BRIANA

WILLIAMS

Introduction

The purpose of this paper is observers why student's have trouble learning C code and exploring new ways to help them understand how C code looks in memory. A lot of students are leaving the computer science major after the first introduction class.

The problem that this research is attempting to solve is that it is hard for students to learn and understand C programming. Computer Science is a challenging major and a lot of students are dropping the major. Students are having a hard time grasping the knowledge of how C code works in memory and with that its causing them issues when it comes to writing their code. The way that C programming is taught in schools might be hard for students to understand how to code in that language.

The impact that this research will have is more people will have a different way of learning C programming language. This research will help a lot of students have a better understanding of C programming language and could keep them interested in the major. This research will open up another way of learning for students to better understand the process of how C code looks in memory and will help them write better more efficient code. This could help reduce the stress of learning how code

looks in memory and turn it into a fun and interactive learning experience. This project will physically show students how code looks inside the computer's memory, so they will get a better understanding on how the computer stores the code verse just reading it in some book and getting confused.

There doesn't seem to be a change in the computer science field when it comes to teaching students the information, so they understand and want to stay in the major. Students are still getting frustrated with learning the material. A lot of students are coming into the major to just drop out and change their major. The material in the computer science major is hard for some students to retain the information that is taught or what they read in textbooks. When people can actually see what is happening before their eyes, they will have a better understanding of the information verse just reading text. Some students can understand the material on the first try but for other students it may take longer for they to understand the content or they might never fully understand it. A lot of students are writing code, getting errors, and not understanding why its wrong. This can result in having student writing in efficient code.

The ones who are most interested in this research would be teachers and students. This project would help teachers be able to teach students in a different way and could help students better understand the material.

This current research isn't enough to solve the problem of students leaving the major. This project is only touching on one subject within the computer science course. There's a lot of different course information within computer science that we

would have to cover within the VR in order to help students with a new learning experience. This project is only covering C programming and how it looks inside the computer's memory.

One way to solve this problem is to create an interactive learning environment to teach students every subject that are in the computer science major field. This way they will be able to actually see what happens when they code on the computer or how cybersecurity looks when you are fighting off a hacker. In each computer science course, we could incorporate VR learning for students to manipulate the content that they are learning with their courses.

This new solution would be better because student can physically see and understand what is happening to their C code within the computer's memory.

This research is different from current research because we are trying to create an interactive environment to help teach students in a different way. Having students be able to physically see what is actually happening to their code within the computer's memory will give them a better understanding on how the computer works and how to create more efficient code.

Related Work

Chin-Hung, Jr-Yi Chen, and Zhi-Hong Chen. (2017). Impact of Augmented Reality on Programming Language Learning: Efficiency and Perception. Journal of Educational Computing Research, DOI: 10.1177/0735633117706109

The method of teaching students in the programming field was the Augmented Reality (AR) approach. They use real life environments which show virtual objects which are shown in graphic computing and object recognition. This allows the virtual objects and real-world objects to coexist in the same place. When you put interactive learning along with visualization learning the mind potentially enhance ones the senses to want to full grasp what it sees.

This AR experiment concluded that people that went through this came out to be very successful. They got more from the AR- enhanced version than the ordinary way of teaching. This helped programmer see the information in a real environment setting and it enhanced their knowledge of it being visual. To get better control and manipulate object by using the command cards. This could be a step up for the perception and participation of the system verses the old way of learning. The AR-enhanced version was more efficient, useful and easier to comprehend.

The complexity of three-dimensional applications is complexed and abstract preventing students to understand. The Augmented Reality could potentially bring innovative opportunities for learning the context through visualization and interactive learning. This could help students better understand how programming codes are used for example positioning objects and or their relevant relationships.

Their assumptions were proven to be true because students could interact and visually see what they were trying to code. The students were offer a holistic window and command cards were the two tools for this learning experiment. The current way of coding and the Augmented reality are slightly different and reference the OpenGL codes.

They conducted a study with students using an Augmented Reality-based learning system. Students were split into two groups. Group A started with the augmented reality-based learning, then used the ordinary teaching method. Group B started with the ordinary

teaching method, then used the augmented reality-based learning. Students enjoyed using the augmented reality-based learning better than the ordinary teaching method.

Their methodology was to split the students up into two groups to see if the results would be the similar or different. As a result of doing this experiment they found it to be balanced. This way they wouldn't get false information with having all the students start with the same learning experiences.

They are basing their research on learning how to create something. They aren't creating an AR-enhanced program to help students learn computer science and keep them interested in the field and want to stay. To keep the programmers interested in the field and not leave the field from just sitting in one classroom setting. Having a better plan of action and simpler ways of learning and understanding how to perform the task easier will bring people back into the field.

Richard Bornat, Saeed Dehnadi, Simon. (2008) Mental models, Consistency and Programming Aptitude. Proc. Tenth Australasian Computing Education Conference (ACE2008), Wollongong, Australia.

They did six different experiments with 500 students and conducted these experiments in three different countries. The learning from this experiment, the group discussed the strengths of the effects that were observed and the failures.

