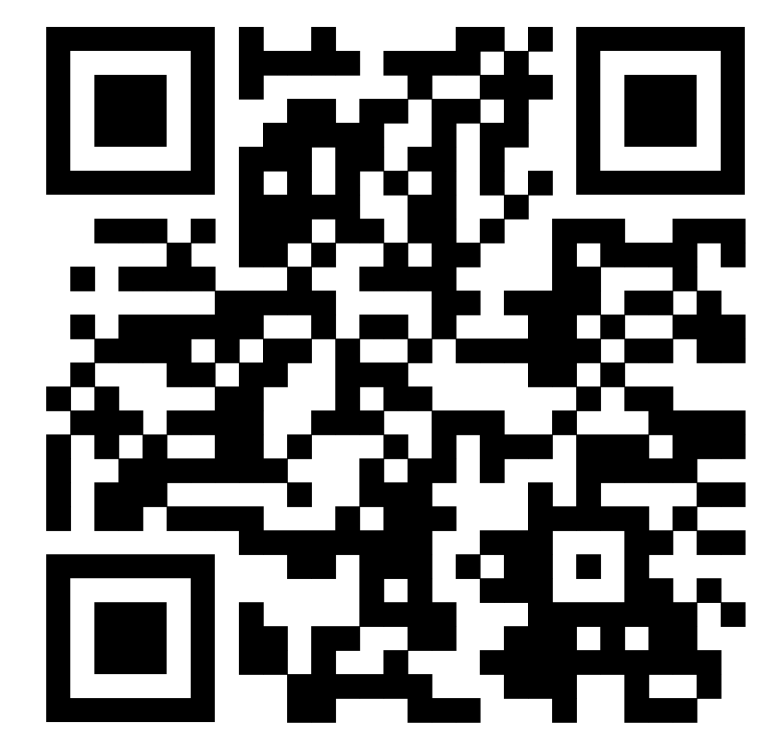




# Care VR Nursing

## Senior Design

Aman Hogan-Bailey, Andrew Mondejar, Charles Pham, Mark Holcomb, Yusuf Cavus



### Background

The Care VR Nursing system aims to give the nursing program at the University of Texas at Arlington a new tool to teach students about end-of-life care in a way that provides practical experience over the traditional classroom environment. This is vital because practical experience will better equip nursing students with the skills, expertise, and emotional support needed to care for hospice patients over the typical classroom education. Additionally, this project would improve the quality of care given by healthcare professionals, enhancing the reputation of the University of Texas at Arlington's nursing program and the experience of the hospice patient. The system will be integrated into the nursing curriculum to supplement traditional simulation and clinical practice. The goal is to improve the quality of palliative care from healthcare professionals.

### Key Requirements

The VR Palliative Care system allows users to interact with their surroundings and optimize the learning process beyond what traditional computer applications can offer. The goal of this system is to better equip nursing professionals with the knowledge and skills necessary to provide exceptional care to patients in palliative care settings.

