Final Year Project Proposal

TU857

Bilateral integration in virtual reality

Mykolas Kubilius
C20321456

School of Computer Science
TU Dublin – City Campus

27/09/2023

Table of Contents

Declaration

I hereby declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

Signed:

*Mykolas Kubilius*_____

Mykolas Kubilius

27/09/2023

Summary

My project idea is to implement bilateral integration into virtual reality. The term bilateral integration is the ability to coordinate both sides of the body together. For example, we can clap our hands together, or use a roller pin to roll out dough, but children with special needs don't have that skill acquired. So, I want to build a virtual reality game that will teach and help those children gain the important ability. I Looked up on the TUD's online library to see if there was a similar project done in computer science infrastructure, but I was unable to find any ideas similar to what I wish to do. There are a few VR-related ideas, but my idea is to use bilateral integration in VR. I think this would be a great idea as it will help the children with special needs learn how to integrate the skill of using your two hands independently. Children enjoy playing games and having fun so implementing a level-based game would allow them to enjoy while also getting the grasp of the bilateral integration skill. I also wish to implement a progression system that the teacher would be able to look at and see how each kid is doing.

Background (and References)

This idea was suggested by Bryan Duggan, he is a lecturer for Game Engines 1 that I have for this year. At first, I never thought that bilateral integration was an actual skill that most people would develop over time without any problems. Children with special needs find it difficult to obtain that skill set due to the lack of opportunities or they aren't challenged enough by their own environment. It is important for children to get that skillset because it allows them to engage in activities that allow them to use both sides of the brain such as running, skipping, or hopping on one foot or even catching a ball. It's also important for day-to-day life since you will be required to pick up objects, write or draw on paper and play different types of games with other children. There are schools dedicated to helping children with bilateral integration, they encourage children to participate in different types of activities and exercises such as lining up, pushing/pulling with both hands on the same object, practising tying shoelaces or drawing with two different crayons or colouring pencils simultaneously by making strokes with each hand. These are all done physically in the real world, but I think I can make it more entertaining, using VR and different types of movement sensors I can implement different types of games that require children to use both hands. An example of a game would be a flappy bird-styled game like Flappy Bird, where the child would have to flap their arms at the same time as a bird while they would go through the gaps of pipes. Another level idea would be a game where you would be required to clap at the end of a show. Or give them a virtual whiteboard and ask them to use two markers to draw on the board. So, using the example that is used by teachers I can implement those types of exercises in virtual reality, there will also be a progression system to check how many levels each child has passed and how long they spend in each level.

Madeline Jones, n.d. Bilateral Coordination: What It Is, Why Its Important, and How To Teach It [WWW Document]. Twinkl. URL https://www.twinkl.ie/blog/bilateral-coordination (accessed 9.27.23).

Proposed Approach

I am planning to use the agile methodology where it will be trial and error since I am not building this VR game for myself but rather making it for children with special needs. I will start off by getting some ideas of what type of exercises are currently being used in the real world by teachers and figuring out how I would implement those exercises into virtual reality and turn it into a fun level-based game that will also have progression so that the teachers can track how each child is doing and if they are completing the levels or to check if they are experiencing any difficulties. I will be using movement sensors, a VR headset and hand controllers that the sensors will monitor a child's hand movements which will then replicate the hand movements in virtual reality. I will be making levels designed to implement real-life exercises used and turn them into different types of fun mini-games that the children will enjoy playing, this will encourage them to keep building and adapting that bilateral integration skillset into their brains. By testing I am planning on putting my game to the schools that teach children with special needs, the teachers will monitor how they behave in the virtual world and examine if the games are suitable and easy to understand so that the children will not struggle to play them, they will monitor their progress and provide any feedback that they might have or address any concerns that need to be fixed or changed or if possible I could be there present to show the teachers how to use VR and also I will be able to monitor how children will interact with virtual reality. This project is targeted to help the children so the teacher's feedback will be greatly appreciated. There won't really be any need for maintenance other than implementing newer mini-games and exercises to my project that will be suggested by the teachers. As for implementation, I will be using a game engine known as Godot since it is the gaming software that I will be primarily using for my module game engines 1, and Godot supports the making of VR games. I am also planning to use an account system that will require a database, these accounts will be made by different children to adjust any settings during their gameplay, for example, light adjustment should the game be too bright for them, volume settings so that the gameplay wouldn't be too loud for them. For my testing, I am planning to use a Beta/Alpha method of testing, I would make a prototype of a completed level or even the whole game and give it to the children with special needs to try out under professional supervision. Then the teacher or the therapist can give an evaluation of how they think the game helped out, they can give me feedback that I can take into account and apply that to my game. Then I finish applying the feedback I will give the children to try it again. This will go back and forth until the therapist, or the teacher is fully satisfied that the game works the way it should be intended.

