

Georgia Institute of Technology Grand Challenges: 2nd Year Proposal

Team Motus (Team #14)

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I. 'How Might We' Statement:

How might we equip students at Georgia Tech with a personalized and readily accessible tool to confront college-related stress and anxiety issues?

II. Problem Background

A. Context

Georgia Tech is notorious for being stressful and rigorous. Students are often sleep-deprived, and always busy in their schedules [1]. This stress is often triggered by some very common activities all students face at some point. The top three fears we identified amongst the student population are public speaking, interviewing, and social anxiety. According to an article by the ADAA, public speaking is said to be the biggest fear reported by many American adults, topping flying, financial ruin, sickness, and even death [2]. It is also claimed that social anxiety disorder affects more than 15 million Americans. Such fears increase stress in the student population everyday, making college unnecessarily harder.

Stress caused by public speaking or interviews often stems from the environment of these activities. Lecture halls, classrooms, event spaces, interview rooms - these are the spaces that introduce fear in a student's mind. For someone to handle a situation well, they usually need to be comfortable with where it is taking place. Therefore, it is important to simulate or replicate the environments in which these stressful situations occur. As far as the 'where' of our problem is concerned, this problem is prevalent across all college campuses in the US, especially academic powerhouses like Georgia Tech which are known for their amount of rigor and stress. The fact that Georgia Tech is ranked as one of the most rigorous schools, and is commonly known for its high stress levels, and at times even for low student happiness, indicates that there is a problem that needs solving [3]. Therefore, we feel it is important to introduce a solution that brings about a change directly on the campus level. Our solution too, needs to be one easily accessible to students regardless of where they live, on or off campus.

As for the timing of this problem, college is undoubtedly the period in which students must begin personal preparation for professional environments. A student's mastering of public speaking and interviews often marks the transition of an ordinary college student into a young professional, which employers use as distinguishers against other applicants in today's competitive job market. Anxiety however, is a common issue that is not minimized with age and if anything, intensifies through higher levels of education, as proven by the 40 million American adults who are still affected by anxiety disorders [4]. College is the perfect time to empower students with the skills they need to tackle anxiety when they are most flung at stress-inducing situations. If not solved, students will continue to struggle with these issues and may never learn to overcome these fears once and for all, affecting their career plans in the long run. Additionally, the lack of an easily accessible resource that can be picked up and set down again to one's own convenience will proceed to discourage college students on campus from confronting their fear and stress-induced anxiety when their personable skills are being tested the most.

Colleges and universities have established counselling centres for student to come in and talk about matters troubling them. However, many times counselling isn't enough to provide training, and students are often afraid to seek help from career and personal development centres. The approach our team plans to take is to personalize training for a student and make seeking help easy. We hope to use virtual reality technologies to simulate environments such as a mock interview, a room full of people for a speech, etc. to help students practice their skills.

B. Stakeholders

1. **Students** - Our main target audience as they're the ones with the fears and anxiety issues.
2. **Georgia Tech Faculty and Staff** - Faculty from College of Computing, along with the GVU Center and School of Interactive Computing serve as valuable resource for technical consulting and testing. The Counseling Center staff will be invaluable for their experience with the problem.
3. **Virtual Reality Community** - Companies such as Oculus, Leap, Thalmic, and Unity as we plan to use their devices and tools. They also provide access to their huge developer community and serve as a medium to showcase our work. Leap and Unity have provided initial monetary support by giving us Leap Motion Devices to start working with.

III. Project Goal

We want to help Georgia Tech students overcome their fear of public speaking and interviewing by equipping them with a tool that is easily accessible and is customized to their needs. Therefore, we are focusing on making 'help' services more approachable and personalized for college students [5]. We plan on doing this by building a virtual reality tool that simulates the situations which trigger stress or cause fear and anxiety. We're doing this as current services that train students to be better speakers and interviewers, or help them manage stress, are not accessible in the sense that students are not too comfortable in seeking help. However if they had a tool that could train them in the comfort of their house, according to the pace they wish to go at and at times they wish to use it, students would be much more ready to work on these skills. Most people with glossophobia will not only be afraid of public speaking, but will also be afraid of joining a public speaking club to help them overcome this fear [6]. The fear kills the ability to take incentive to try to get over it. If our solution is successful, we would be able to provide students with a way to reduce their fears and handle anxiety better when it comes to situations such as public speaking or interviewing. Students would be able to customize their training depending on their level of anxiety, or how much time they want to spend. On a larger scale, we hope our solution can reduce anxiety issues and such fears to a certain extent on college campuses.

