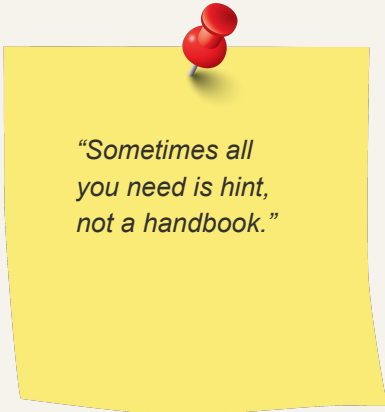


"Am I the only one who is unable to move the scene."

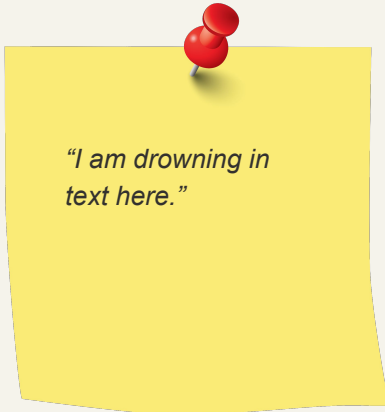


"Is there exists any information to identify, how i can move the scene."

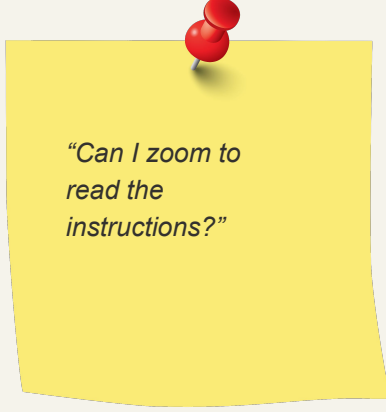
→ Navigation instructions are text heavy.



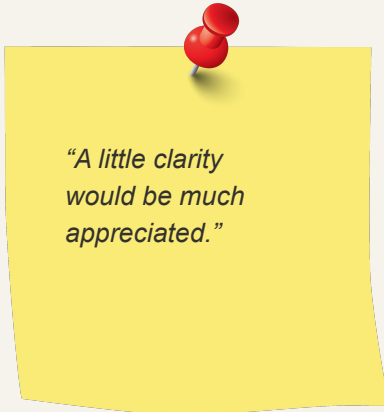
"Sometimes all you need is hint, not a handbook."



"I am drowning in text here."



"Can I zoom to read the instructions?"

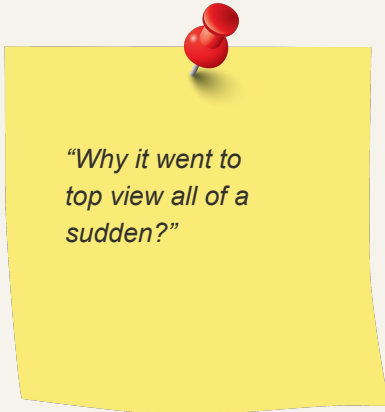


"A little clarity would be much appreciated."

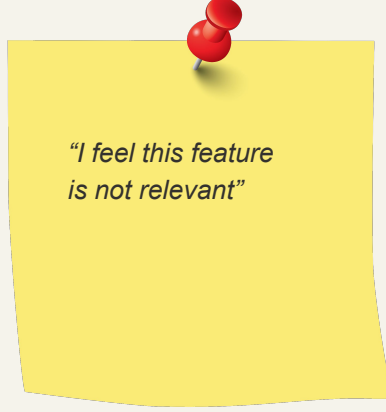
→ Zoom in Zoom out feature was not upto the expectations.



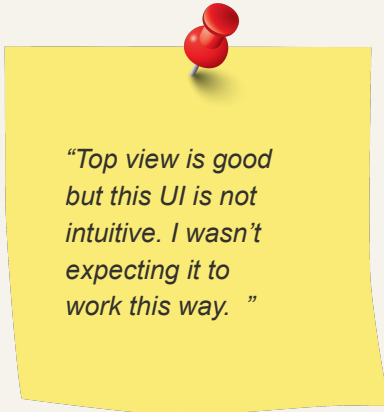
"It's bit weird"



"Why it went to top view all of a sudden?"




"I feel this feature is not relevant"




"Top view is good but this UI is not intuitive. I wasn't expecting it to work this way. "


→ Visuals of scene could have been improved.