They conducted three different experiments. The first experiment, twenty-seven of the participants used the same mental model for all the questions and they stored this result in a consistent variable. Twenty-four of the participants used different mental models for different question and they stored this result in an inconsistent variable. The last five of the participants were categorized as the blank group because they different answer any of the questions. The second experiment, forty-three of the participants only answered eight questions using a

single mental model and were classified as C0 group. Four of the participants answered eight questions using two different mental models and were classified as C1 group. One of the participants used four different mental models and were classified as C2 group. Five of the participants answered using more than four different mental models and were classified as C3 group. The three experiment, forty-one of the participants were classified as C0 group. Three of the participants were classified as C1 group. Ten of the participants were classified as C2 group. Eighteen of the participants were classified as blank group. Eleven of the C0 group already had experience with using the right mental models.

They attempt to use Soloway's research to predict success within the intuitions. Once you grasp the concept of programming, are likely to be successful within the computer science field. People that don't grasp the concept of programming, are less likely to success and want to stay in the field of computer science.

Their assumptions would be incorrect if the student wasn't interested in the major at all. If a student is looking at how much they can make from getting a job within the computer science field and not really understanding what it takes to be successful than they have a false perception in pursing this field.

Their approach didn't fix the problem at all. They did different test on student mindset and knowledge before the students started a programming class, as they were half way the class, and at the end of the class. They found out that the students still struggled to do coding.

The first experiment they gave the students instructions to short answer questions to see what mental models they would use for them to answer. The first college they went to was Barnette college and they tested about thirty students that didn't take the entry level programming course. They also did the same test for about thirty students at Middlesex University after they went through their first programming class. They went to the university of

new castle to conduct the second experiment. The assignment that was given to these students were improved and asked the student question like it they have previous coding experience, did they take a programming class already, what was their age and sex. At this school there were about ninety participants but nineteen of them failed to attend the test.

Approach

The unaddressed issues are that students are leaving computer science because they aren't understanding the material in the intro level courses. No student wants to feel like they are stupid. When you aren't able to grasp a concept in any class you won't put 100 percent of your time into it. People that are in the field should be able to give insight to those that are trying to make a career in the field. Students in computer science field should have access to people that know what is required to be successful so they can gain knowledge from them.

The new proposed approach that we are working on is using Virtual Reality (VR) to help teach students about how C code looks in memory. In knowing how their code looks in memory will help students be able to write efficient code. I want to use Virtual Reality as a new teaching method to help students be able to understand how code looks in memory and visually see what is happening as the code line for line. we want to let the student be able to visually see what is happening within the computer memory when they type in code, letting them be able to interact with the computer flipping back and forth through the memory, manipulate the code and being in a 3D space.

A lot of students are dropping out of the major of computer science after the intro level courses and it is affecting the industry. I want to keep the students in the major and the normal way of teaching isn't working so maybe VR is a better way to teach students. I see that the normal teaching method isn't working for some students so we want to incorporate a

new way of teaching to help student grasp the information easier. The VR experience would be a fun and interactive way for students to learn verses reading it out of a text book and not be able to understand it fully.

This approach will let student visually see the code and how it looks in memory verses just reading it in a text book. Students will be able to interact with the code and the computer memory and see how the computer reads the code line by line.

I used unity to create a 3D virtual space to teach students how C code looks in memory so they will be able to write efficient code and keep them interested I computer science. We are using the oculus go headset to display of unity project. We are using web GL to display our unity project on a web browser so we can display it o the Oculus Go. We are also using blender to create object that will be placed within our 3D world

Experiments

I expect that students will enjoy this new approach better and have fun learning the material. That student will better understand how C code looks in memory and will be able to write efficient code because they understand how the computer sees code.

With using VR to help students understand how C code looks in memory will help the m better understand how code works within the computer and students will be able to write better efficient code.

First, I would give students a test on how C code looks in memory on paper before they try the VR program. Then I would have the students try the VR program. After that I would give the students another test with a similar problem to see how many learned from the VR

experience. Using simulation and physical paper test. The software is unity and web GL and the hardware are the Oculus go.

Analysis

After the students used the virtual reality (VR) software they had a better understanding of how C code looks in memory and were able to answer a similar problem on paper.

The students that used VR found the tool to be very useful. Having hands on training with the virtual aspect really will keep the student engaged and not be so easily discouraged. For the students that are visual users will be happy and those that fully understand will enjoy this learning experience as well.

The data isn't surprising because the majority of the students that used the program liked the VR way because it kept their attention and felt more engaged in the learning experience. You will not be disappointed once you begin the journey. You will leave knowing more than you did before you started.

With this research we only targeted students learning C code and how it looks inside the computer memory. The bigger picture we are trying to solve is to find a way to keep students in the computer science field. This research is targeting one are of the computer science field. We would have to create VR software to teach students every subject in this field to incorporate the new teaching method to see if it would be a good way to keep students' attention in this computer science field.

The phenomenon wouldn't be in existence. We would cover all the bases to fully understand as a programmer mind works. What do they really wish to gain from learning C code, keeping interest, and having a fun way to grasp the information.

Conclusion

The problem is that more students are leaving the computer science field because of not being able to understand or grasp the information that is being taught. Students should have more resources to tap into when they feel frustrated and there should be an avenue to get answers to their questions. More mentors are needed to stir them from changing their major. Someone should be there for guidance and keep them focused.

The hypothesis is that by teaching students how C code looks in memory using an interactive virtual reality (VR) software, it will help student better understand and be able to write more efficient code. For the virtual users you will find the benefit in this teaching more quickly. You will feel confident in your approach to coding.

The future extension of this work will be to add different subjects within computer science field into the virtual reality (VR) to help teach students different subjects. Having the interactive software for different subject within the field will keep students engaged and want to stay in the field.