



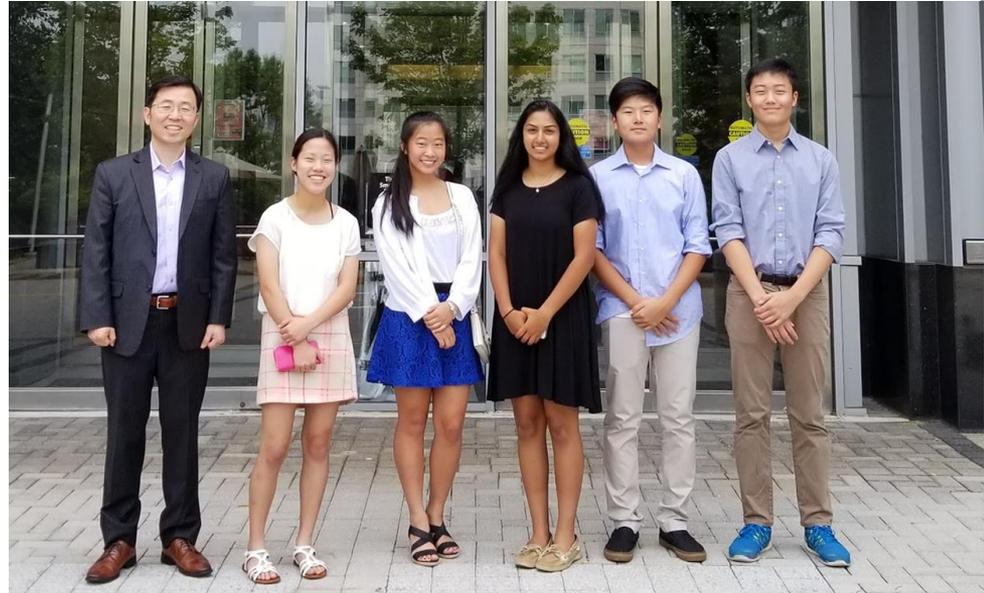
Digital (Cyber) Security of MR

Andrew Shim



About Me

- 15 years old, rising sophomore at Thomas S. Wootton High School
- Avid coder
- Cyber security / Software development
- I ❤️ music
- Trumpetist



Research with TALK

Week 1: Visit to Samsung 837, NY

Week 2: Visit to Northrop Grumman, VA

Week 3: Meeting at Samsung SDS, VA

Week 4: Individual research

Week 5: Practice presentation at Samsung SDS, VA

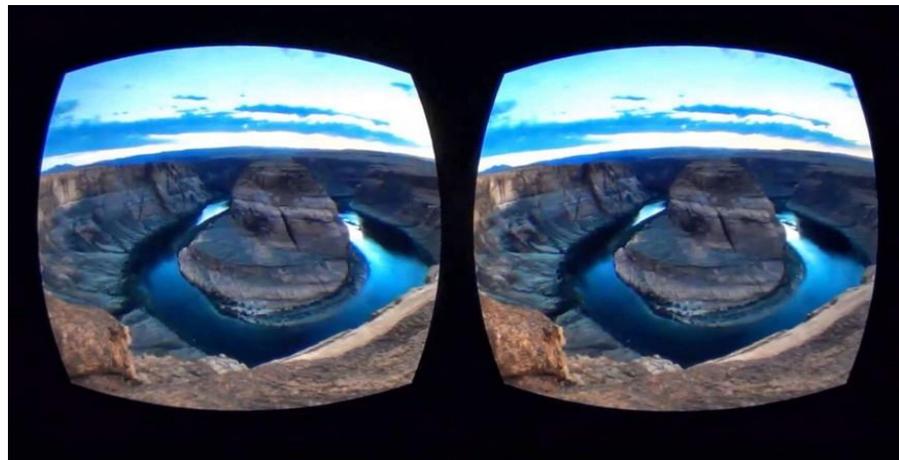
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3. Conclusion / Things to Look out For



Consumer-Grade VR Hacking

Use of VR Technology



Why? How?

VR is being taken into the largest companies and incorporated into almost every part of our lives, such as shopping, entertainment, etc..

