CSE – 19Z620 INNOVATION PRACTICES

PROJECT 04

VESTIBULAR REHABILITATION SYSTEM USING IMMERSIVE VIRTUAL REALITY

ROLL NUMBERS

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2. 21Z214 – DEEPIGA S
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4. 21Z263 – THIRIKSHA S
5. 22Z435 – BRINDHA L

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Being presented by Roll No: 21z263

INTRODUCTION

VESTIBULAR SYSTEM:

The vestibular system is like your body's internal balance system, located in your inner ear. It helps you keep your balance, stay upright, and know where your body is in space. It's responsible for sensing motion, gravity, and changes in head position.

VESTIBULAR DISORDERS:

Vestibular disorders can cause problems with balance and coordination. Symptoms may include dizziness, vertigo (feeling like you or the room is spinning), nausea, and difficulty walking or standing.

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UNDERSTANDING THE NEED

Rehabilitation for Vestibular Disorders:

- Vestibular rehabilitation is a specialized therapy aimed at improving balance and reducing symptoms of vestibular disorders.
- It involves exercises and techniques to help reduce feelings of dizziness and improve overall quality of life for individuals with vestibular disorders.

Use of Virtual Reality (VR) in Rehabilitation:

- Virtual reality (VR) technology creates immersive, lifelike environments that can be used for rehabilitation.
- In vestibular rehabilitation, VR can simulate real-life scenarios and movements to help patients practice balance exercises in a safe and controlled environment.

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PROBLEM STATEMENT

This system aims to improve the precision and efficacy of rehabilitation exercises while enhancing patient engagement through integrating virtual reality.

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LITERATURE SURVEY

PAPER	AUTHOR	YEAR	INFERENCES
Virtual Reality for Vestibular Rehabilitation	Song, J. J.	2019	• VR Vestibular Rehabilitation Improves DHI Scores Significantly • Potential Long-Term Benefits of VR • Side Effects of VR Decrease Over Time
Virtual and augmented reality in the vestibular rehabilitation of peripheral vestibular disorders	Heffernan, A., Abdelmalek, M. & Nunez, D.A.	2021	• Dizziness underscores ENT's diagnostic and therapeutic importance. • Vestibular therapy stabilizes, reduces fall risks in patients. • VR technology optimizes rehab efficiency through immersive experiences.

EYE EXERCISE

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GAZE STABILIZATION EXERCISES:

1. In sitting or standing position, keep your eyes fixed on a single stationary object either held in hand or placed on a wall and move the head side to side / Up to down. Repeat the exercise for 5 times on each direction.

2. In sitting or standing position hold a single target in hand and keep your eyes fixed on target. Slowly move the target side-to-side/up-down/diagonally while head stays still. Repeat the exercise for 5 times on each direction.

EYE EXERCISE

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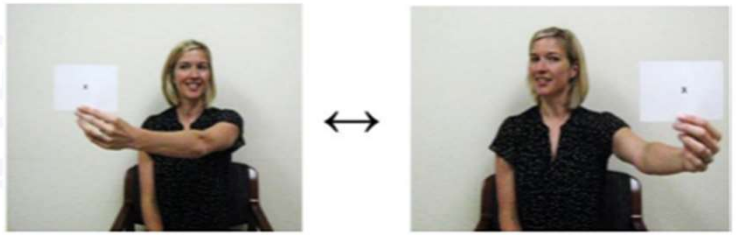
3. In sitting or standing position, hold a single target in hand and keep your eyes fixed on the target. Slowly move the target, head and eyes in same direction up-down/ side to side/diagonally. Repeat the exercise for 5 times on each direction.

4. In sitting or standing position, hold a single target in hand and keep your eyes fixed on the target. Slowly move the target up-down/side to side/diagonally and simultaneously move the head in the opposite direction of the target. Repeat the exercise for 5 times on each direction.