IV. External Advisors

A. **Dr. Larry F. Hodges - Professor, Human-Centered Computing Division, Clemson University**

He is Professor of Human-Centered Computing at Clemson University, but began his career at Georgia Tech where he was a faculty member for 14 years and was a founding faculty member of both the College of Computing and the GVU Center. He is the Co-Founder and Chairman of the Board of Virtually Better, Inc. His expertise in the areas of virtually reality therapy will be invaluable.

B. **Dr. Mack S. Bowers - Associate Director for Training, Counselling Center, Georgia Tech**

He is the Associate Director for Training at the Georgia Tech Counseling Center. His professional interests include anxiety disorders, family communication patterns and spirituality. Dr. Bowers has immense experience interacting with students who have anxiety issues. His inputs in this forte is something our team would really benefit from.

C. **Dr. Kerry Ressler - Investigator, Howard Hughes Medical Institute**

He is a practicing psychiatrist with an interest in translational and clinical research on fear-based psychiatric disorders. His clinical psychiatry research, conducted at Grady Memorial Hospital, focuses on post-traumatic stress disorder (PTSD), and he is a leader in the area of genetic underpinnings of fear and anxiety disorders.

D. **Dr. Blair MacIntyre - Associate Professor, School of Interactive Computing, Georgia Tech**

He directs the Augmented Environments Lab, whose research focuses on the design and implementation of computer-enhanced interactive environments. Since a chunk of our solution to the problem is based upon virtual reality, Dr. Macintyre, with his invaluable knowledge will be able to point us to the correct resources and advise us on other technical matters.

V. Objectives

Objective #1 - Clearly design solution and map out an elaborate action plan.

The first part of our iterative process would be the ideation and design stage. We hope to immerse ourselves in the problem and come up with the best possible solution. For now, we have decided to proceed with the fear of public speaking that many college students face. Accordingly, this objective can be broken up into couple of parts:

- A. Identify different aspects of the problem, such as the environment a student is put into.**
This would require taking into account the different stress triggers. For public speaking, this includes things like the location (classroom, lecture hall, stadium etc), the audience size and demographic and topic of speech.
- B. Design the virtual environment in which we plan to simulate the situation.** This involves picking general themes (such as location and size) to deciding specific details (such as structure and colors)
- C. Design the interaction mechanism between the user and the virtual environment.** This involves deciding how the user interacts with his or her environment and audience. For example, does the user get to walk around on a stage, hold a microphone, make eye contact with audience etc. It also includes coming up with responses from the environment (the audience in this particular case)
- D. Create an abstract map of pseudo-code.** This involves deciding what part of our solution uses what tools, devices and software. For example, the visual rendering would use the Oculus Rift, whereas limb motion would use the Myo. It also includes deciding what software tools and languages need to be used to code different parts of the application, and deciding how to go about developing this application.

This objective is extremely important and necessary as it serves as the foundation for the rest of our project. Completing it would give us a much better idea of how to proceed with the technical portion of the process. It also includes us doing a feasibility analysis while designing our solution, so it would help by keeping us on track. Without it, our project would tend to run astray and might end up with us going in circles. Some issues we might face would be related to designing different aspects of our solution. We might not be able to decide what parts are required in such a solution, and what parts are actually feasible for us. We hope that interactions with faculty and staff at the GUV center and CoC at Georgia Tech, along with researchers at Virtually Better Inc. will help us overcome these issues. This objective will be successfully achieved when we have a concrete step-by-step plan of how to proceed with the technical part of building our solution. This happens when we know what our exact solution is, and we have discussed its feasibility and individual aspects.

Objective #2 - Build the virtual reality portion of the solution, incorporating various VR tools for different purposes.

Having a well thought out plan of action in which the basic structure has been outlined is essential in working towards the next goal, which is building the tools necessary to help reduce the impact that the anxiety triggers have on the individuals. In order to show that individuals can be taught how to tackle anxiety triggers, we have chosen the issue that covers the widest student audience, public speaking. In public speaking, we will need to develop different tools that will each tackle a separate sub-fields within the

field of our anxiety-reduction process. These separate items (visuals, gestures, and response) put together, would be the foundation for the rest of the idea.