All consumer-grade VR software are open-sourced, meaning that its code is available to anyone on the internet, being redistributed and modified.

Hackers can take advantage of VR's immersive nature and harm users in various ways.

Immersion occurs when one's mind becomes focused on his/her main visual and auditory content and starts to block out things that interfere with that content.

Purpose: Hacking VR in the public is usually for personal reasons, to harm specific people and attain personal information.

Possible Aftermaths of VR Hacking

- Can cause trauma or trigger an existing trauma
 - Ex. Explosion, Gunshot, Deaths
- May make user susceptible to ideas not of his/her own
 - Ex. Immersion causes user to become temporarily or even permanently hypnotized



Military-Grade VR Hacking

Military Use of VR

- Currently, VR is used for training for combat soldiers as well as medics
- Using a more immersive VR, trainees are able to be more productive in emergencies and under pressure
- In these virtual simulations, hackers can find out classified information and sell the information to other governments and

Content Hacking

- Content hacking was categorized as the most frequently attempted by dark web hackers (black hat hackers)
- Instead of targeting the people and harming them through VR, it is much easier to monitor and take the information it carries
- Information in this age is worth much more than anything (Facebook: Sells your information to companies to fit your interest in ads) (That's why free apps exist; your information is currency on the internet)
- Hacking and information leaks are now the most secured and anticipated matter the world has ever faced

In The Near Future

- VR is spreading so fast that it's invading every aspect of our lives
- By 2020, economists say that everything you do will somehow include VR
- Hacking opportunities as well as attempts will rise significantly
- It is a necessity to have skilled hackers (white hat hackers) in the internet, protecting the public and countering the attacks of dark web members (black hat hackers).

A Solution to Hackers? More Hackers”

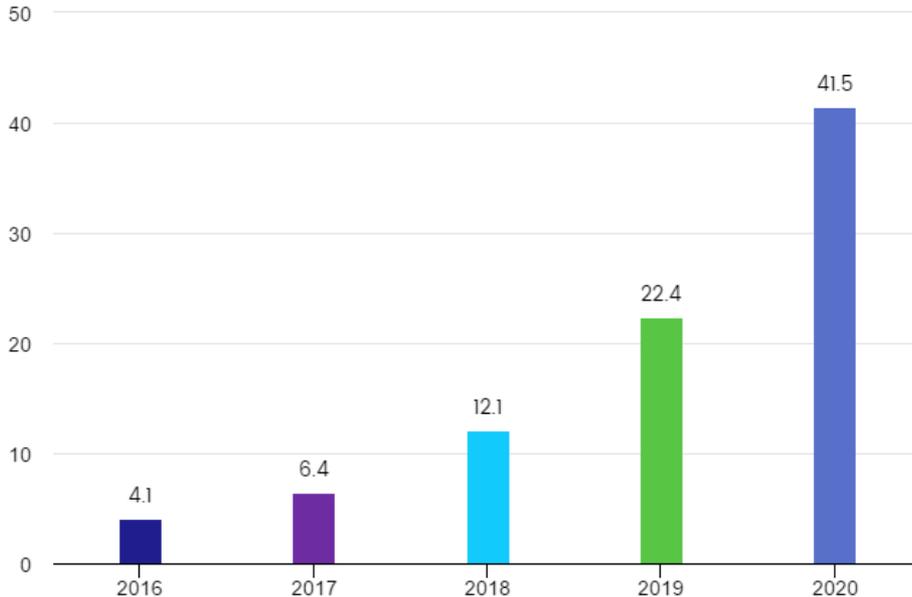
(New York Times - NSA with the Def Con)

Virtual Reality and the Retail Market

Restructuring the Private Sector through VR

Overall VR Applications

Virtual reality software and hardware market size worldwide from 2016 to 2020 (in billion U.S. dollars)