PROCESS MODEL

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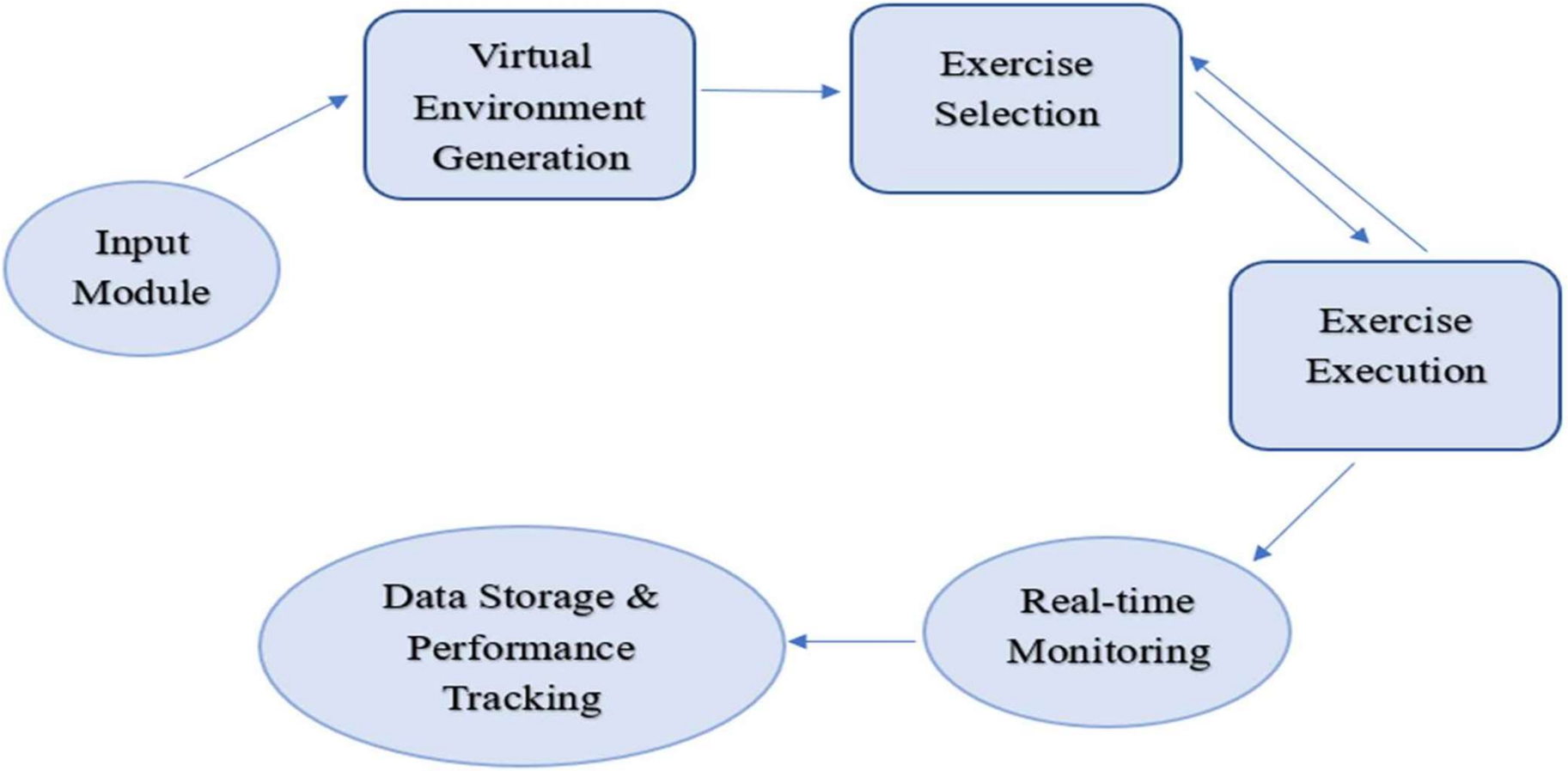

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EXISTING SYSTEMS

Many vestibular rehabilitation systems using immersive VR are game-based, incorporating gaming elements to enhance engagement while some focus primarily on simulating real-world environments and activities relevant to vestibular rehabilitation that include virtual environments.

DRAWBACK:

Some patients may experience motion sickness or discomfort when using VR headsets, which can limit the duration and effectiveness of rehabilitation sessions.

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PROPOSED SYSTEM

- This system transitions manual exercises and instructions, typically performed in a physical setting, into a virtual reality environment.
- It bridges the gap between traditional physical rehabilitation methods and immersive VR technology, that combines the tangible benefits of physical objects with the immersive advantages of VR.
- It provides gradual exposure to VR environments and smooth movements within the environment to reduce motion sickness and discomfort.

