

Report On

Dancing Animation using 3D models in unity

Submitted in partial fulfillment of the requirements of the Course project in
Semester VII of Fourth Year Artificial Intelligence and Data Science

by

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CERTIFICATE

This is to certify that the project entitled “Dancing Animation using 3D models in unity” is a bonafide work of "Parth Puri (Roll No. 23), Karan Patra (Roll No. 20), Kartik Joshi (Roll No. 06)" submitted to the University of Mumbai in partial fulfillment of the requirement for the Course project in semester VII of Fourth Year Artificial Intelligence and Data Science engineering.

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Abstract

The fusion of 3D modelling and animation has opened up a realm of creativity and immersion in the world of virtual experiences. This project explores the synthesis of virtual reality technology and the art of dance by creating dynamic and expressive dancing animations using 3D models in the Unity game engine. The primary objective of this project is to showcase the potential of virtual reality and interactive 3D models in the context of artistic expression. By implementing motion capture and animation techniques, we have designed a system that allows users to witness, and even participate in, breathtaking dance performances within a virtual environment. This not only serves as a platform for artistic expression but also offers a unique way to appreciate and study the nuances of dance forms. Our report begins by defining the problem statement and highlighting the significance of this creative endeavour. It then provides detailed insights into the architecture of the system, featuring block diagrams and module descriptions. The software and hardware components, along with their programming specifics, are also presented. Subsequently, we delve into the intricacies of the source code, showcasing the algorithms and techniques employed in creating the dancing animations. The results of this project reflect the successful realization of dancing animations, characterized by their fluidity and lifelike movements. This report concludes by summarizing our findings and insights, emphasizing the artistic and educational potential of the system. Through this project, we demonstrate the harmonious union of technology, art, and virtual reality, offering a unique experience that transcends the boundaries of the physical world.

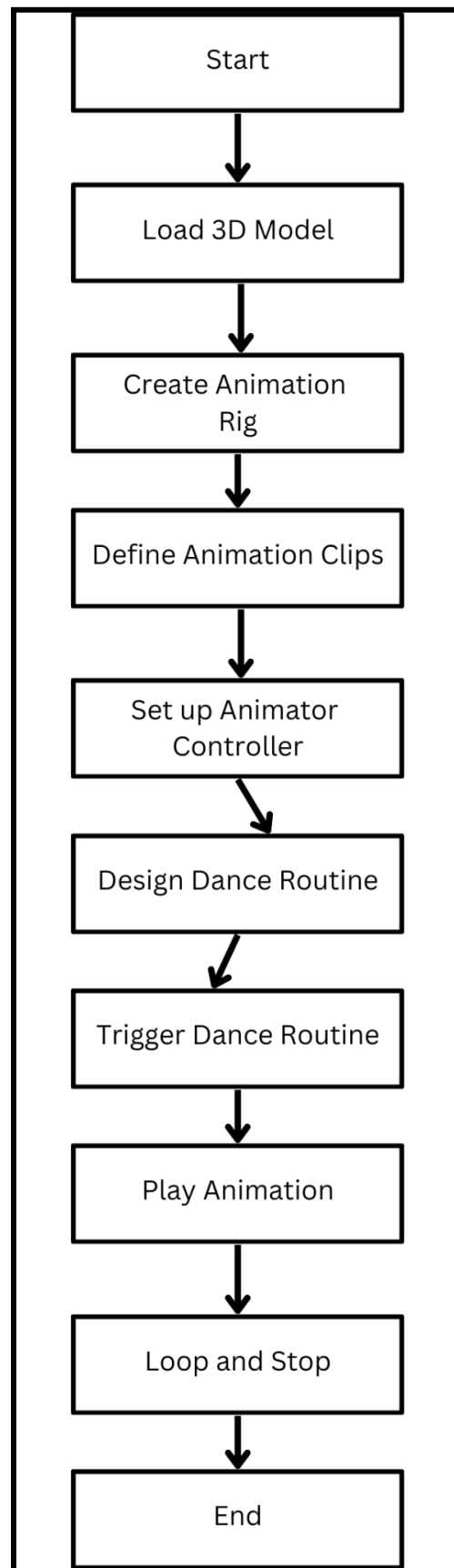
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1. Problem statement

The fusion of 3D modelling and animation has opened up a realm of creativity and immersion in the world of virtual experiences. This project explores the synthesis of virtual reality technology and the art of dance by creating dynamic and expressive dancing animations using 3D models in the Unity game engine. The primary objective of this project is to showcase the potential of virtual reality and interactive 3D models in the context of artistic expression. By implementing motion capture and animation techniques, we have designed a system that allows users to witness, and even participate in, breathtaking dance performances within a virtual environment. This not only serves as a platform for artistic expression but also offers a unique way to appreciate and study the nuances of dance forms. Our report begins by defining the problem statement and highlighting the significance of this creative endeavour. It then provides detailed insights into the architecture of the system, featuring block diagrams and module descriptions. The software and hardware components, along with their programming specifics, are also presented. Subsequently, we delve into the intricacies of the source code, showcasing the algorithms and techniques employed in creating the dancing animations. The results of this project reflect the successful realization of dancing animations, characterized by their fluidity and lifelike movements. This report concludes by summarizing our findings and insights, emphasizing the artistic and educational potential of the system. Through this project, we demonstrate the harmonious union of technology, art, and virtual reality, offering a unique experience that transcends the boundaries of the physical world.