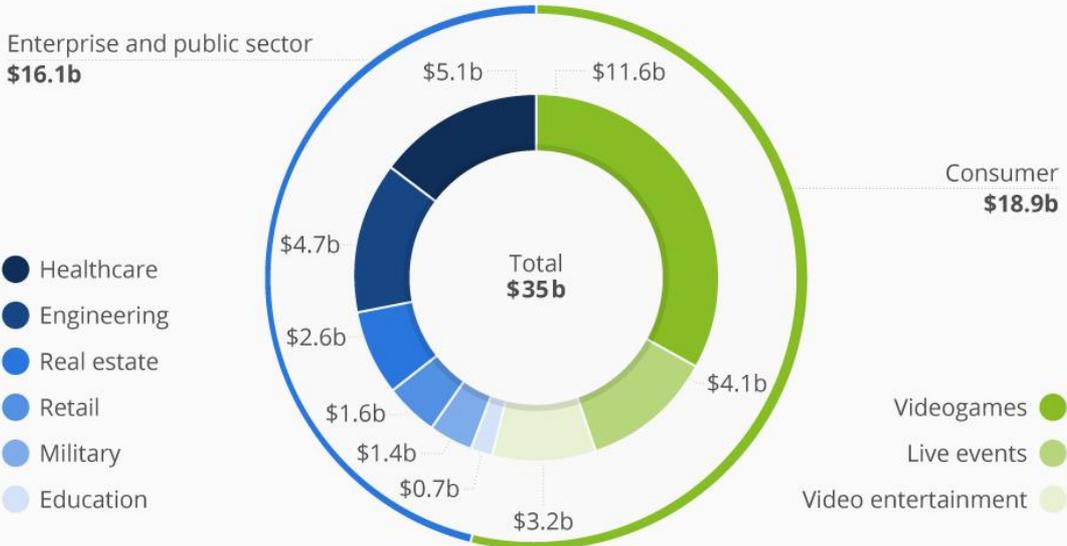
- Investment is growing
 - 2015: \$700 Million
 - 2016: \$2.3 Billion
- 2020: \$108 Billion
- More and more companies join every quarter



Overall VR Applications

The Diverse Potential of VR & AR Applications

Predicted market size of VR/AR software for different use cases in 2025*



- Limited barrier to entry
- Spreads to other industries

* Base case scenario
Source: Goldman Sachs Global Investment Research



Private Sector

- Military

- Northrop Grumman

Virtual Training Systems (VTS) at Northrop Grumman has developed a system for training that includes the use of an immersive environment called the Virtual Interactive Collaborative Training Resource Environment – “VICTR/E”

Real Estate

orange

Now technology is looking to fill this imagination gap through the use of virtual and augmented reality, giving buyers and sellers a new way to experience properties.

Retail Market

E-commerce

Virtual reality has many promising applications in the world of retail. From building a brand image to creating virtual experiences for customers that are meant to sell the product purely based on the ‘wow’ factor and the novelty of this particular kind of tech.

As a Consumer

- Restructuring
- Offers a new experience
 - Emotions
 - North Face
 - Tommy Hilfiger
 - Mercedes-Benz



- Current methods will become outdated

Services

Change How People Offer Their Services

Real Estate

- No longer physically needed
- Now need to work with virtual reality in order to simulate the best experience with customers
- Does not eradicate them



Training

- Similar to education and the military
 - Walmart
 - Training
 - Consulting
 - Assessment
- Virtual reality can offer a realistic mean of experiencing certain situations



Conclusion

Conclusion

- New technologies are completely molding the retail world
- In the coming years, more industries will follow after Google, Microsoft, and Samsung
- Will have a massive effect on the public and private sector

How VR/AR Technology can Affect Marine Biology



Janice Lee



Overview of where we have visited

Week 1: Retired Military Officers' Business Association Annual Constellation Award Gala

Week 2: Samsung Building in New York

Week 3: Northrop Grumman Innovation Center in McLean, Virginia.