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SOFTWARE REQUIREMENTS

- Unity (version 2021)
- Plugins : XR Plugin
- Programming language: C#
- Blender

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HARDWARE REQUIREMENTS

- Oculus Quest VR Headset with hand controllers
- A console
- GPU

IMPLEMENTATION – 3D OBJECTS

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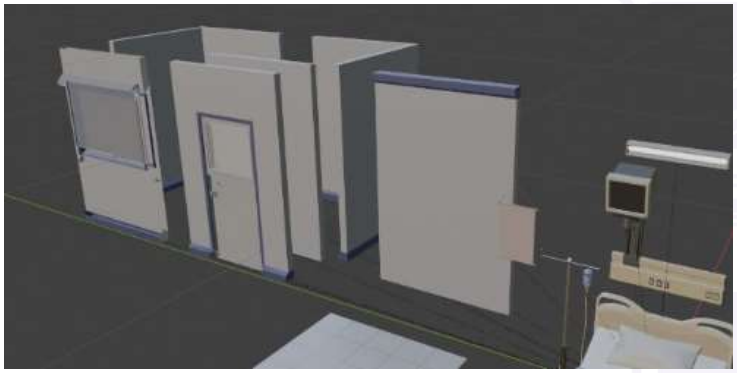

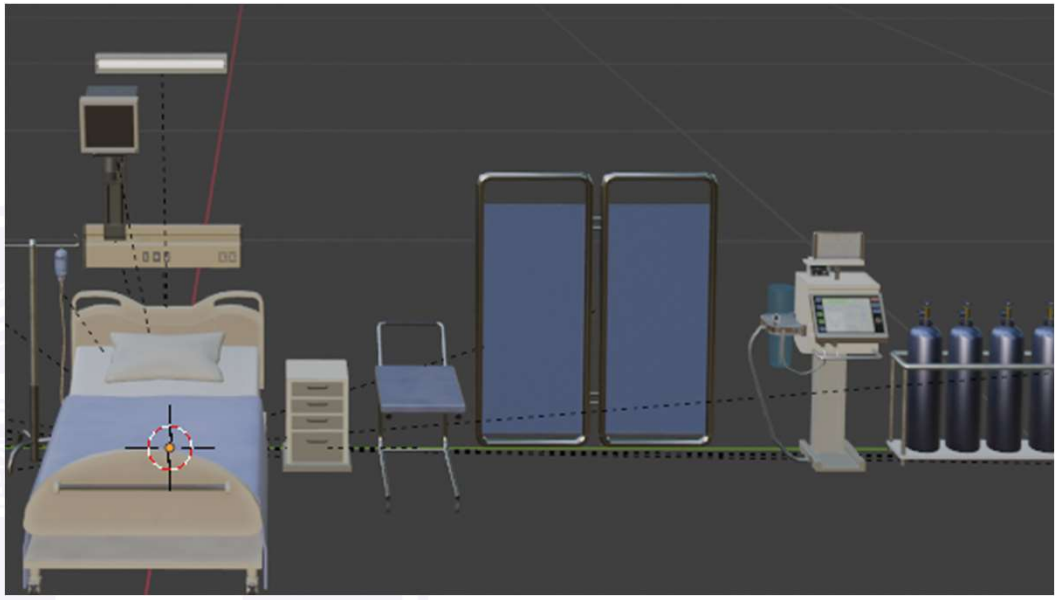

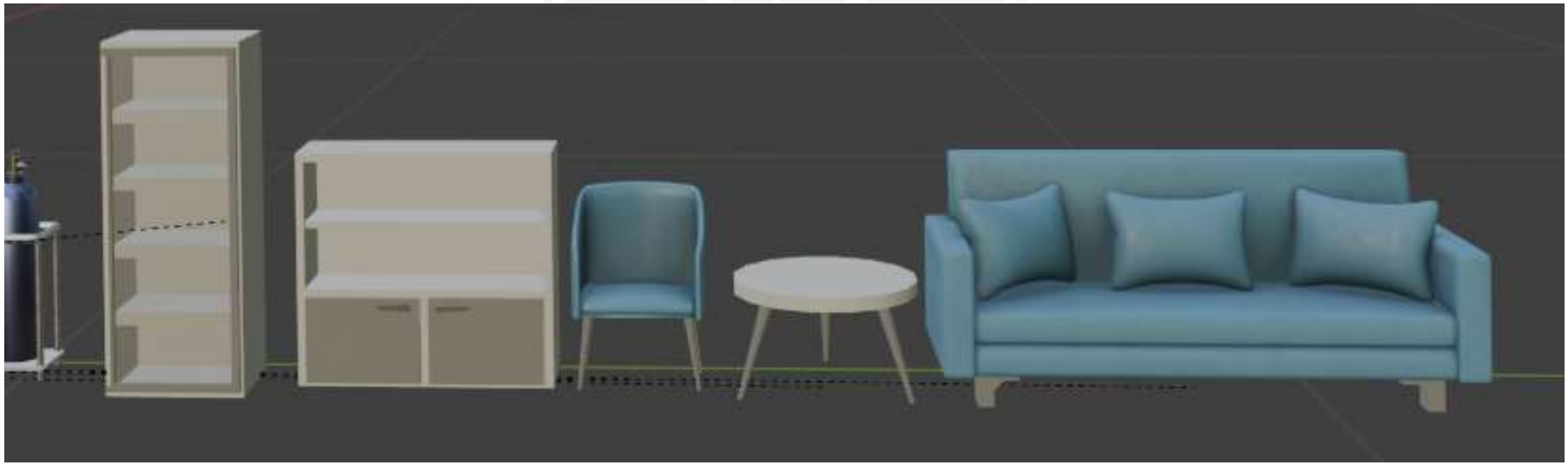

IMPLEMENTATION - VR ENVIRONMENT

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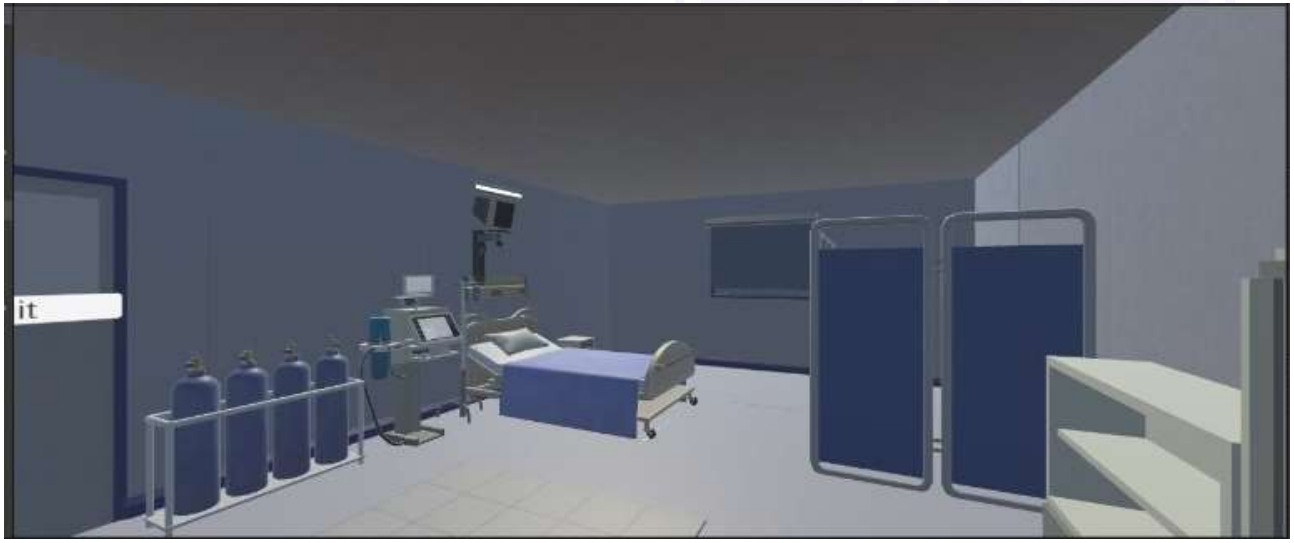

ACTIONS IN VR ENVIRONMENT

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- UI Press
- UI Pointer
- Rotate right & left
- Move / Fly Mode

