

Emerging Trends (ACCB6019): Part 2 – Individual Reflective Journal.

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My Contribution:

- Leadership for the prototype/proof-of-concept and the software development.
- C++ firmware for the speed sensor (Raspberry Pi Pico W) [1].
- All code for the proof-of-concept procedural city environment in Godot engine [2].
- Communication with Godot developers (to help with bug fixes related to the Android version of Godot) [3].
- Research into similar products, particularly exercise bikes with games built in [4][5][6].
- Testing of the proof-of-concept on gym equipment.
- 3D printing.
- Contribution of ideas and features.
- All my own slides + associated research [7][8][9].
- Overseeing software development in Unreal Engine (by Gillean).

Evaluation of Risk Factors:

While we have done our best to ensure the safety of users, there is some risk associated with using VR headsets near moving machines. We have implemented various methods to reduce the risk as much as possible.

Treadmills:

Issues:

- On a treadmill, the main risk is falling. This could be triggered by motion sickness / dizziness caused by the VR environment, or by becoming disorientated due to being unable to see your (the users) position in the real world.

Solutions: Multiple safety nets have been proposed.

- Ensuring that the user is connected to the emergency stop cord on the treadmill.
- Ensuring the user is holding the headset controllers (the Quest controllers can detect the presence of a hand), and that the controllers are fixed to the treadmill via sturdy clips (if they do come loose, the movement can be detected, and the headset can be put into passthrough mode allowing the user to see their environment).
- In the proposed final product, using a two-way connection which allows the game environment to control the treadmill, it would be set up with an emergency stop button on the controllers so that the user doesn't have to lift their headset or find the stop button on the treadmill by feel if they start to feel dizzy or want to stop without navigating the UI.

Cross-trainer Machines (not our main target):

Issues:

- Cross-trainer machines are typically safer as the user is always holding on.
- The user would be strongly encouraged to hold the machine itself rather than the controllers, or to use only one controller if they needed to.
- However, there is still a risk of motion sickness / dizziness, which could lead to a fall.

Solutions:

- The same features would be in place as with a treadmill, namely an emergency stop button on the controllers, and automatic triggering of passthrough mode if anomalous movement was detected.

Exercise Bikes:**Issues:**

- The risks associated with using VR on an exercise bike are much lower than either a treadmill or a cross-trainer because the user is seated.

Solutions:

- The controllers can be mounted if the user desires, but this won't be mandated for exercise bikes.
- The emergency stop button will still be present on controllers, this will not stop the machine as an exercise bike is not self-propelled, but it will enable passthrough mode on the headset.

Inbuilt safety in Meta Quest headsets:

- All Meta Quest headsets automatically enable passthrough mode if the user leaves the safe area or comes too close to an object or wall.

Conclusion:

The experience should be generally safe for adults who don't suffer from motion sickness caused by VR. The solutions proposed will not entirely mitigate the risks involved in movement and use of machinery while being unable to see the real world; however, there should be no greater risk than using either VR [10] or gym equipment [11] separately.

We would, of course, get a professional health and safety assessment [12] before taking the product to market, and work closely with regulators to ensure the product was suitable for consumer use.

Design Limitations:

- The scope of integration between exercise machines and the game environment will depend on the APIs available for each brand of exercise machine.
- The market is potentially limited, but the cost at our end is relatively low as what we're proposing is largely software, so I envisage we could make a profit without much difficulty.

Team Ratings:

Everyone did well, Andrew (team leader) kept everyone up to date and encouraged communication – helped by Morgan who also carried out lots of research. Having separate leaders for specific areas made sure that everyone was doing what they were best at and giving guidance to the rest of the group based on their expertise. Gillean, who's secondary role was to help with software, did great, handling most of the Unreal Engine implementations along with

Andrew. Rory, in charge of the overall design, cooperated with everyone and shared ideas freely. Overall, I'm very happy with the experience and would award everyone a rating of 5/5.

Related Products:

There are a few potential competitors, similar products include the Exerbike GS [6] (an exercise bike that works as a game controller for PC and Xbox) and Holofit VR [13] (a VR application that works with multiple exercise machines).

Future Development:

Continuation of our project would include development of the application for exercise machine consoles, continued development of the game environment, 3D recordings of real-life hikes and cycle routes around the world, development of in-app purchases of store content e.g. community maps, et cetera.

Personal Reflection:

The project met our design goals, I contributed notably to the final product and maintained good time management throughout.

Technical Reflection:

The scope was adjusted a little during the project as we had originally aimed to produce a full prototype level; however, the outcome was satisfactory. The speed sensor was a huge success given our lack of a budget, along with the Godot VR environment and the 3D printed clips.

References:

- [1] “Buy a Raspberry Pi Pico,” Raspberry Pi. <https://www.raspberrypi.com/products/raspberry-pi-pico/> (accessed Mar. 18, 2025).
- [2] Godot Engine, Version: [4.4.stable, 4.5.dev], Godot Foundation, 2025. <https://godotengine.org/>
- [3] “Mouse Capture not working on Android” *Github.com*, 2025. <https://github.com/godotengine/godot/issues/103196> (accessed May 02, 2025).
- [4] M. Hanlon, “Exertris Interactive exercise-bike,” *New Atlas*, Jun. 04, 2004. <https://newatlas.com/exertris-interactive-exercise-bike/2123/> (accessed Feb. 13, 2025).
- [5] A. Bankhurst, “Playpulse ONE Is an All-In-One Exercise Bike, Video Game Console, and Entertainment System - IGN,” *IGN*, Apr. 13, 2021. <https://www.ign.com/articles/playpulse-one-is-an-all-in-one-exercise-bike-video-game-console-and-entertainment-system> (accessed Feb. 13, 2025).
- [6] “Exerbike GS - Exergame UK,” *Exergame UK - Europe’s No1 Supplier of Interactive Fitness and Gaming Products*, Jul. 26, 2020. <https://exergame.co.uk/product/exerbike-gs/> (accessed Feb. 13, 2025).
- [7] Michael Dawe, “Progress Presentation”, unpublished (previously submitted), 2025, slides 21-25 & 34.
- [8] Michael Dawe, “Presents: StrideVR (Progress Presentation 2)”, unpublished (previously submitted), 2025, slides 14-18 & 40-41.
- [9] Michael Dawe, “Presents: StrideVR (Hackathon)”, unpublished (previously submitted), 2025, slides 17-22 & 53-54.
- [10] NSPCC, “Virtual Reality Headsets,” *NSPCC*, 2023. <https://www.nspcc.org.uk/keeping-children-safe/online-safety/virtual-reality-headsets/> (accessed Feb. 13, 2025).
- [11] “Safety Concerns with Exercise Equipment,” *AKFIT Fitness Specialty Store*. <https://akfit.com/blogs/own-your-fitness/safety-concerns-with-exercise-equipment> (accessed Feb. 13, 2025).
- [12] “Product Safety Assessments,” *SGSCorp*, 2024. <https://www.sgs.com/en-gb/services/product-safety-assessments> (accessed May 02, 2025).
- [13] bojana, “HOLOFIT - VR Fitness App for Your Rower, Bicycle or Elliptical,” *HOLOFIT by Holodia*, Oct. 07, 2024. Available: <https://www.holodia.com> (accessed Feb. 13, 2025).