Week 4: Research

Week 5: Research Project Presentation



Introduction

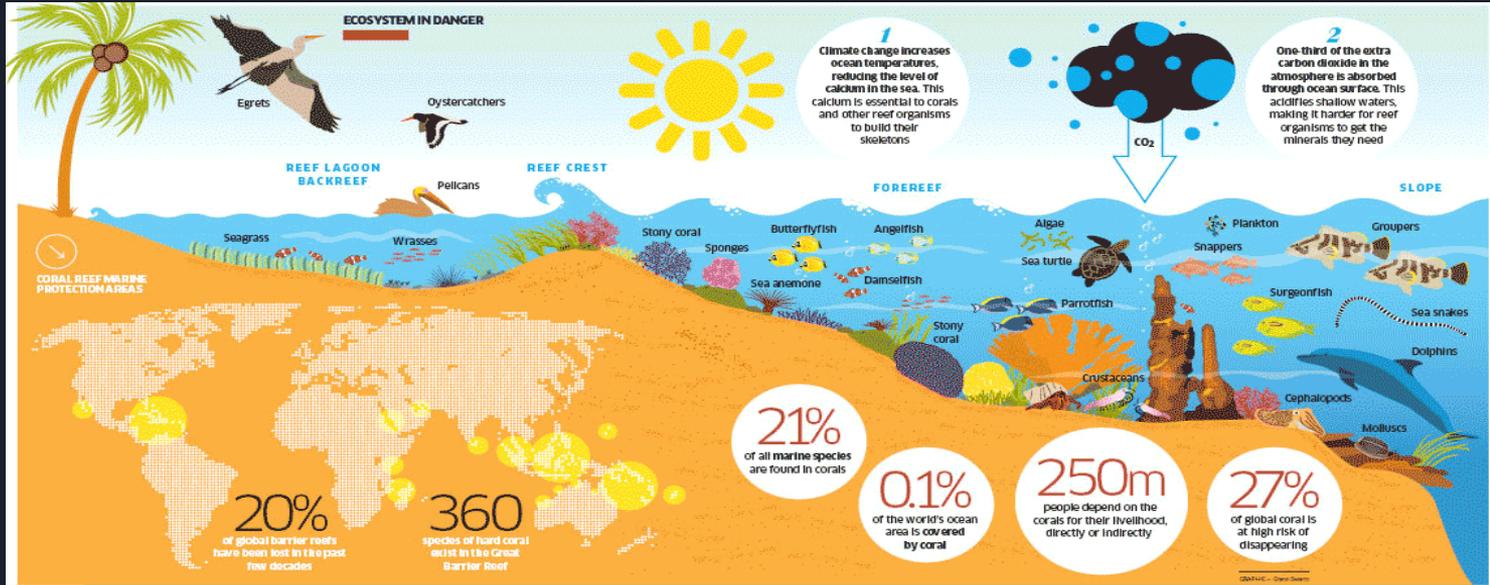
1. *Intro to Marine Biology*
2. *The Effects of Ocean Acidification and the statistics*
3. *Where does the use of MR fit into Marine Biology?*
4. *Advantages in using MR for oceanic study*
5. *Closing*



An introduction to marine biology

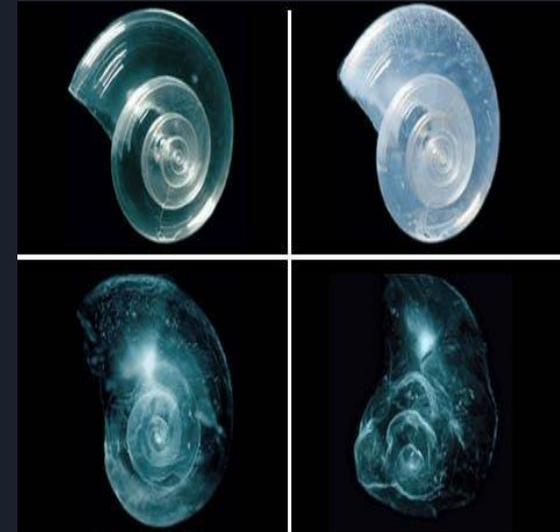
- ❖ Marine Biology is the scientific study of marine life in oceans. Scientists may study the behaviour as well as the psychological processes of marine species. They can also help assess how human activity affects marine life.

Scientific Study and the Statistics



- **0.1%** of the world's ocean area is covered by corals, but an estimated **27%** of global coral is at high risk of disappearing.
- **250 million** people depend on corals for their livelihood directly/indirectly and **21%** of all marine species are found in coral reefs.

Scientific Study and the Statistics



National Geographic Society

- A major effect of ocean acidification is the loss of coral reefs. Ocean Acidification causes corals and shellfish to lose their ability to produce skeletons (structures) and shells.
- The shell on the right shows the process of dissolving over a **45 day period** in ocean acid. Research showed that more than **50%** of pteropods from central California up through northern Washington had “severely dissolved shells.”