EXERCISE IN VR ENVIRONMENT

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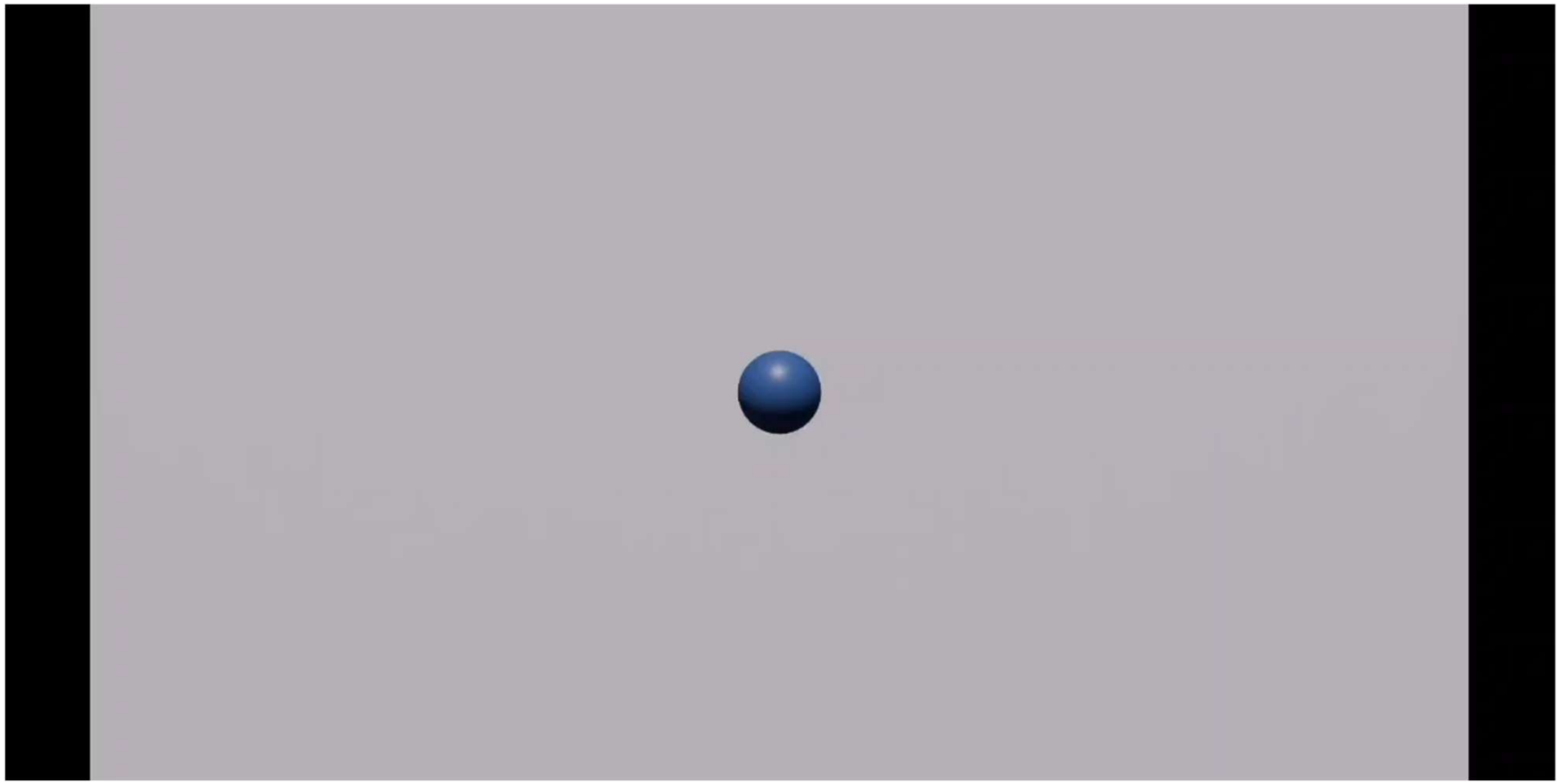

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REAL-TIME MONITORING:

- SideQuest is used for streaming the activities in the VR Environment on a monitor.
- The doctors can monitor patients' exercises through this.

