

Golf VR

Students:

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Supervisors:

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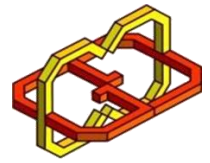
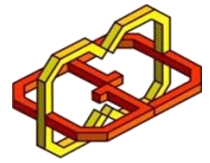


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Who We Are:

We, David Avnerson and Hanan Sabo, are undergraduate students, at the Computer Science faculty, at the Technion – Israel's Institute Of Technology.

We have participated in a Virtual Reality project, conducted by Mr. Boaz Sternfeld, and Mr. Yaron Honen, in course number: 234329.

Abstract:

Our main goal was to simulate a first person Golf experience, using the HTC Vive kit.

We also wanted to learn about the new and evolving world of VR. Gain hands-on experience, with the newest technology, alongside getting to know the Unity environment.

We have successfully made a VR application, which simulates a first person experience, of an enjoyable, yet not accessible in common means.

We have made it possible to play a golf course while being able to stay stationary, at a one place, but still like you can explore the whole course.

We have simulated a physics system, which made the experience feel authentic, from the free ball velocity, to simulate friction with different surfaces, and many more.



Tangent Systems & Development Environment:

- HTC Vive:

The HTC Vive is a virtual reality headset developed by HTC and Valve Corporation. The headset uses "room scale" tracking technology, allowing the user to move in 3D space and use motion-tracked handheld controllers to interact with the environment.



VIVE™

- Unity:

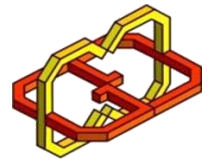
A cross-platform game engine that can be used to create both three-dimensional and two dimensional games, as well as simulations for desktops and laptops, home consoles, smart televisions, and mobile devices. Unity is scripted with C# in Visual Studio.



- Visual Studio:

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code.





- **Git:**
Git is a distributed version control system for tracking changes in source code during software development. It is designed for coordinating work among programmers, but it can be used to track changes in any set of files. Its goals include speed, data integrity, and support for distributed, non-linear workflows.

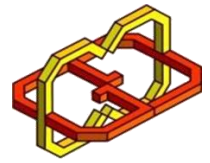


- **GIMP:**
GIMP is a cross-platform image editor available for GNU/Linux, OS X, Windows and more operating systems. It is free software, you can change its source code and distribute your changes.
Whether you are a graphic designer, photographer, illustrator, or scientist, GIMP provides you with sophisticated tools to get your job done. You can further enhance your productivity with GIMP thanks to many customization options and 3rd party plugins.



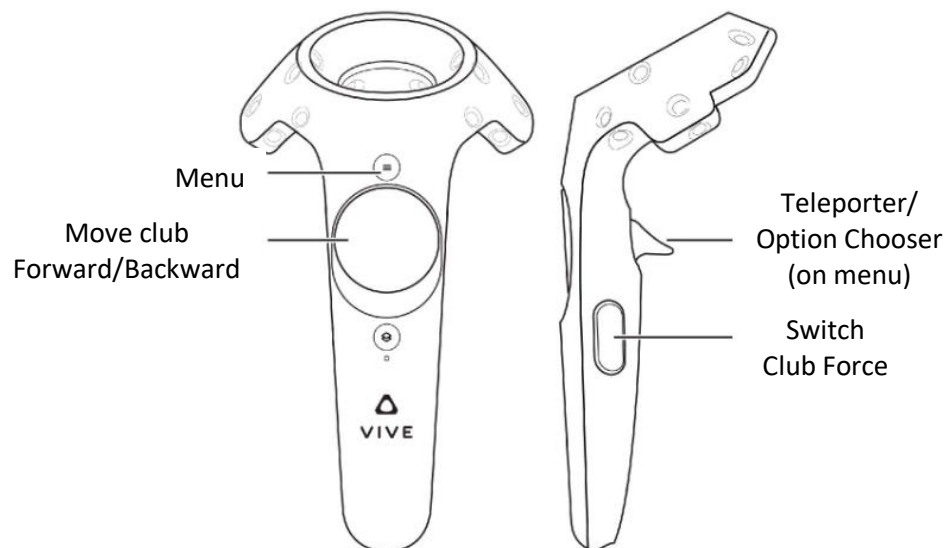
- **Golf Pack 18-hole Course:**
Golf Pack 18-hole Course is a Unity asset. This package contains a full 18-hole golf course in a low-poly art style + lots of golf props to help us build our own golf simulation.

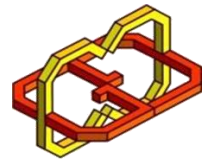




Application Overview:

- Movement:
 - Alongside walking regularly, you can also move in-game, using teleporter, while staying at the same point in real life.
 - If the ball is hits too far, an automated golf-cart takes the player to the landing site of the ball.
While in-driving the player can enjoy the view.
- Clubs Changing:
 - You can adjust the force a swing will give the ball by changing the club to a different one.
 - There is three different clubs – identified by the different color.
- Adjust Club Height:
 - In order to fit the club to each individual, with different height, the player can move the hands that holds the club higher or lower.
- Swing:
 - After adjusting all the previous properties (location, club power & height) – one can simply hit the ball by swinging the club and hitting the golf ball.
 -
- Controls:
 - The following is our controllers input map, to use the above mentioned features:





Development Process:

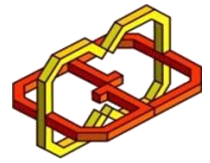
The development process of our project, was characterized by modular, feature driven work, which has allowed us to adapt to the changing requirements, and risen problems, fairly quickly, and efficiently. Each of our features, such as the teleporter, self-driven cart, and the club changing, was developed separately, so, for example, when we needed to add haptic feedback when hitting the ground, after the mid-semester meeting, in which the supervisors directed us to where the project should go. The changes we have made were minimal, and we were able to update, in a way which didn't effect features, other than the swing itself.

We have been using the Git version control system, to allow easy tracking of our changes & backup, and working from different computers. Which was a very wise decision due to the fact that we didn't have a personal station in the lab.

For a realistic physics system, to make the user feel like he is not in a simulation, from a physics stand-point, we manually tried to perfect each parameter, by implementing a trial and error approach, in various stages of our development. Additionally, at the beginning, our project wasn't supposed to include the cart feature, but due to feedback, we have decided to implement it, for a better user experience.

For even more of a realistic feel, we have added a dynamic sound feature, which includes traffic sound on street level, but when you go up, that sound switches to a wind breeze, which gives the user a better location perception, to enhance the user's experience.

The development of a program in a completely new environment (Unity) and concept (Virtual-Reality) was an exciting challenge, rewarding in knowledge that we gained, and satisfaction of accomplishments we achieved. A small example: the cart behavior forced us to learn about the 'baking' process, in which the object acquire new qualities. And simultaneously we accomplished to define the baking properly in order for the cart to travel as fluent as possible.



Future Development:

Unfortunately, this project has come to an end, and our work on it has to stop. We would like to suggest a few additions in future works, to further enhance the application's user experience, and perhaps to give it various purposes:

- Leaderboard – keep track of the most successful players – the ones which finished with the least hits as possible (both per hole and the entire course).
- Add a competition mode in which more than one player can play each time.
- Add a network-multiplayer option.
- All of the above in order to add some competitiveness element to our system.
- Add different level of difficulty (expressed in the starting distance from the hole, clubs power variety, diameter of hole etc.).
- Adding a 'shuffle' holes mode – if one wants to change the order of the holes in the course.
- Make the arrow that direct to where the flag is to change its size dynamically, relatively to where the player is.