ROVERS
Remote Operated Volatile Explosives Retrieval Systems
An Educational Game Collaboration Between the Bernard M. Gordon Center for SubSurface Imaging Systems, the Northeastern University Multimedia Studies Program, and Metaversal Studios, Inc.

Abstract

Educators often struggle to introduce math and physics concepts in engaging ways. Computer games provide an engaging environment where considerable learning can take place. However, surprisingly little work has yet been done to integrate these concepts into entertaining computer games, instead mostly focusing on "skill-drill" style games. Leveraging our expertise in subsurface imaging, we have developed a simple, attractive prototype computer game based on the distance equation. We propose extending this work to include a wide range of concepts relevant to middle school-aged students on up to college students and beyond.

The Focus Group

Students first played an early prototype of the game, then received a whiteboard lesson on the mathematics behind the game: how the distance equation is an adaptation of the familiar Pythagorean theorem, how solutions to the equation correspond to possible locations of the target, and how multiple equations (i.e. a system of equations) can be used to determine the exact target locations.

The Computer Game

ROVERS is currently an online, Flash-based game with full 3D graphics. ROVERS incorporates various levels of play in an intuitive sequential format, enticing new users into the game world and gradually building up the degree of difficulty, i.e. the amount of formal math required to win. ROVERS also includes a 'Handbook' feature which explains how the game works, including the math behind it.

Accomplishments

Several versions of a simple prototype computer game based on the distance equation have been developed. In it, players locate hidden explosives by performing "scans" of different points on a 2D space. A graphics suite, based on ROVER, a three-dimensional robotic dog, has been developed, which can be used for future work on the game. Extensive benchmarking of other educational computer games and software has been performed, finding surprisingly little available for math and physics beyond the elementary school levels.

The Players

• Metaversal Studios: Experts in designing and developing educational games based on research in subsurface imaging concepts and through its education outreach, in how to explain these concepts to students of various levels.
• Northeastern University Multimedia Studies Program: Introducory seminar program specializing in information and interaction design for music and visual arts.
• CenSSIS: Experts, through its research in subsurface imaging concepts and through its education outreach, in how to explain these concepts to students of various levels.

Future Plans

In order to make the computer game widely used as possible, we hope to make it freely available online. This model has already been used with tremendous success by the 'Nerf's Army' game developed by the US Army. Similar to the US Army's goal of raising interest in the military, our interest is in raising general interest in pursuing careers in math and science.

Deployment Plan

We now seek funding to further develop the game. The initial prototype we are presenting shows off the sophisticated level of multimedia-based education that we are developing, but it only scratches the surface on the possibilities for the game itself.

Future directions include:
• Addition of a third dimension to gameplay
• Addition of other mission scenarios not involving landmines (medical scanning, etc.)
• Creation of a 'toolbox' which will enable other developers to add to the game
• Creation of a virtual environment so that students may compete against one another within the virtual world
• Possible integration with the popular "Second Life" massively multiplayer online world.

Accomplishments

Four 5th grade physics students from Health Careers Academy, a Boston Public Schools charter school located on Northeastern’s campus.

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