Where can VR/AR technology come into play

- ❖ A professor at Stanford, Jeremy Bailenson, created a virtual-reality program that emphasizes the problems of ocean-acidification. He stated, “Phenomena such as ocean acidification are difficult to illustrate because they happen in slow motion.”
- ❖ His research helped scientists catch on to the important details, but they also affected consumers by allowing them to experience what ocean acidification can do marine life.





How the use of VR/AR can positively affect marine biology

- ❖ People who experienced the VR ‘underwater’ experience were more inclined to have more empathy and change in attitude for the environment than those who watched movies on ocean acidification.
- ❖ VHIL (Virtual Human Interaction Lab) is developing a fish avatar project, which will take data from tagged fish from Monterey Bay and transfer it into a virtual reality. The project’s goal is to raise awareness for the bay’s future.

Closing Statement

- ❖ Using this new technology, VR/AR technology can raise more public awareness and prevent the degradation of oceanic life for future generations. It will get rid of the abstract relationship that connects humans with marine life by making it more concrete. Just as technology advances further throughout the years, the preservation for our marine life must be maintained.



Virtual and Augmented Reality for Healthcare



Jamie Kim

About Me

- Rising 11th Grade
- Attends South County High School
- Interests: technology, business

How AR/VR Can Affect Health Care

- lowering costs of healthcare services
- making services more available and accessible
- improving the speed of services or training

What Is VR

- Virtual reality is an artificial environment that lets you interact with scenes around you using images and sounds.



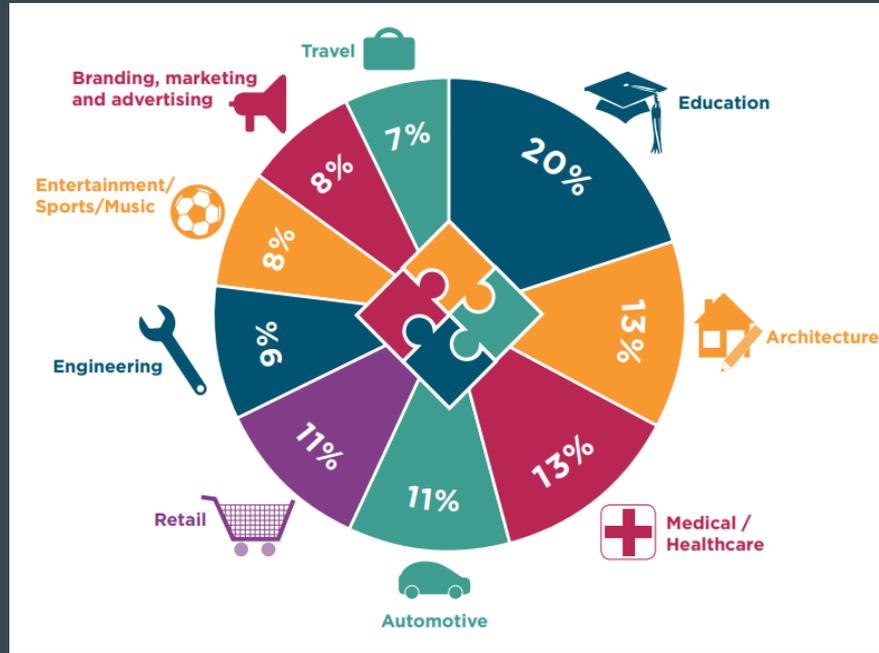
<http://www.businessinsider.com/samsung-gear-vr-headset-selling-out-online-2015-11>



<http://www.bestbuy.ca/en-ca/product/samsung-samsung-gear-vr-sm-r322-open-box-sm-r322/10425975.aspx?>

38%

Of 523 VR Professionals surveyed believe that in the next 3 years, the medical and healthcare industry will be most impacted by VR technology, only behind gaming and education.



13% of surveyed organizations categorize their business currently under the Health Care category

How Can VR/AR Be Used to Help Patients?