"I would have aligned the scene if the colour would have been bit different."



"Layer of scene looks very similar to the grid."

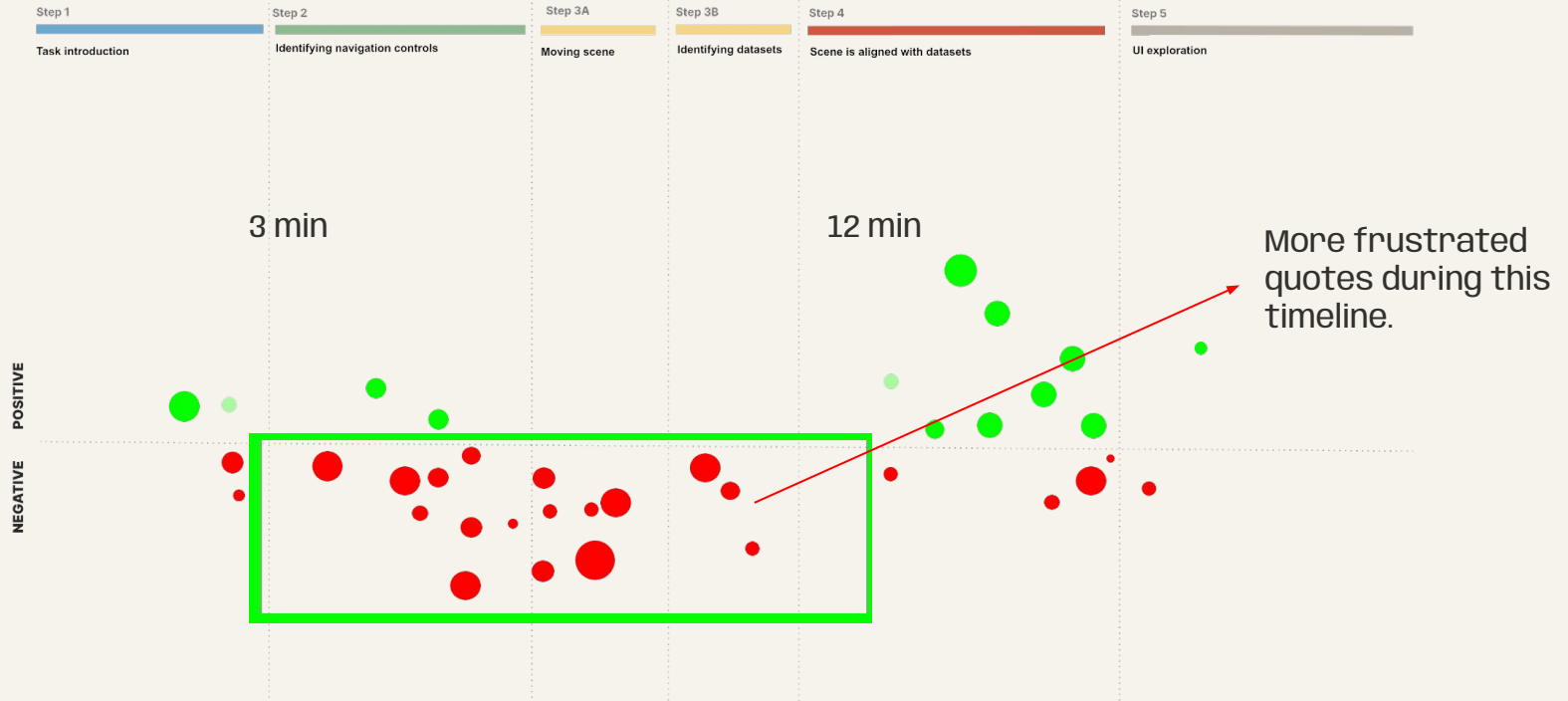


"Add some colours to the scene, white looks bit off."

