Use of Augmented Reality in Improving Student Study Habits

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PROBLEM STATEMENT

The problem we're trying to solve is that many college students struggle with good study habits and get distracted while studying. Up to 10% of college students struggle with concentrating when studying [1] and many struggle with concentrating for more than fifteen minutes at a time [2]. What we want is to help students study effectively by tracking their gaze which will inform them when they're losing focus and should take a break from their studies. Our goal is to help college students improve their study habits by tracking their concentration and by eliminating distractions.

MOTIVATION

Augmented reality offers many educational opportunities for students. While technology often distracts students from their studies, it can also be used to improve their study habits. We would like to make technology a tool instead of a hindrance for students.

STATE OF THE ART

Headsets that enable eye tracking and object recognition already exist, and a company called Tobii Pro provides universities eye tracking tools for research purposes [3]. Their tools are marketed towards researchers and universities and require students to study using specific desktop machines, while we want to focus on empowering individual students to study using their own tools.

NEED FINDING

SURVEY

As our demographic is focused on undergraduate students, we're going to use surveys in order to gather a wide swathe of data efficiently. After our prototype is finished we will send out a survey via an email link to a pool of undergraduate students, which also shows our prototype so that participants may see our plans for the final implementation and give feedback as to what changes would help their studying the most.

SAMPLE SURVEY PROTOCOL

The survey participants will consist of undergraduate students at the University of Delaware, and we will try to get as many responses as possible.

INTERVIEW

Once our survey is complete, we will selectively interview several participants about the nature of their study habits. These interviews will be more open-ended than the survey, and will allow us to

gain a more nuanced understanding of the struggles that students face while studying.

CONTEXTUAL INQUIRY

We decided against using contextual inquiry because the nature of our application requires students to study in their natural setting, and the presence of an interviewer during that process would be inherently distracting from that goal.

PARTICIPANTS

Because our goal of improving study habits is applicable to the entire undergraduate population, we want to get input from as many students as possible, not just from one specific group.

PROTOTYPING

STORYBOARDING

Our prototype will be a storyboard detailing how the tool will be used by users. It will show what the user will see in the head set depending on the situation. The simplicity of the storyboard will allow us to easily make design changes, and allow us to quickly get user feedback.

FIDELITY

Our initial prototypes will be low-fidelity in depth because any working implementation would require many hours of development in computer vision and similar analysis, which is time better spent ensuring that the users are pleased with the direction our product is going; these low-fidelity prototypes could consist of simple videos or any form of pre-fed data so that live computation is not necessary.

IMPLEMENTATION

TECHNOLOGY

Because our product will need to track the user's gaze and be able to recognize predetermined objects, such as notebooks and smartphones, augmented reality would be an excellent medium for our product. Our computer vision would likely be implemented by using pre-trained, public use neural networks that are typically designed in Python. Gaze and eye tracking would be implemented depending on the hardware our product supports, using the corresponding APIs that are given to us. Our augmented reality interface would use Unity, as it is the standard for the majority of these types of AR applications. Our product will not require any form of server backend, as the computer vision would be performed on-device.

FEATURES

Our product will incorporate many different features. The most important features consist of focus detection and distraction recognition to tell if the user is studying less efficiently than they otherwise could be, for example if they need to take a break or are distracted by their phone, and offer recommendations. Our product will encourage efficient studying by adding an incentive in the form of a virtual garden: as the user studies efficiently and follows the recommendations our system gives them, the virtual garden will grow and be healthy. We want to implement this incentive in this specific, 'game-ified' way because we want the user to remain in control of their options and decisions, allowing them to ignore the recommendations with no ill effect; this is in contrast to, for example, punishing the user for picking up their

phone during a study session. Other features we would like to implement include textbook recognition and recognition of the specific sections within the textbook, and display additional information, such as review questions or summaries, alongside the textbook.

CHALLENGES

One of the biggest challenges we expect to face would be technical challenges when implementing the software. Both image recognition and focus recognition are difficult problems to solve, and creating effective algorithms for either of these problems represent entire products themselves. We expect to spend significant amounts of time on these two aspects, and hope to accelerate our work by using as many public solutions, such as open-source projects, as possible. Another challenge we might face would be that current state-of-the-art augmented reality headsets are unwieldy; these large, bulky, and immobile helmets can be distractions and inhibit users from studying effectively. This problem is not unique to our product — every augmented reality application needs an augmented reality headset, after all — and the most practical solution would be to simply wait for the hardware technology to catch up to the software, and assume our software product will run on a future AR headset.

USER STUDY AND EVALUATION

Our hypothesis states the following:

If we create an augmented-reality application to improve how efficiently students' study, then these students will retain a higher percentage of information when they study using our system compared to when they do not use any system.

BASELINE

Our baseline will be the percentage of information retained by students studying pre-supplied material for a specified period of time with no help from our system.

EXPERIMENT

Our experiment will be between-subject and consist of undergraduate students at the University of Delaware studying for a specified period of time without our system, and studying for the same amount of time with our system. We will then compare how much information they retained from that period with versus without our system. Because our device recommends study breaks, and each study session requires a specific amount of time, each individual experiment will take a considerable amount of time, thus limiting the amount of participants that we could go through. Because our population is the entire undergraduate body at the University of Delaware, we will most likely just ask people we know if they are willing to participate.

CHALLENGES

One potential challenge for conducting this experiment is the large amount of time each participant requires, and the inability to parallelize this process. This can greatly limit the amount of participants that we can go through, which is further compounded by the problem that our devices must be shared among other HCI researchers and students that require the same hardware that we use. Another possible challenge is comparing how our augmented reality solution compares to other solutions already on the market. As augmented reality is

an incredibly new area for products, as well as remaining a niche, current state of the art solutions are mostly relegated to researchers [3].

ALTERNATE SOLUTIONS

If technical issues arise with our product, we have two solutions for users. The first solution is simply to study how they would otherwise without our system; product failure does not put any user at risk of any danger, and the worst case scenario of a product malfunction is simply that the user goes back to how they would otherwise study. The second solution provides a lesser user experience using more rudimentary techniques, where the user would set a simple study timer. Depending on which aspects of the system failed, such as either the eye tracking or the object recognition, our system will default to trusting the user and assume they are studying as they should be.

TIMELINE AND DELIVERABLES

Finish storyboard (Crystal, Marc, Brian): 11/5/19

Finish and send out survey (Crystal, Marc, Brian): 11/8/19

Finish storyboard based on survey results (Crystal, Marc, Brian): 11/12/19

Implement eye tracking (Crystal): 11/19/19
tentative, feature can change based on need finding

Implement object recognition (Marc): 11/22/19
tentative, feature can change based on need finding

Implement recommendations (Brian): 12/1/19
tentative, feature can change based on need finding

Create website & video (Crystal, Marc, Brian): 12/3/19

Final presentations (Crystal, Marc, Brian): 12/5/19

REFERENCES

[1] Concentration Tips for College Students. (2018, January 11). Retrieved November 3, 2019, from https://www.collegeatlas.org/concentration-tips.html.

[2] Thompson, V. (2017, November 21). Losing Focus in College. Retrieved November 3, 2019, from https://education.seattlepi.com/losing-focus-college-1583.html.

[3] Eye tracking in education and educational research. (2015, June 9). Retrieved from https://www.tobiipro.com/fields-of-use/education/.

BIO

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