- Reduce pains and aches by making the somatosensory cortex is less active
- Motivation for recovery of brain trauma through games
- Accessibility for physical therapy patients Ex. The Mind Maze's MindMotion Pro system uses VR to help those recovering from stroke



How Can VR/AR Be Use to Help Professionals?

- Train professionals in different operations and usage of equipment saving time and money Ex. Tracheal insertion costed \$3,000 per employee to learn and could only be practiced on a live person but VR allows them to practice it virtually for only \$40.



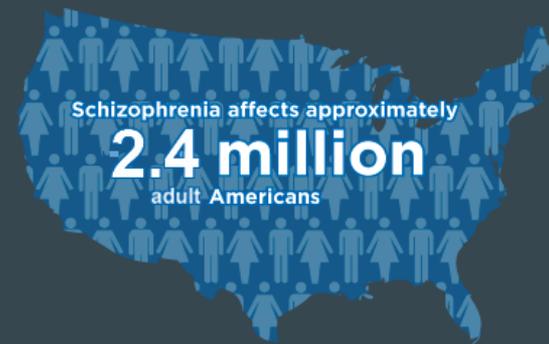
<https://thinkingofdoing.wordpress.com/2015/10/17/virtual-reality-four-industries-will-benefit/>

3.8 Billion

Is the projected Global Market value for healthcare by 2020.

My Interest - Mental Health

- Schizophrenia - mental disorder that affects someone's emotions and behaviors leading to delusion, paranoia, and inappropriate behavior
- How it could help -
 - By exposing patients in a VR social or isolated situation
 - Teaching patients how to cope with their triggers
- Affects -
 - A quicker and less expensive method to help treat patients
 - It can bring awareness by showing people what schizophrenic people some symptoms



<https://www.emaze.com/@ACTTZ>
ORC/schizophrenia

My Interest - Mental Health

- Alzheimer's - progressive mental deterioration that degenerates memory and mental function.
- Detection:
 - Studies found that using VR can help detect early alzheimer's through test such as a VR maze
- Helping Patients:
 - Give patients a purpose or something to do as a therapy
 - Studies have shown that exercising the brain can help slow the progression of alzheimer's
- A Cause:
 - Hopefully VR will be able to help professionals study the behavior and reactions patients to input into coming up with a better working cure

Sources

<http://vr-intelligence.com/vrx/docs/VRX-2017-Survey.pdf>

<http://fortune.com/2015/08/17/virtual-reality-hospitals/>

<http://www.tomshardware.com/news/mindmaze-mindmotion-pro-fda-approved,34428.html>

http://www.strategyr.com/MarketResearch/Virtual_Reality_VR_In_Healthcare_Market_Trends.asp

<https://www.medgadget.com/2016/08/global-virtual-reality-vr-in-healthcare-market-2016-industry-demand-segment-statistics-and-research-to-2022.html>

<https://www.slideshare.net/waltergreenleaf/how-virtual-and-augmented-reality-will-transform-healthcare-august-2016-64590290>

<http://fortune.com/2015/08/17/virtual-reality-hospitals/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4866355/>

https://www.visitingangels.com/how-virtual-reality-could-change-alzheimer%E2%80%99s-care-article_200

<http://www.alzheimers.net/2014-04-03/how-a-virtual-reality-forest-helps-alzheimers-patients/>

