

eRebuild Level Creator

TECHNOLOGY AND ARTS SHOW AND TELL

Dan Smith

Computational Science Department
Florida State University
Tallahassee, FL 32306 USA
das10c@my.fsu.edu

Abstract

eRebuild is a learning game initially created as a learning tool that integrates data-based assessment. As the game develops into a robust learning platform, more content becomes necessary. To keep the content focused on learning, we enlist math teachers as level designers. By creating a mixed-initiative co-creative environment, even the complete novice level designer can create a targeted learning experience.

Introduction

It is frequent repetition that produces a natural tendency. (Aristotle)

Nowhere is this more apparent than the field of mathematics. This repetition can be seen easily in how we teach math to children. Worksheets, flash cards, multiplication table drills, and even most math-based video games embody the *practice makes perfect* mantra.

During the development of eRebuild, a math-learning based game, repetition had to be temporarily placed on the back burner. While developing tasks, the game focused on assessment, which necessitated breadth not depth. In addition, the game was intended to be different from early learning games. We are not creating digital flashcards. Instead, game design and math content should support each other, not limit one another.

As eRebuild has grown into a learning platform in addition to an assessment tool, the demand for more levels has become apparent. The time required to create these levels manually is equally apparent. Procedural tools can generate generic levels that mimic those already seen, but if these systems produce a level of low quality, education suffers and the experience can feel much like the repetitive drill eRebuild was designed to avoid.

Each level should be novel in its presentation, and each task must have value as a math-learning tool. As such, generated levels must offer both of these properties. eRebuild's initial procedural generation systems lack assessment for both of these parameters (novelty, value).

As such a Mixed-Initiative co-creative environment has been created. Domain experts ensure that each level highlights its focal task and adjust the play area to ensure a balanced difficulty with minimal distractors.

eRebuild

Created by an interdisciplinary team of mathematicians, assessment experts, math educators, and architects, eRebuild is a math-learning game for students in grades six through eight. The game began development as a learning tool that integrates the data-based assessment, scoring student game-play data as proficiency in a number of the middle school common core state standards. Players navigate through a 3D world recovering from a recent disaster rebuilding homes and schools using their unique abilities. They also collect and trade construction materials, and allocate spaces to displaced people. Each level was designed to elicit evidence of learner ability in the focal competency.

As one transitions to a more robust learning tool, additional content becomes necessary to enable task repetition. This content is displayed through game levels. To mitigate the time cost of creating these new levels, eRebuild includes a co-creative level editor aimed at teachers as opposed to game designers.

When designing a level, the creator chooses one or more target competencies from a list of supported math standards, based on which the level editor recommends a number of task types. The level is then procedurally generated based on the tasks selected. If the level generated is unsatisfactory, the generation process can be repeated. Once the level is complete, the teacher can further adjust parameters such as number, level locations, and type of subgoals regenerating the level as necessary. Finally, narrative elements can be added to selected items within the scene.

Conclusion

Unfortunately, the time required to create quality games with a variety of content remains large. Procedural content generation is one way to resolve this issue. Many of these methods leave something to be desired in the way of creativity.

By combining the procedural system with a level editor, the sum of the two becomes greater than the individual parts. A co-creative environment allows for a quicker development time than using the editor alone and gives the procedural system, a much needed human touch and some fine tuning.

Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant No.1720533.