A 3D Game to Engage Students in Coding

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BACKGROUND

Research shows that serious games are more effective at teaching and engaging students than traditional lecture-style teaching (Barnes et al., 2007).

We are developing a game to increase retention and success in the introductory courses and decrease drop rates from computer science programs (Kinnunen et al., 2006).

An innovative Web-portal allows instructors to create programming challenges that are customized for their students and gives instructors access to detailed data about student progress (Lee & Ko, 2011).

ABSTRACT

We extended a 3D serious game to teach and reinforce fundamental coding concepts. The objective of the game is to find missing animals scattered around the city and help them return home by solving coding assignments. The built-in IDE (Integrated Development Environment) supports multiple programming languages that could be easily changed by instructors in the instructor’s portal. This innovative feature allows instructors to create customized programming challenges that students solve in the context of the game. The game was designed to engage and motivate all students, with a special focus on women and underrepresented groups in computer science. A preliminary evaluation of the game at three colleges in CUNY shows promising results in the use of the game as a teaching tool.

THE GAME

The game takes place in a 3D urban environment with subways, moving cars, and rivers.

The objective of the game is to find missing animals wandering aimlessly around the city.

The saved animals are transported to the animal sanctuary (“trophy room”).

The game uses the Judge0 API to run instructor-created in-game coding challenges, which are compiled and executed. Supports over 40 languages (including Java, C++, Python).

ACCESSIBLE USER INTERFACE (UI)

• UI was designed according to Universal Design principles
• Fonts and color schemes were chosen to provide an exceptional user experience for visually impaired and color blind individuals

STUDENT FEEDBACK

This game was evaluated on over 80 students in Brooklyn College and College of Staten Island. Students were enthusiastic about the game as a fun way to learn and practice programming. A separate survey of students enrolled in a serious game development course indicated that 75% would play this game to assess their knowledge of programming.

“I love the 3D graphics, I hope to get into 3D animation one day so this was a great game to play!”

“I brought a twist to coding that made programming a lot more fun than the cut and dry homework assignments.”

FUTURE WORK

• Further enhance game design and storyline, instructor portal
• Include support for non-programming challenges (e.g., Parson’s puzzles)
• Conduct a rigorous evaluation of the game on students
• Adapt the game for Google Cardboard VR

REFERENCES


ACKNOWLEDGEMENTS

This game was supported by a SIGCSE Special Projects grant.