Treating PTSD: Virtual Reality

Nidhi Nagireddy

About Me

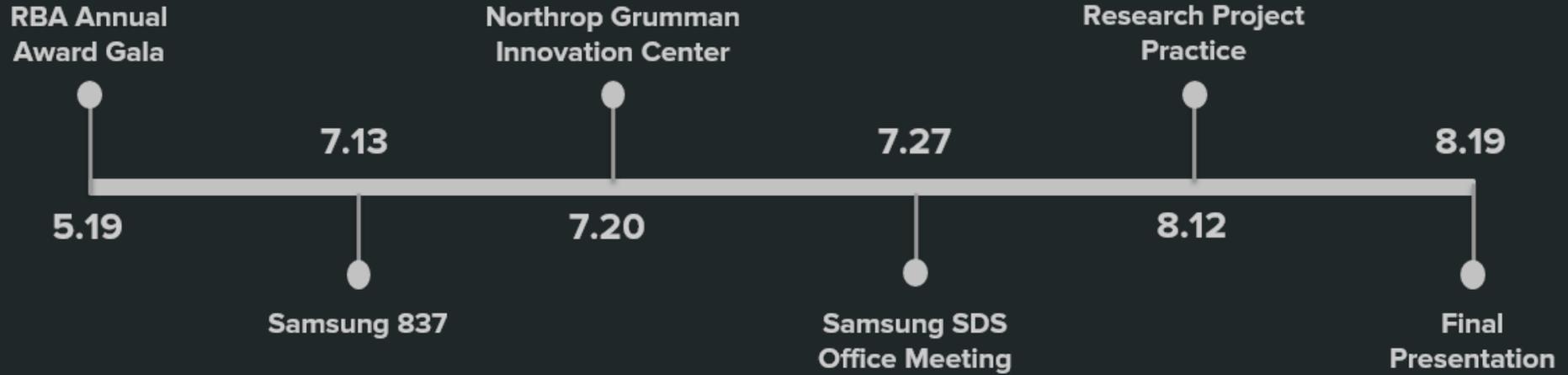
Nidhi Nagireddy

- Rising 11th Grader
- Thomas Jefferson High School for Science and Technology
- Areas of Interest
 - Military
 - Government
 - Engineering
 - Psychology

Agenda

- Internship Timeline
- Augmented Reality vs Virtual Reality
- PTSD Overview
- Current Treatment Applications
- Proposed Treatment Improvements
- Further Application of Proposed Technology
- Conclusion

2017 TALK Internship



Post-Traumatic Stress Disorder (PTSD)

- Anxiety disorder caused by exposure to extreme trauma or a life-threatening experience (i.e. combat, car accident)
- Symptoms
 - Reliving traumatic event
 - Hyperarousal
 - More negative feelings/beliefs
 - Avoiding situations/triggers that relate to the trauma

Types of PTSD Triggers

- People
- Thoughts/emotions
- Objects
- Places
- Anniversaries
- Smells
- Feelings/sensations
- Sounds
- Tastes
- Situations

11 out of every **100** veterans are diagnosed with PTSD

1 out of every **5** Iraq war veterans is diagnosed with PTSD

Over **540,000** veterans have been diagnosed with PTSD

Augmented vs Virtual Reality

Augmented Reality (AR)

- Technology that layers computer graphics onto a view of the real environment
- User interacts with enhanced reality



Virtual Reality (VR)

- Computer-generated simulation of real environment
- Immerses user into artificial world using mostly audio-visual experiences



Application of AR and VR: PTSD Treatment

- Exposure Therapy: exposing the patient to gradually stronger stimuli until fear response is reduced
- AR/VR Technology is used to recreate trauma experience for exposure treatment (i.e. the simulation of a battlefield)
- Mainly audio-visual simulations, but PTSD triggers prove to include senses of smell, taste, and touch as well

PTSD AR/VR Exposure Treatment



How can we incorporate all five senses into PTSD AR/VR therapy?

Application of AR and VR: PTSD Senses Treatment

Proposal

- Create a AR/VR experience that is also able to mimic senses of smell, taste, and touch
- This will improve PTSD treatment technology and be able to treat a wider range of triggers
- Technology can also be used in many other industries such as culinary, entertainment, and retail

