Virtual Reality: A New Approach to Introductory Computing Science

Authors: Chloe Coleongco, Owen McLeod, Kynan Ly, Cody Steinke
University of Alberta, Dept. of Computing Science, Faculty of Science Summer Camps

Purpose

- To explore, evaluate, and document the use of JavaScript in CoSpaces, a virtual-reality-rendering platform
- How can virtual reality (VR) be used to engage and teach students in computing science and other subjects?

Overview

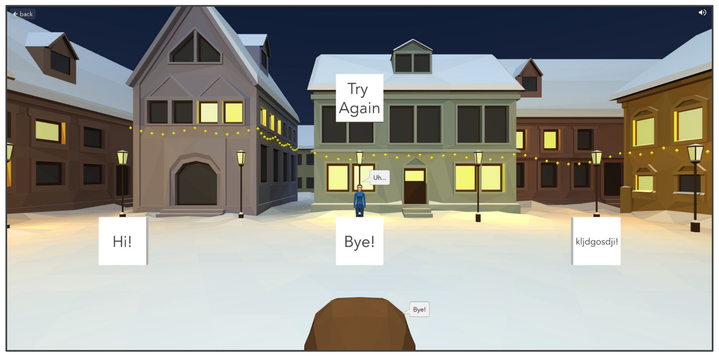
- VR is a computer generated 3D environment that users can become fully immersed in and interact with
- Real world applications include gaining “in the field” knowledge while remaining in a controlled environment (e.g. pilots learning how to fly)
- CoSpaces brings the creation of VR programs into the hands of an individual with internet, a smart phone, and a Cardboard Viewer
- Most CoSpaces users currently opt to use Blockly to program, so the extent of JavaScript’s potential on the platform has yet to be explored
- JavaScript is a programming language used to make dynamic, interactive, and visual programs

Methods

- Created a variety of visual, interactive programs in CoSpaces’ JavaScript environment
- Made the programs publicly accessible on GitHub for use by future educators and learners
  - *https://github.com/ChloeColeongco/CoSpaces-Code*
- Made a lesson plan and demo project for an introduction to JavaScript in CoSpaces

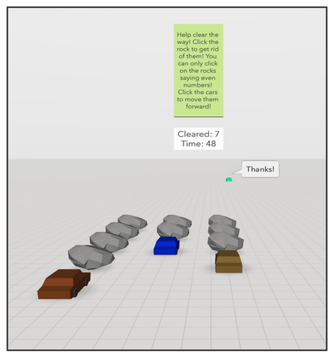
Educational Games


```
//if called on, makes game character start the conversation
function init() {
    character.say("Hi!")
};
//calling conversation start after one second
Scene.schedule(init, 1);

//one choice player could make and the results if that choice is clicked
var response1 = Scene.createTextBillboard(-5, 5, 0);
response1.setText("Hi!")
response1.onActivate(function() {
    player.say("Hi!");
    Scene.schedule(next, 1);
    response1.deleteFromScene();
    response2.deleteFromScene();
    response3.deleteFromScene();
})

//if called on, handles game character response to player's wrong choice
function tryAgain() {
    character.say("Uh...");
    var tryAgain = Scene.createTextBillboard(0, 5, 3);
    tryAgain.setText("Try Again");
    tryAgain.onActivate(function() {
        tryAgain.deleteFromScene();
        init();
    })
}
```



- Educators can create their own VR activities and games

Introductory Lesson Demo




```
//for every opponent in the opponents array...
opponents.forEach(function(opponent) {
    //check if opponent is being hovered over...
    opponent.onHover(function(isHovered) {
        //if it is, display a random number between 0 and 100...
        if (isHovered) {
            var num = Math.round(randNumBetween(0, 100));
            nums.push(num);
            opponent.say(num);
            //if the opponent is clicked...
            opponent.onActivate(function() {
                //and the number displayed is evenly divisible by two...
                if (num%2 === 0) {
                    //delete the opponent from the scene...
                    opponent.deleteFromScene();
                    var index = opponents.indexOf(opponent);
                    opponents.splice(index, 1);
                    done.push(opponent);
                    //and give the player a point...
                    cleared++;
                }
            })
        }
        //otherwise, display nothing
        else {
            opponent.say("");
        }
    });
})
```

- Students can learn computing science concepts, creating games and simulations that show their learning

Results

- CoSpaces provides users with a wide range of easily implemented and accessible tools, filling a niche among other introductory and intermediate virtual reality resources
- Programming in JavaScript, as opposed to Blockly, gives users the ability to use newly-developed functions not yet enabled in the Blockly or user-interface environment
- Syntax, math, and control flow debugging can be a challenge with JavaScript, especially while trying not to overload CoSpaces’ processing capacity, so having ready-made program “templates” for common functions and fixtures is helpful
- The CoSpaces programming environment may not render scene reliably either on the website or the app due to the active expansion and updating of their API, and the fact that it’s a browser-based platform, however, for simpler beginner programs this should not be an issue

Conclusion

- CoSpaces a rapidly developing, versatile, easy-to-use tool with strong community support for developing engaging educational resources
- Whatever the subject, teachers can tailor projects, simulations, and games to supplement their lessons while students can learn new concepts and show their learning
- Encourages the usage of computing science outside of a specific, or any, classroom

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COSPACES

UNIVERSITY OF ALBERTA
FACULTY OF SCIENCE
Department of Computing Science