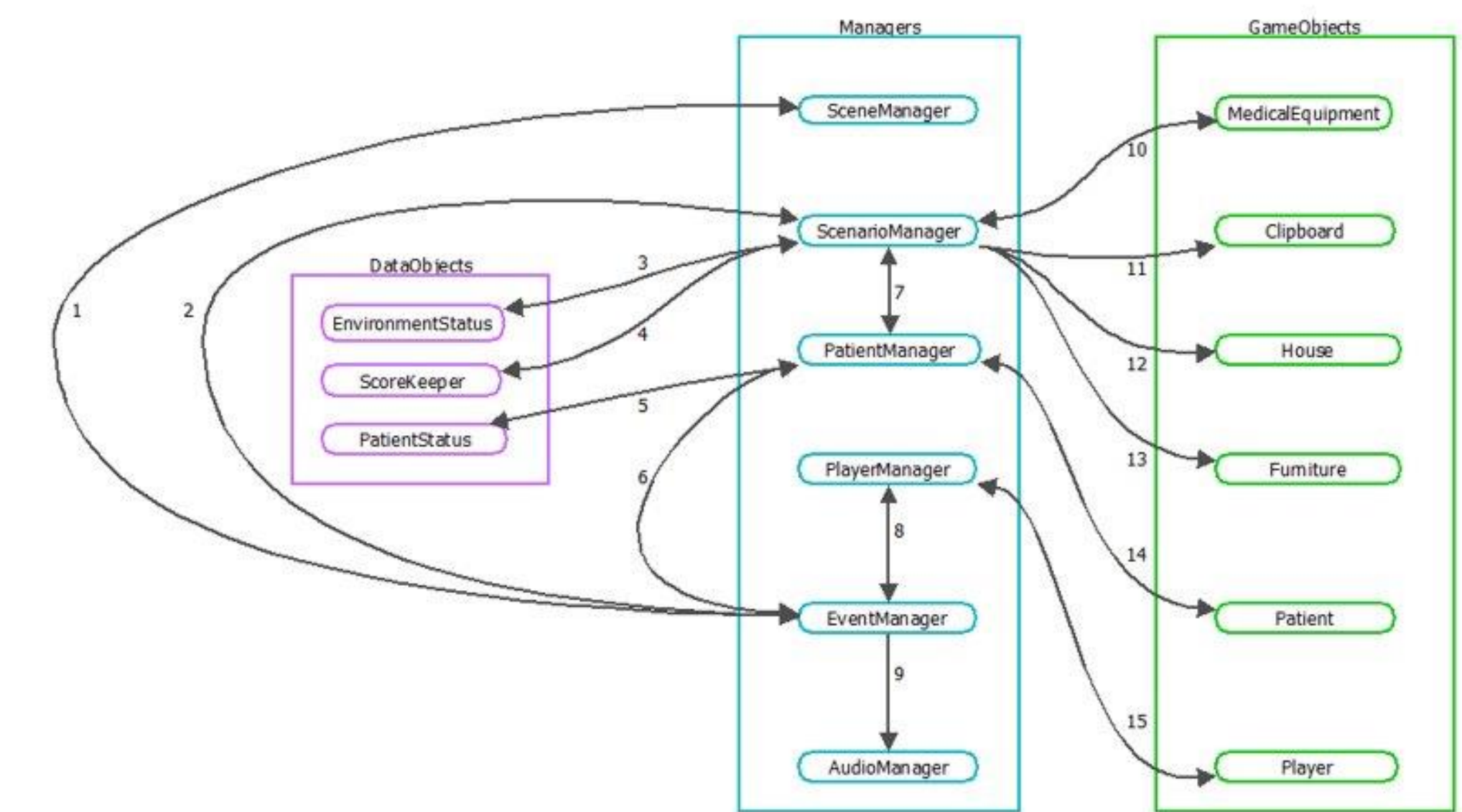
The requirements for this project include:

- **Customer Requirements**
  - Main Menu and Tutorial
  - VR Sickness Warning
  - Pause Menu
  - Scenario 1, 2, 3, 4
  - Results Screen
  - Dialogue Options
  - Hygiene
  - IV Administration
  - The Glasgow-Coma Scale
  - Patient Diversity
- **Packaging Requirements**
  - Product size
- **Performance Requirements**
  - Frame Rate
  - Thermal
- **Safety Requirements**
  - Motion Sickness Mitigation
  - Warning to User to Clear Nearby Obstacles
  - Warning to User to properly secure control stick
- **Security Requirements**
  - Maintenance & Support Requirements
  - Code documentation
  - Testing and Debugging
  - Version Control
- **Other Requirements**
  - C# Programming Language
  - Priority
  - VR Headset Independence
  - Headset Portability

### Architectural Design

The VR Palliative Care Simulation consists of three sections (layers): *Managers*, *Game Objects*, and *Data Objects*. The Manager layer controls how the game operates. The Game Objects layer displays the types of game objects used in the game. The Data Objects layer shows how the data will be collected and stored. Each layer interacts with each other by sending messages/using each other to run the game.

- **Manager Layer** - oversees the systems that initiate and execute the game's real-time logic. Its primary function is to segregate various functionalities into their distinct roles.
- **Game Object Layer** - defines the interactions of game objects within the virtual world, both with other objects and various systems.
- **Data Object Layer** - functions as a mediator, facilitating the communication between the application and the database to manage various data objects and entities.