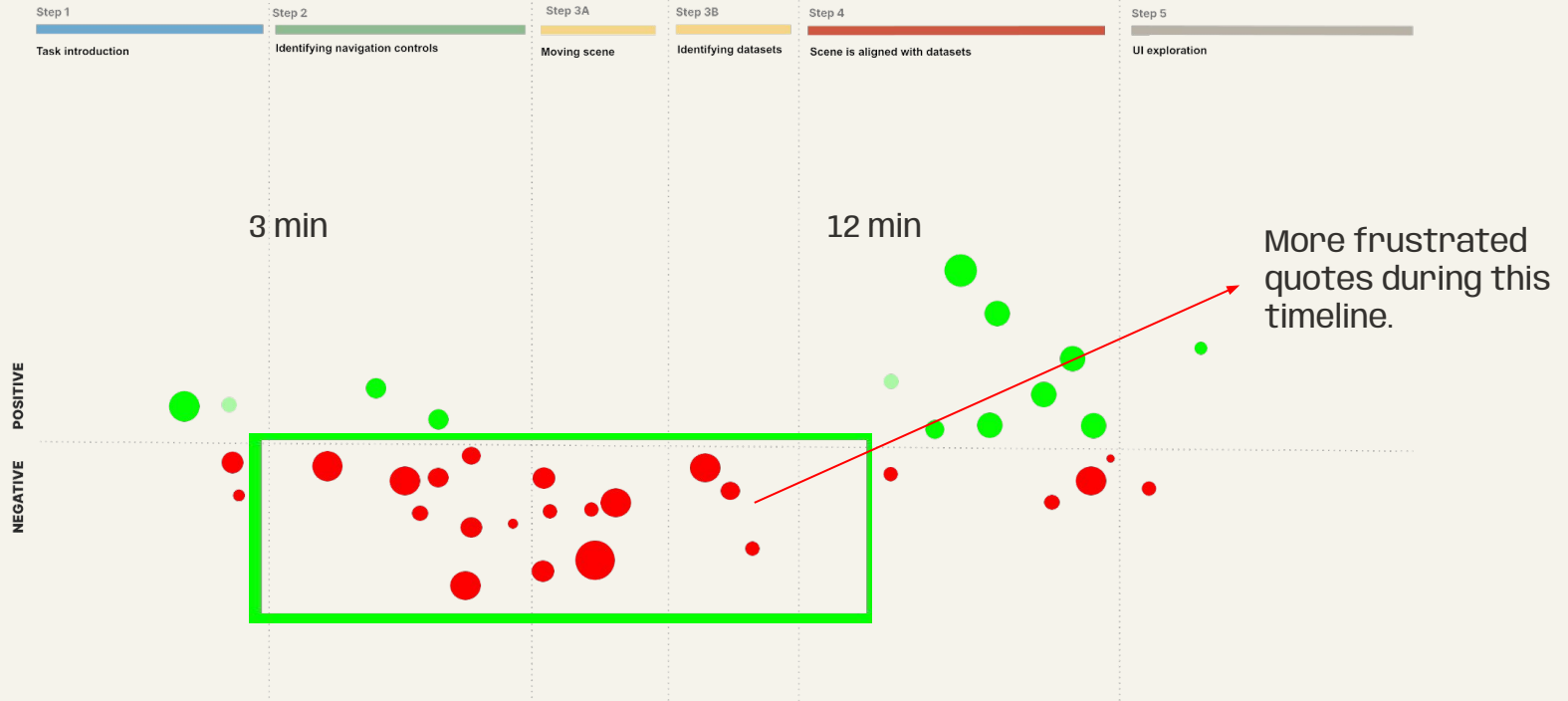


"Some volume can make scene look good"

→ Emotion analysis through “quotes”.



→ Participants are confused and frustrated initially.