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FUTURE DEVELOPMENTS

- Database Storage
- Performance Tracking
- Development of other Vestibular Exercises
  - Balance Exercise
  - Head Neck Exercise
  - Brandt Daroff Exercise
  - Object Manipulation Exercise

SLIDE TITLE

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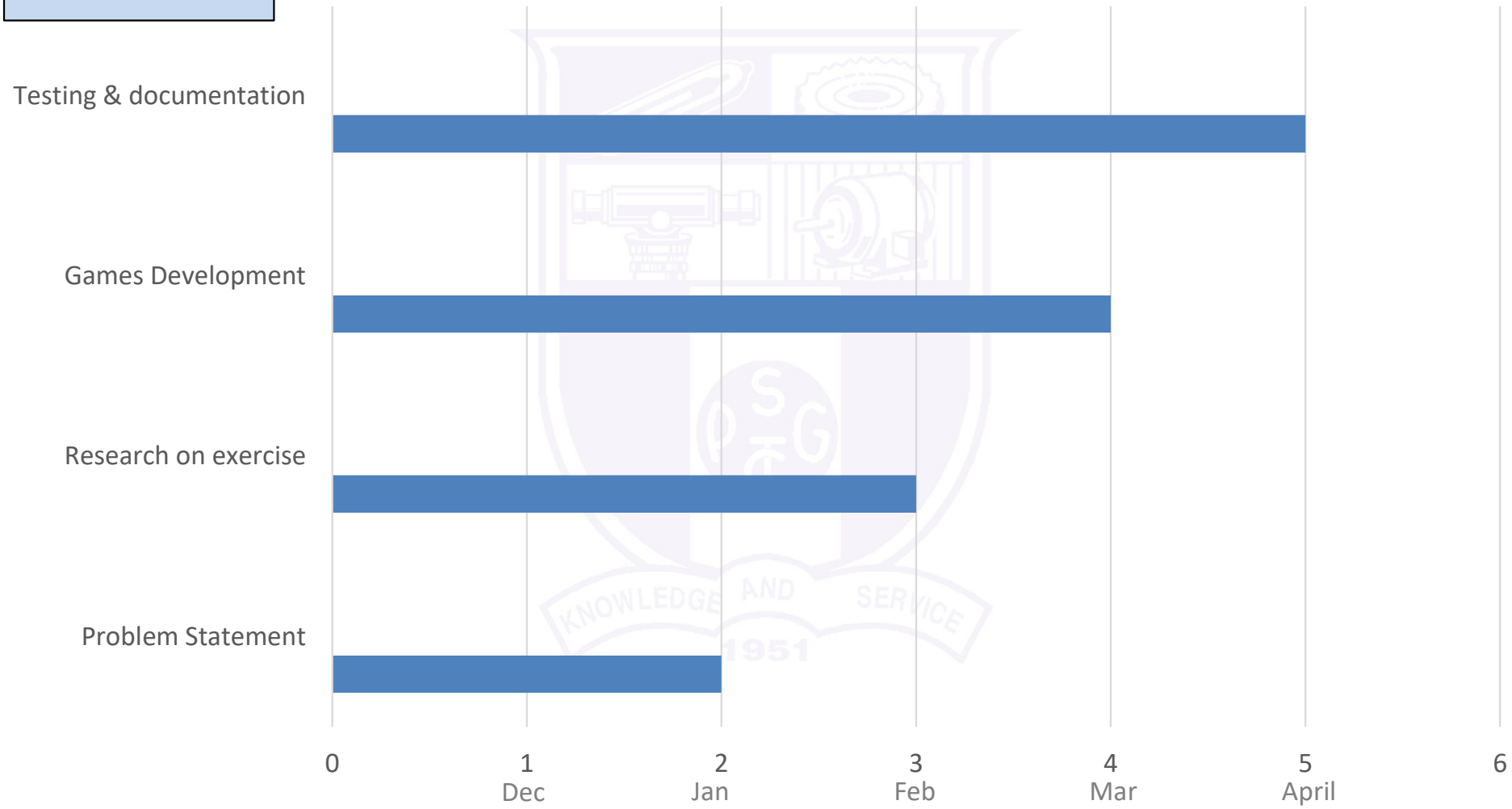

THANK YOU