Augmented Reality Sandbox

Overview
As an educational children’s museum, Discovery Space is always looking to bring new lessons to their patrons. Currently, education about the impact of man on the environment is absent from their offerings. An interactive, small-scale environment simulator would be an appropriate teacher.

Objectives
Our goal was to design an augmented reality sandbox exhibit to be enjoyed by Discovery Space patrons. It would need be portable, easily set up and operated by Discovery Space staff, and include realistic and educational features. After weighing multiple design options for the table and sensory hardware, we decided on a poplar table wielding an Xbox Kinect. Our software design includes topographical coloration, as well as hydrological and volcanic features.

Approach
• Visited Discovery Space in State College, PA to discuss specifications, features, and other expectations
• Compiled a list of software features to be implemented
• Tested multiple compositions of sand to be used
• Sketched variants and decided on table design
• Split team into two subteams: hardware and software
• Hardware team led fabrication of table and mounting arm
• Software team created software and assembled processor
• Hardware team applied finish to table, mounted arm, mounted projector
• Software team debugged code, implemented rain and volcano features
• Software team designed and implemented realistic fluid flow behaviors for water and lava

Outcomes
After a complete debugging, our design was beta tested by a group of 3rd grade students who visited Discovery Space. The AR Sandbox was received very well, with kids very excited to learn about volcanoes, terraforming, and rain runoff through physical interaction with the sandscape.
• Designing the software from the ground up, custom for the client, allowed us to provide a sandbox with features only native to sandboxes priced substantially above our $1000 budget.
• Our custom, lightweight software allows the box to operate on lighter hardware, further helping us cut budget.
• Treating and finishing the wood ourselves allowed us to match the finish to other Discovery Space exhibits, adding aesthetic value, as well as ensuring its durability against children.