Quantitative Analysis

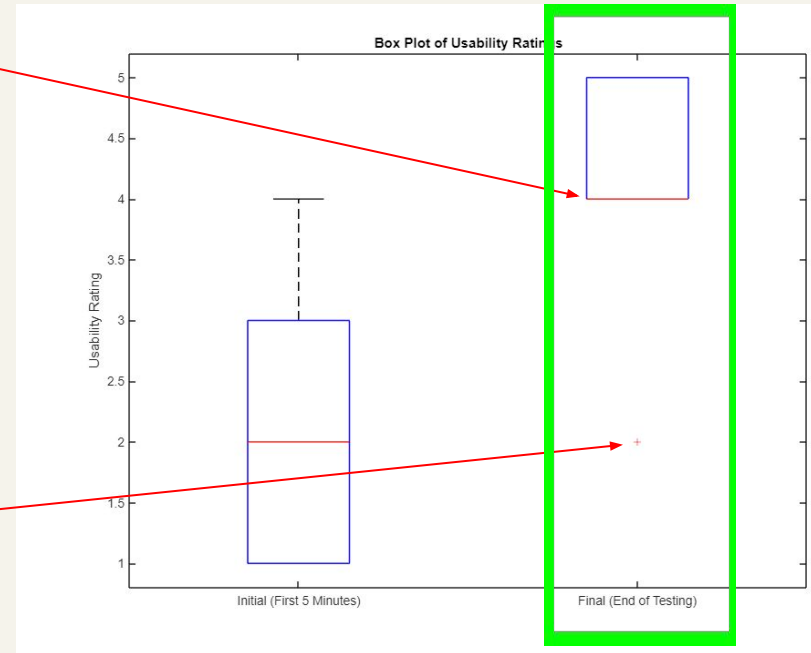
→ Box plot: Initial phase analysis

- To gauge participants' initial reactions and their evolving perceptions of the interface, we introduced a **two-point assessment within the testing procedure**.
- **Median Usability Rating:** The median, indicated by the red line within the blue box, appears to be around 2, **which suggests that initially, the median user rated the usability relatively low**.
- **Interquartile Range (IQR):** The box representing the middle 50% of the data (from the first to the third quartile) spans from about 1.5 to 3. **This wider IQR indicates a significant variation in how users initially perceived the usability of the UI.**



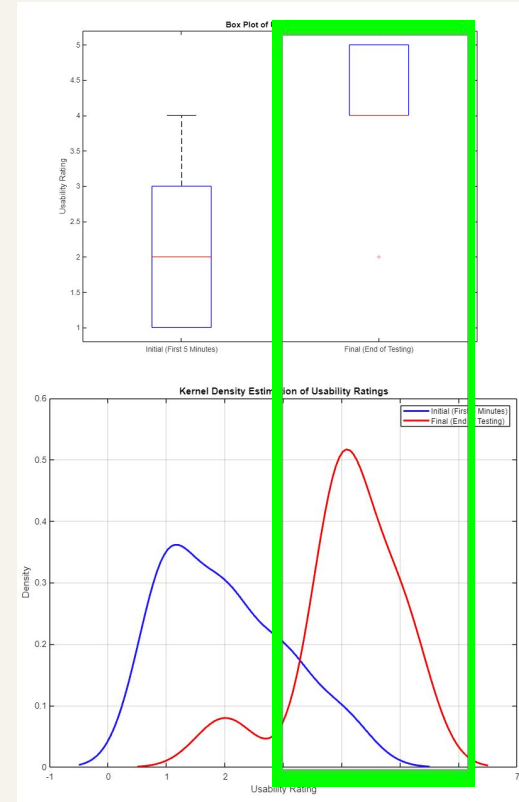
→ Box plot: Final phase analysis

- **Median Usability Rating:** The median here is significantly higher, which suggests that users' ratings of usability improved by the end of the testing.
- **IQR:** The box has very small IQR and, hence, less variability in user perceptions at this stage. Most users rated the usability consistently high.
- **Whiskers:** The lower whisker extends down only to around 4, and the upper whisker is at the maximum of 5, which shows that **all users rated the usability at the higher end of the scale.**
- **Outliers:** The plus symbol below the lower whisker of the final phase indicates one outlier. **This represents a single user who did not find the usability improved as much as others did.**



