Implementation of a Nonplayer Character (NPC) as a Versatile Learning and Assessment Tool for a Virtual Reality Radiation Protection Game

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Introduction and Motivation

- Goal is engaging the player with lessons about radiation physics using an NPC

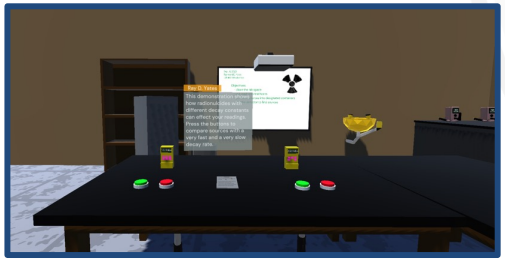
Technical Approach

- Unity game engine, C# programming
- Finite state machine
- Custom inspector for the NPC
- NavMesh with object collision boundaries and allowance for spatial imprecision

Results

Versatile NPC event system:

- NPC has smooth collision-free navigation based upon events
- Displays written dialogue
- Multi-choice answer prompts



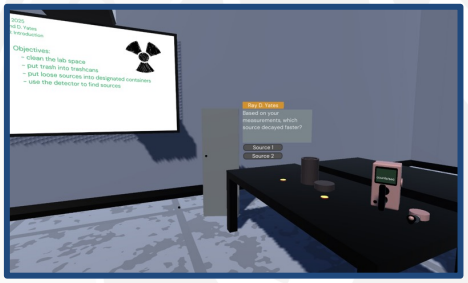
```
12 references
public class NPCState
{
    public string Name = "State";

    public int nextStateIndex = -1;

    public UnityEvent scriptCallbacks;

    public string[] dialogue;
    public string[] dialogueChoices;
    public int[] dialogueTransitionStates;

    7 references
    public enum WaitType
    {
        Signal, DialogueContinue, DialogueChoice, None
    }
```



Conclusion

- NPC provides the player with clear directions during tutorial
- NPC asks questions to assess player understanding

Next Steps

- Better 3D model and animations
- Recorded audio for dialogue

Improved User Interface and Radiation Physics Implementation in a Fully Immersive Virtual Reality Educational Experience

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Introduction and Motivation

- Players boot into initial room without guidance or context
- Lack of interactive tutorial material for radioactive decay

Technical Approach

- Interactive canvas game object as start menu
- C# scripted green and red buttons manipulate radionuclide state (presence)
- Three sources with different half-lives
- Real time detector displays count rates

```
1 reference
public void GreenButton()
{
    performDecay = true;
}

1 reference
public void RedButton()
{
    performDecay = false;
    packet.Counts = initialCount;
    ResetTime();
}
```

Results

- Starter screen introduces game
- Interactive workstation teaches decay

Conclusion

- Triggered starting screen improves player orientation
- Workstation concept effective as physics tutorial

Next Steps

- New workstations for inverse square law, radiation shielding, and activity

Mission Relevance

Teaching radiation protection in a VR environment will help future college students find a passion for the field and contribute towards nuclear safety at a global scale.

Expected Impact

Adoption of the VR environment in curriculum as an educational aid for the exploration of more dangerous radioactive material.

MTV Impact

Provided us opportunities to learn about a new field and discover an interest in nuclear safety.

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