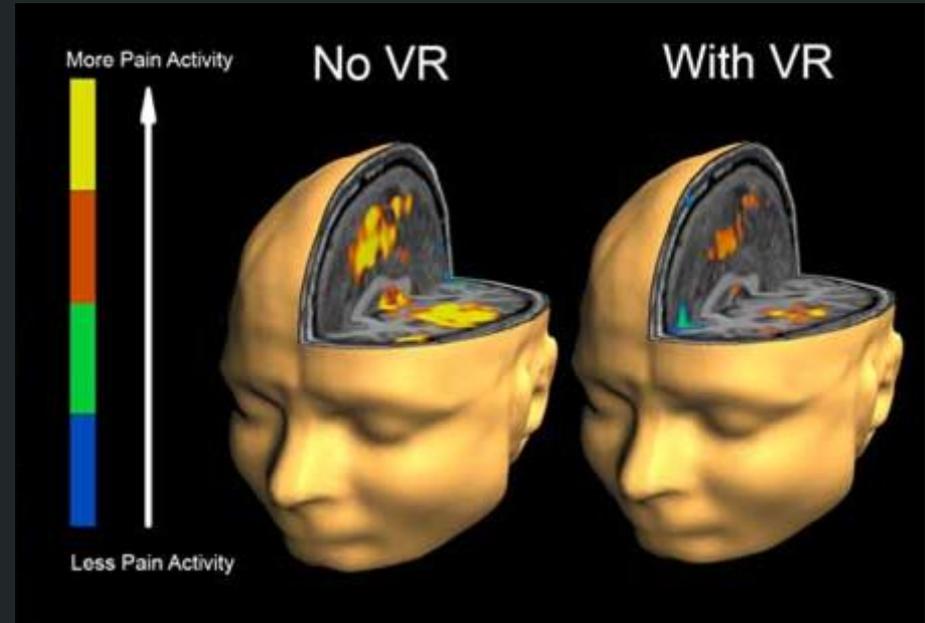
Application of AR and VR: PTSD Senses Treatment

Proposal

- Taste: electrode stimulation
- Smell: atomized liquid spray scents
- Sensations: electrical stimulation
- New senses would include development of more advanced headset to accommodate technology

Effectiveness of PTSD VR Exposure Treatment

- PTSD exposure treatment has been proven to be effective among patients
- 75% of veterans treated with VR exposure therapy report reduced symptoms
- 4 out of every 5 hospital patients using VR report at least 40% pain reduction



Further Application of Proposed Technology

- 5-D Entertainment Experience
- Training of Law Enforcement K-9s (VaporWake)
- Consumer Market
 - Real Estate
 - Communications
 - Online Shopping
- Technology can be applied to any industry

Conclusion

- PTSD is an extremely widespread and complicated disorder
- VR technology is an essential and effective treatment method
- The addition of taste, smell, and sensations would greatly improve current treatment
 - Reduce symptoms and help many more patients
- Proposed technology can be used anywhere
- Stepping stone in making VR a holistic experience by engaging all 5 senses

Sources

- Augment. (2017, March 06). Virtual Reality vs. Augmented Reality. Retrieved August 06, 2017, from <http://www.augment.com/blog/virtual-reality-vs-augmented-reality/>
- Gonçalves, R., Pedrozo, A. L., Coutinho, E. S., Figueira, I., & Ventura, P. (2012). Efficacy of Virtual Reality Exposure Therapy in the Treatment of PTSD: A Systematic Review. Retrieved August 06, 2017, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3531396/>
- Goodrum, M. (2016). Wounded Warrior Homes - PTSD. Retrieved August 06, 2017, from <http://woundedwarriorhomes.org/ptsd/>
- Irwin, K. (2014, August 28). Software Innovations for Identifying and Treating PTSD. Retrieved August 06, 2017, from <http://www.softwareadvice.com/medical/industryview/technological-innovations-ptsd-2014/>
- Li, A., Montaña, Z., Chen, V. J., & Gold, J. I. (2011, March). Virtual reality and pain management: current trends and future directions. Retrieved August 06, 2017, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3138477/>
- Matthews, D. (2017, March 09). Why Smells Are So Difficult To Simulate For Virtual Reality. Retrieved August 06, 2017, from <https://uploadvr.com/why-smell-is-so-difficult-to-simulate-in-vr/>
- National Center for PTSD. (2013, August 15). PTSD: National Center for PTSD. Retrieved August 06, 2017, from <https://www.ptsd.va.gov/>
- National Institute of Mental Health. (2016, February). Post-Traumatic Stress Disorder. Retrieved August 06, 2017, from <https://www.nimh.nih.gov/health/topics/post-traumatic-stress-disorder-ptsd/index.shtml>
- Pita, P. (2017, March 27). What is Virtual Reality Really Good for? Retrieved August 04, 2017, from <http://virtualrealitytimes.com/2017/03/27/what-is-virtual-reality-really-good-for/>
- Weiner, L. (2017, May 10). VR studied for PTSD, phobia treatment. Retrieved August 06, 2017, from <https://blog.applysci.com/?p=6509>

Questions?