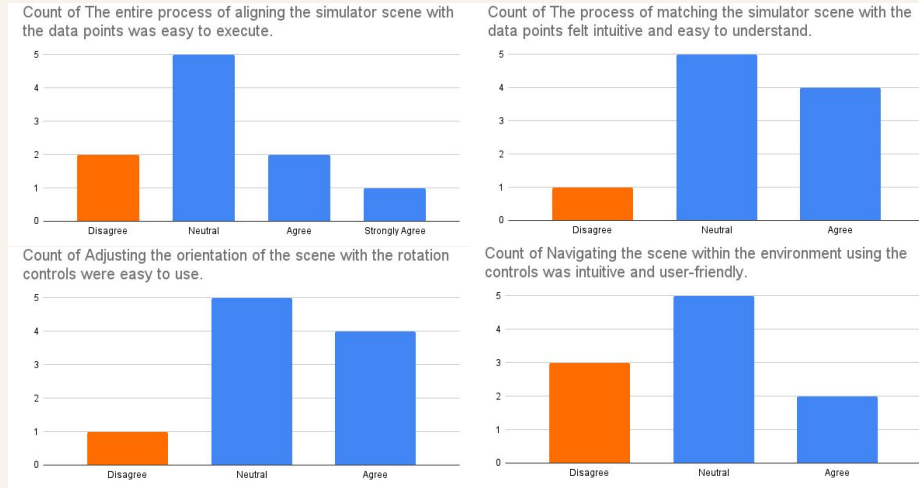
→ Comparative analysis

- Improvement in Usability:** There's a clear improvement in both the median usability rating and the consistency of ratings from the initial to the final phase. **This indicates that users found the UI more usable after they had more time to interact with it.**
- Learning Effect:** The change in the distribution of ratings suggests there's likely a **learning effect at play**. Users seem to be able to navigate the UI more effectively as they become accustomed to it, leading to higher usability ratings.
- User Experience Consistency:** By the end of the testing, the ratings are not only higher but also more consistent, implying that the users have a more **unified experience** with the UI after they have **learned its features and functions**.



In conclusion, while the initial user experience with the simulator have room for improvement, the overall user experience becomes positive with time and familiarity, which is a strong indication that **users appreciate more as they learn how to use the simulator features.**

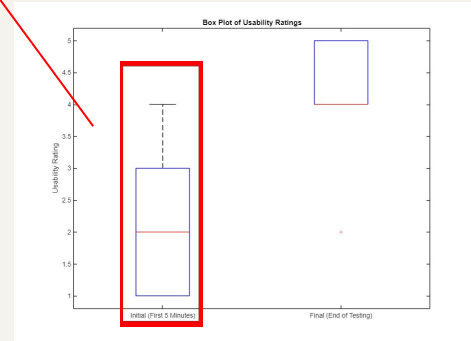
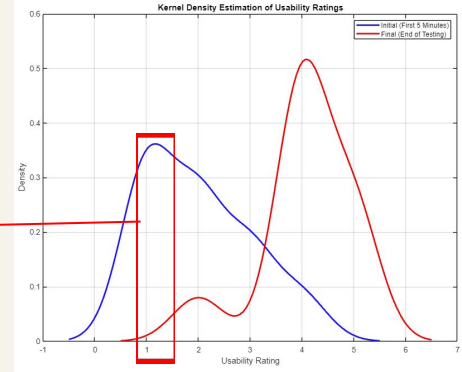
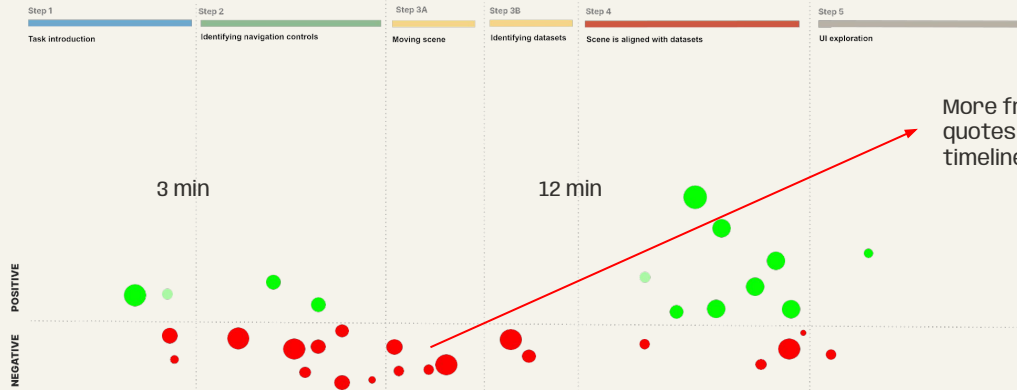
→ Survey analysis



From the survey results, participants **showed less disagreement** with the navigation features, which is a positive response to the usability features of the interface. However, many survey responses are **neutral**, which means there is a scope for improvement in the **intuitiveness of a user interface and navigation of the scene**.

Additional Insight

- Quantitative and qualitative results indicate that the learning curve for users could be enhanced. Providing a clear set of instructions or a video tutorial might be an effective way to improve their experience.



Thank You!