- A. Develop visual environment.** A huge root of the problem when it comes to public speaking is the pressure that everyone is watching. In order to make the overall experience as realistic as possible, the virtual environment has to be as close to reality as possible. We would be using Unity, a programming language of our choice, and either the Oculus Rift or the Google Cardboard to generate a variety of virtual venues ranging from a small classroom, to a toast at a wedding, to a large concert hall to test and push the comfort levels of the individuals.
- B. Incorporate personal gestures.** We will be using the Leap Motion and the Thalmic Myo in order to accurately record and virtually recreate the hand gestures and pacing that goes into each speech. The amount of progress made in gestures is a good sign in increase in confidence in the individual.
- C. Incorporate external stimuli.** Using Unity and the programming language of our choice, we will create user responses such as yawns, signs of disinterest, heckles, untimely applauses, and a few other virtually generated responses based on the comfort level of the individual. If these distractions don't manage to affect the user, then they're ready to advance.

This building of tools is the foundation for the rest of the idea since the programs coded and the feedback received in this stage are the ones that will be run while executing the anxiety reduction process. It is imperative that our base programs and code function in order for our anxiety reduction plan to work properly. If we don't build these tools, we will be stagnant in our process towards building a functional public speaking anxiety reduction program. Additionally, if faced with any adversities, we'd need to go back to the first objective and analyze at which step it is that we're failing and what we need to do to fix it. We will know this objective is complete when we have a working demo application that meets the specified criteria.

Objective #3 - Internally test the designed prototype.

The third phase of the project includes internally testing the designed prototype. The team plans to approach this objective in 4 different sub objectives:

- A. Judge the device based on the initial projected design.** *Objective 1* clearly states the design that we plan to follow to come up with the virtual user interface and the mechanism of interaction between the device and the user. Hence, once we reach this stage of the project, it is imperative for us to look back and track our progress so far. Based on that, we need to check if we are on the right track.
- B. Test the feasibility of the size of the device.** The tool will be accompanied by a head-mounted display that will help to simulate a three dimensional virtual world for the user. Hence, it is quintessential for the team to test this part with paramount importance. Internal beta testing of the headset would include ensuring that the size and portability of the tool is reasonable for and adaptable by most age groups of users. Once, we have taken care of this factor, we will finalise the design pattern of the tool, and proceed with further development.
- C. Streamline the technical component of the device.** Just like any other technological device, our device relies a lot on its interaction with the user . This makes it extremely important for us as developers to ensure that the user has a smooth and well defined experience. It is our goal to produce a user interface which makes it easy (self explanatory), efficient, and enjoyable (user friendly) to operate the device in the way which produces the desired result. Thus, this phase of internal testing would require us to test various components of the user interface, and check to see if it has some glitches in its running.
- D. Consult external advisors.** It is essential for us to gather as much feedback as we can, to better the device in more ways than one. Hence, we plan to consult and approach faculty and industry advisors on the feasibility and effectiveness of the tool. Further, will also ask them for their

perspectives on whether the device seems realistic enough to them. Following the feedback, the team will think improvisations and changes. If needed, we will think of many more exercises and used cases for students.

The focus of beta testing will be reducing impacts to users, often incorporating usability testing. This phase will begin when the software (and the device as a whole) is feature complete. We expect the software in the beta phase to have many more bugs in it than the completed version. The device may also have speed and performance issues, cases of data loss and at times, may also crash. However, catching and rectifying these shortfalls is essentially what the purpose of this phase will be.

Objective #4 - Develop a pre and post diagnostic test to identify the level of anxiety in each person. Test device on students.

Creating a pre and post diagnostic test to identify the level of anxiety of our test subject is absolutely crucial to our project because it is the ultimate method of evaluating our solution. These tests are necessary to our project in order to receive an indication of whether our solution has in fact addressed our target problem of anxiety, and how much it may have affected the anxiety - whether it be positively or negatively. Essentially, the comparison of the before and after will give measurable feedback regarding the extent of the impact our solution will have had on a student's anxiety after the use of our tool. If not completed, our group will have no method of comparing anxiety before and after our tool and no way to confirm whether our solution was effective. This objective can be broken down into the following subtasks:

- A. Examine existing pre and post behavioral and anxiety-measuring tests.** Locating existing pre and post tests is necessary and beneficial to guiding us through the process of figuring out what areas of anxiety need to be closely analyzed for a thorough evaluation of anxiety levels. A few tests that we have already planned to examine include personality tests such as the Myers-Briggs Type Indicator Test (MBTI) and the highly-used professional assessment "StrengthsFinder" Test. The MBTI is a test based on a person's preferences that was developed to aid a person in discovering their personality type according to the letters (which symbolize different traits) they are assigned while taking the test. The MBTI is considered one of the most valid and reliable personality tests in the world because it has been shown to give the same results even when taken multiple times, which are characteristics we want to have in our test. [7] The StrengthsFinder online assessment is another example of a personality test geared to identify a person's top five talents and strengths. [8] StrengthsFinder could be used to shape our own diagnostic test as it would aid in pinpointing whether the subject possesses the skills to deal with anxiety as a strength or not. Existing tests would ideally provide us with sample questions that have been proven to best indicate levels of anxiety, which would act as a stepping block for us to create our own diagnostic test.
- B. Develop diagnostic test of our own.** Next, we would proceed to making a test of our own. Our own diagnostic test would incorporate some of the questions from sample tests that we thought were key, but also some questions we will have created ourselves, based on research. We envision the diagnostic test to be distinguishable in the fact our test would be geared to ask more college-related situational questions. For instance, we would attempt to target a person's behavior surrounding social interactions by asking the subject's reactions to class poster sessions, or inquiring about the subject's stages of emotions during class presentations. This would make the data we collect more relevant to the problem of college-related triggers of stress that we intend to solve.

C. Test Device after obtaining IRB approval.

The creation of our diagnostic test signifies the completion of the overall objective because it would mark us ready for starting our overarching experiment. Having the diagnostic test done would finally put us in the position to receive subjects' responses to our solution, allowing us to continue the iterative design and tweak process using this feedback. Issues we anticipate to arise would be effectively calibrating our custom

test and measuring it relative to the existing tests' results. More specifically, because our diagnostic test would be self-made, it will be difficult to come up with a uniform and reliable method of measuring stress and fear that is as accurate as the existing tests' behavior-measuring algorithm, but altered for the change in types of questions for our diagnostic test. To minimize this issue, we plan to run several control tests on our pre and post survey questions with different sets of people, using a sample anxiety-reducing activity instead of our tool, to try out the reliability factor of our test.

VI. Timeline

Please refer to Timeline here:

https://www.dropbox.com/s/bvmfl1ad36td43j/Team%20Motus_Timeline.xlsx?dl=0

VII. Budget

A. Materials and Supplies

Virtual Reality Tools:

- Electronics and Tools (~\$780)
- Oculus Rift DK2: \$350
- Thalmic Myo (2): \$150 x 2 = \$300 (one per arm)
- Leap Motion: \$79.99
- Leap Mount for Rift: \$19.99 Sponsored by Leap Motion
- Google Cardboard: \$15 - \$30

Supplies: (~\$50)

- 3D Printing
- Wiring/Breadboard

B. Equipment

No equipment worth more than \$1000 is necessary.

C. Services

D. Travel

Virtual Reality and Virtual Reality Therapy Conferences
Company Meetings (via Hackathons, or other events)
Off-Campus Field Trips (in Atlanta)

VIII. References

- [1]http://www.huffingtonpost.com/2014/08/27/college-students-sleep-stress_n_5723438.html
- [2]<http://www.adaa.org/understanding-anxiety/social-anxiety-disorder/treatment/conquering-stage-fright>
- [3]<http://web.archive.org/web/20030328032312/cyberbuzz.gatech.edu/technique/issues/fall2002/2002-08-30/8.html>
- [4] <http://www.nimh.nih.gov/health/publications/anxiety-disorders/index.shtml#pub5>
- [5] http://www.myshrink.com/counseling-theory.php?t_id=55
- [6]<http://www.ecu.edu/cs-studentaffairs/saprofessionaldevelopment/customcf/8%20Things%20First%20Year%20Students%20Fear%20About%20college%20By%20Mary%20Kay%20Shanley%20and%20Julia%20Johnston.pdf>
- [7] <http://www.myersbriggs.org/my-mbti-personality-type/mbti-basics/>
- [8] <http://strengths.gallup.com/private/Resources/CSFTechnicalReport031005.pdf>