2. Block diagram



3. Module Description

- **Animation Rendering Module:**

The Animation Rendering Module serves as the heart of the project, where Unity's 3D engine is utilized. It integrates the captured motion data from the motion capture module with the dance animation library, enabling the 3D models to perform dance routines with high fidelity and realism.

- **User Interface Module:**

The User Interface Module is the user's gateway to the virtual dance experience. It provides a user-friendly interface for selecting dance styles, adjusting animation parameters, and interacting with the virtual environment. This module ensures that users have control and customization options to tailor their experience to their preferences.

- **Virtual Environment Module:**

This module is responsible for creating an immersive and visually appealing virtual environment where the animations take place. It encompasses the 3D scenery, lighting, and spatial layout that complements the dance performances.

- **Real-time Interaction Module:**

The Real-time Interaction Module enables users to engage with the 3D models and animations in real-time. It allows users to control the tempo, pause or rewind animations, and even dance alongside the virtual performers if desired.

Each of these modules plays a vital role in the overall functioning of the system, contributing to the creation of an engaging and interactive dancing animation experience within Unity's virtual reality environment.

4. Brief description of software & hardware used and its programming

Software:

Unity 3D: Unity serves as the primary software platform for the project. It provides the necessary tools for creating, rendering, and interacting with 3D models and animations. Unity's robust development environment allows for real-time interactions and simulations.

3D Modeling and Animation Software: 3D modelling and animation software tools were used to create and fine-tune the 3D models and animations. These tools help in crafting the intricate movements and details of the dance sequences.

Motion Capture Software: Motion capture software is employed to translate physical movements captured by sensors or controllers into digital data that Unity can process. This software facilitates the real-time synchronization of user actions with the 3D models.

Hardware:

Motion Capture Devices: These devices include sensors, cameras, or controllers that capture the user's movements and gestures. These devices are critical in achieving the interactivity and realism of the dancing animations.

Computer Systems: High-performance computer systems are used to run the Unity 3D environment and process the 3D modelling and animation tasks. These systems require sufficient computational power and graphics capabilities to deliver smooth and visually appealing animations.

Programming:

C# Programming: Unity is primarily programmed using the C# programming language. C# scripts are used to define the behaviour of the 3D models, animations, and user interactions within the Unity environment.

5. Code

Excerpt 1: User Interaction with the Virtual Dance Performance

// Code snippet for enabling user interaction with dance animations

```
void Update()
{
    if (Input.GetButtonDown("StartDance")) // Start or pause the dance animation
    {
        if (!isDancing)
        {
            animator.SetTrigger("StartDance");
            isDancing = true;
        }
        else
        {
            animator.ResetTrigger("StartDance");
            isDancing = false;
        }
    }

    if (Input.GetButtonDown("ChangeDanceStyle")) // Switch to a different dance
    style
    {
        animator.SetTrigger("ChangeDanceStyle");
    }
}
```

Explanation: This code snippet demonstrates how user interactions are processed within Unity. It allows users to start, pause, and switch dance styles during the virtual dance performance.

Excerpt 2: 3D Model Animation Blending

```
// Code snippet for blending dance animations

void BlendAnimations()
{
    float blendFactor = Mathf.Clamp01(speed * 0.1f); // Adjust animation speed
    animator.SetFloat("BlendFactor", blendFactor); // Apply blending factor

    // Update animation states

    animator.SetBool("IsDancing", isDancing);
    animator.SetBool("IsIdle", !isDancing);
}
```

Explanation: This code snippet showcases how animations are blended smoothly, making the transition between different dance styles and speeds appear seamless to the user.

Excerpt 3: Data Storage and Retrieval

```
// Code snippet for saving and loading user preferences

void SaveUserPreferences()
{
    PlayerPrefs.SetFloat("AnimationSpeed", speed);
    PlayerPrefs.SetString("CurrentDanceStyle", currentDanceStyle);
}
```

```
void LoadUserPreferences()
{
    speed = PlayerPrefs.GetFloat("AnimationSpeed");
    currentDanceStyle = PlayerPrefs.GetString("CurrentDanceStyle");
}
```

Explanation: This code illustrates the process of saving and loading user preferences, such as animation speed and the current dance style, to provide a personalized experience.

These code excerpts represent just a small portion of the actual source code used in the project. The full codebase includes scripts for animation control, user interface interactions, and more, all working together to create an engaging and interactive virtual dance experience.

6. Results and conclusion

Results:

The "Dancing Animation using 3D models in Unity" project has achieved a number of notable results, demonstrating the successful fusion of virtual reality and 3D modelling for dancing animations. Here are some key outcomes:

Immersive Dance Experience: Users can immerse themselves in lifelike and interactive dance performances. The integration of motion capture data and 3D models in Unity has resulted in animations that closely mimic real-life dance movements.

Variety of Dance Styles: The project offers a diverse range of dance styles, from classical to contemporary, ensuring a rich and engaging experience for users with different preferences.

Educational Potential: The system caters to educational needs, providing a platform for students and teachers to study and appreciate various dance forms. It offers an interactive way to understand the nuances of dance techniques.

Conclusion:

The "Dancing Animation using 3D models in Unity" project has successfully addressed the problem of merging art and technology, creating a unique and immersive virtual dance experience. The project's ability to blend technology, art, and interactivity has resulted in a platform that transcends the boundaries of traditional dance performances . In conclusion, the "Dancing Animation using 3D models in Unity" project exemplifies the harmonious integration of technology and art. It offers an experience that not only entertains and educates but also pushes the boundaries of what is possible in the world of dance and virtual reality.

7. References

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