### Implementation Details and Test Plan

The project runs on Unity, and uses OpenXR to enable support for a wide variety of headsets with little modification. The project has been developed with developers testing it on the Meta Quest 2 headset.

Each scene has independent progress tracking with the values of relevant variables stored in a database. As the player completes tasks, scripts run to inform the progress tracker, which acts as the database manager. The progress tracker will update information in the database, and also retrieve information from the database as needed.

Progress tracking is designed to allow for both real time information on task completions as well as and end of scenario summary of completed tasks.

Fixed?	Priority	Applicable scenes	Description
Yes	Critical	All	Missing user instruction on how to play scenario
Yes	Medium	Scene 4	Feedback Panels Missing
Yes	Low	Scene 2	Pre-briefing panels have button problems
Yes	Critical	Scene 4	Dialog with house owner broken.
Yes	High	Scene 1	Dialogue in phone convo, after the IV part, is unnecessary
Yes	High	Scene 1	Missing reassessment phase after morphine injection.
Yes	High	Multiple	Several scenes have talk buttons that do not work yet.
Yes	High	All	Missing control explanation
Yes	High	All	Pause button, and time, outside range of view.
Yes	High	Scene 1	Missing IV port.
Yes	High	Scene 1	Missing questions for patient.
Yes	High	Scene 1	Computer monitor too small to read.
Yes	Medium	Scene 2	Door opens before the user rings doorbell.
Yes	Medium	Scene 2	Doorbell to door open functionality broken
Yes	Medium	Scene 3	Scene 3 make medical equipment grabbable.
Yes	Medium	Tutorial	Tutorial scene instructions give wrong button for teleportation
Yes	Medium	Scene 1	Scene 1 enable opening door to exit.
Yes	Medium	All?	Teleportation outside the boundaries of the map can occur. (Dev notes: make a more limited teleportation area)

Fixed?	Priority	Applicable scenes	Description
Yes	Low	Scene 1	Morphine spawn location unintuitive.
Yes	Low	All	Add a back button on feedback panels
Yes	Low	Scene 1	hardcoded text output for total number of points in scenario 1.
Yes	Low	Scene 2	hardcoded text output for total number of points in scenario 2.
Yes	Low	Tutorial	Tutorial scene instruction text has spelling and grammar mistakes
Yes	Low	Tutorial	Tutorial scene instructions should include a way to rewind instruction panels.
Yes	Low	Main menu	Main menu makes several sounds and is laggy. Simplification is needed.
Yes	Low	Scene 1	Objects dropped on or near patient get stuck and cannot be picked up again.
Yes	Low	Scene 1	Scene 1 conversations: originally only patient convo enabled, enabling doctor convo disabled patient convo.
Yes	Low	Scene 1	Exit door incorrectly plays animation before end of scene.
No	Critical	Scene 4	Scene 4 is unfinished.
No	Critical	Scene 2, 3, 4	Lady is dressed too risque
No	Critical	N/A	Performance decreases drastically after 15-30 minutes of playing.
No	Critical	All	Levels finish without informing the user.
No	High	Scene 3	Unable to put on gloves.
No	High	Scene 1	Confusing choices in phone dialogue
No	High	All	No indicator for when the user does something right or wrong.
No	High	All	UI for dialogue choices is confusing.
No	High	All	Not every dialogue choice has multiple options.
No	Medium	All	Dialog option selection is very finicky.

### Conclusions and Future Work

The team resolved several implementation errors by tackling bug fixes, increasing readability and program consistency, and modifying the code logic for stability, scalability, and maintainability. The team also added several features to refine the user experience and removed other initial features based on feedback from the sponsor. Below are some future plans for the project:

**Resolve/Detect Bugs**- Streamlining the efficiency of the simulation and resolve any bugs and unimplemented features in the project backlog

**User Testing** - Test the simulation using students in the nursing department to consolidate needed and unneeded features, and detect additional bugs.

**Patient Diversity** - Support a change in race, gender, and financial status. When changing the financial status, the tools and house should change to reflect the patient's financial status.

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