Overview:

One of the more prominent issues with VR is the way HMDs (head mounted displays) like the HTC VIVE and Oculus Rift are the limited by the amount of room the user has available to move around in. Many developers have found interesting ways around this problem, where most of these alternatives have been covered in our class (some alternatives we covered: teleportation, flying around with the wands, exaggerated hand movements, etc.). While other developers might limit the size of their game by limiting how much room the player has, the idea of 360-degree treadmills may make this an issue of the past, if done correctly.

History:

Just like virtual reality, 360-degree treadmills have been around for a while. Notably the use of such a treadmill in the early 2006 by the military (alongside the CAVE) to let the users go great distances without the need of leaving the area they are confined to. Same as with systems like the CAVE, the system was too big and not made directly for consumer use and rather focused on the industry and research side of things. Due to the popularity of the affordable VR setups that have come in the last few years, many companies (including Virtuix) saw huge potential in getting products that can be used by both consumers and industry with the currently available VR devices. Thanks to the rise of websites such as kickstarter, and ability to showcase your systems online by getting people to try it out gets more consumers excited for the concept. This is personally how I found out about the system over 4 years ago, when I saw a video of a prototype of this exact system being covered at CES.

Technology:

The treadmill I will be covering in depth is the Virtuix Omni, while comparing it to other existing treadmill solutions. The idea behind these treadmills in general is that a user is held (usually at the waist /chest) to insure they don't fall over when moving around. The Omni treadmill has little friction to enable the user to walk/run in any direction when used with the appropriate shoes and shoe trackers. The curvature of the treadmill makes it so that the user is moved towards the center when they are moving around. It simulates the movements in games/applications, even when the movements are running, walking or just crouching. Other systems such as Vue VR even support jumping on top of the other movements. The nice thing about the Virtuix Omni and similar systems is how little room they consume, just like treadmills at a gym, where you can have multiple side by side (as shown below).

Combability:

The system works along with currently existing systems such as the HTC Vive and the Oculus Rift. The rest of the movements, specifically hand gestures and head tracking, are either handled by the controllers that came with the HMDs or with some custom controllers. These custom controllers, such as rifles are very popular for FPS games, and make the games even more immersive. In the spirit of treadmills, the system doesn't take up much room and should easily fit inside of even the smallest rooms. And the tracking lighthouses could be positioned easier since the player would be restricted to a very fine area to be inside of. The only downside is the proprietary shoes and their trackers, but this is a small downside that may be solved as other systems become available as the VR market becomes more

popular. When it comes to hardware side of things, just as VR is demanding, so is this system, as it does require a pretty significantly strong computer to run the games, but this is pretty common with most games that have been released so far.

Comparison to other existing treadmills:

There are multiple other 360-degree treadmills that are either available or currently being created. They can vary in the technologies they offer, but most function the similarly. Systems such as the Vue VR or Cyberith's Virtualizer show very similar technologies of how the player is being held in overall. While the Infinadeck does stand out by having a system that resembles a more traditional treadmill system. The Infinadeck system is much bigger and bulkier due to this design choice, and complicated, making the price much higher. As of writing this, the Omni seems to be the cheapest, but most of these systems are made to order and aren't easily available for the consumer market. Systems such as the Infinadeck require less time to get in and allow users to use regular shoes, which may be a better alternative for places that have the room and money to afford those systems. These figures are subject to change, and regarding more information and any updates on these systems links will be provided in the references.

Applications:

For the Omni there currently exists a library of about +15 games that are made with the specific system in mind. Their focus is to ensure proper mobility when using the system, and make full use of the capabilities such a system offers. One game that stood out of the selection for me was the Nature Treks VR since it's an application I would see myself using. The game focus on exploration, which becomes much more enjoyable when you're doing all the traversing physically instead of holding down on the trackpad. (Note: this is a biased outlook on the library of games they offer, since other games are range from arcade to high adrenaline first person shooters). Applications that focus on walking, running, jumping etc. greatly benefit from this system. The idea of going to a gym in the future to be immersed in a walk through the mountains or forests without having to those places are enticing and not far from reality. Since most applications currently available for VR systems need to use physical movement as a form of input, the amount of applications that could benefit from this system are almost endless.

Issues/cons:

With the Omni specifically, since December of 2016, you cannot purchase the system as a consumer, only commercially (targeted at arcades mainly). This means the promise of delivering the system to consumers for around the promised 500$ on kickstarter fell a bit short after the initial units sent out. Also with Omni, any kickstarter backers who backed the project and lived outside of the country had their money returned since Omni didn't ship anything outside of the United States. This meant that many people who were expecting a unit after waiting and backing the project were left in the dust and with no treadmill of their own. As of writing this paper there is still no one treadmill to rule them all.

Thoughts:

These types of systems have great potential, even if in their current state they might be expensive or hard to get. They are a great addition to a VR setup in a room with limited space. This would give people

the ability to do more than just pretend to walk/run in games, but to do it in real life. These technologies are maturing and becoming cheaper, slowly making them one of the most interesting accessories to think about after buying an HMD. The limited spaces inside homes can greatly benefit from systems that don't need to take an entire room for a user to have an enjoyable experience. And as mentioned previously, I do hope that one day I can go run in a virtual forest rather than looking at a wall when running in the gym.