Deliverables

My project will be a Virtual reality level-based game that has implemented exercises and games that is being used in the real world by teachers to help children with special needs that don't have the bilateral integration skill. Each level will contain a mini game that will be entertaining and encouraging for the children.

Technical Requirements

- VR headset
- VR hand controllers
- VR sensors
- Game engine- Godot
- Database for accounts and settings

Conclusion

In summary, my project is about implementing bilateral integration into virtual reality. Using real life world example that is used by teachers to help children with special needs learn that skill, I will be putting those exercises and different games used by teachers into a level based virtual reality game, the game will contain progression that will be monitored by the teacher, the children will be required to complete each level to the best of their abilities while there will be a hidden timer that a teacher can look at to see how long each child is spending on each level.

References

- https://www.zotero.org/support/quick_start_guide

- https://www.twinkl.ie/blog/bilateral-coordination

- https://library.tudublin.ie/search?/XDT211C++Dissertations&SORT=D/XDT211C++Dissertations&SORT=D&SUBKEY=DT211C++Dissertations/1%2C33%2C33%2CB/frameset&FF=XDT211C++Dissertations&SORT=D&15%2C15%2C

- https://library.tudublin.ie/search?/XDT228++Dissertations&SORT=DZ/XDT228++Dissertations&SORT=DZ&extended=0&SUBKEY=DT228++Dissertations/1%2C149%2C149%2CB/frameset&FF=XDT228++Dissertations&SORT=DZ&28%2C28%2C

Appendix A: First Project Review

Title: EvolVR- Investigating procedural Ecosystems and Evolution

Student: Ryan Bryne

Description (brief):
The project aims to make a virtual ecosystem with diverse animal groups while simulating their evolution over time. These animals adapt to procedurally generated environments by passing their traits through genetic mutations. The animals AI is being controlled by a behaviour tree.

What is complex in this project:

- Terrain generation
- VR implementation
- The procedural movements of creatures
- The genetic mutations of animals through generations
- The animal AI behaviour tree

What technical architecture was used:
This project using virtual reality was made in Unity and used C# as the programming language.

Explain key strengths and weaknesses of this project, as you see it.
The biggest strength that I saw was the usage of AI to develop animal behaviours and allow animals to evolve their genetics through mutation, the weaker animals with poor genetic traits would die off while the animals with stronger traits would survive. There wasn't a lot of weakness that I could spot other then some issues that were noted that were not fixed like, Teleportation action got stuck or hands sometimes switched back to regular hands from teleporting when turning

Appendix B: Second Project Review

Hint: review a past project from the library website that relates to your project idea.

Title: VR Safari

Student: Elihu Essien-Thompson

Description (brief): VR safari is a game where the user is placed into a Safari viewing experience while attempting to take pictures of the animals to gain points while the animals roam freely. The player is allowed five minutes to gain points before the game is over and the score is shown.

What is complex in this project: The complexity was the Animal AI since it was made so that animals would act as realistically as possible in their placed terrain.

What technical architecture was used:
The virtual reality Safari game was made in Unity.

Explain key strengths and weaknesses of this project, as you see it.
I noticed the Animal AI to be an interesting strength since the animal would roam around and act in a realistic way, it included hunger that if the hunger meter would reach zero then the animal would die off if it didn't eat something.