Lawrence Technological University

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Sensior Project

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Interactive Learning Game with Balls and Kinect

1) Project Description

Design and implement an interactive learning game using Microsoft Kinect and throwing objects, in this case, a ball; using the Microsoft Kinect SDK 1.8, Kinect sensor, and a projector. For visualization, a project was used on a flat surface, a wall. The Kinect sensor was used to calculate the depth data that it receives, and used the data to interact with the user. The concept of the project was originally in development by Nicholas Sienkiewicz. It used part of his work to create this project.

2) Purpose

The main purpose of this project is to teach the user about the geography shapes of countries in this world. The interactive visualization tool is to be used as a physical education activity.

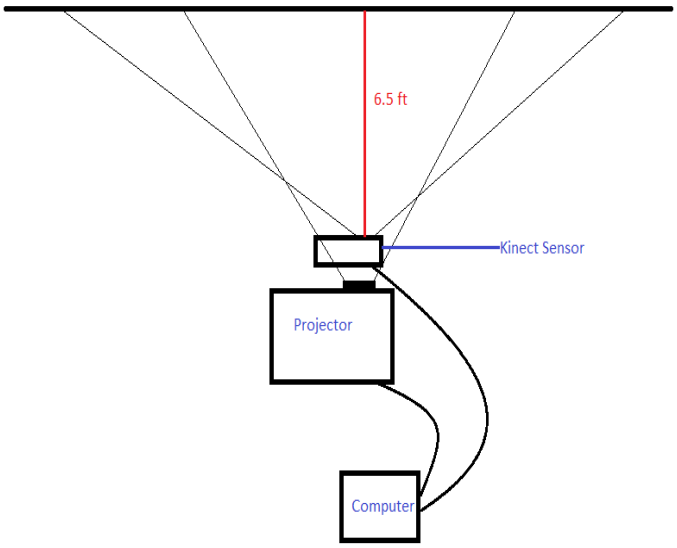
3) Project Design

The whole concept of this project is to be used as physical activity. It needs a large room to be used. The implementation of this project is simple. Once the program starts, the user is required to enter their name and calibrate the Kinect sensor to start the game. Once the user enters their name and calibration is complete, it starts and displays the counter, and displays four different geographic shapes of the countries. As of now, the program contains 11 different countries, the countries that participated in RoboFest. The score is added each time the user hits the right country that the program asks for. Once the game is complete, the user can view the high scores of other users.

The program uses the depth data that it receives through the Kinect sensor. It uses red, green, and blue color to detect the depth level of the program. While calibrating, when the surface becomes blue and sees no green, it means the calibration is ready to go. Green means the detection, so whenever a ball is thrown close to the wall, the part

of the Kinect sensor screen will turn green; however, this will not be seen since calibration is done once, and the depth data will only be shown only when calibrating. The projector is only for visualization purpose.

4) Setup Diagram



5) Test Cases

Test Case #	Description	Expected	Pass/Fail
1	Detection of moving objects	Detects the moving object	Pass
2	Depth Detection	Detects every object within the depth range	Pass
3	Hitting correct country shape	Make a happy sound and animate the shape	Pass
3	Hitting wrong shape	Displayed special "X" shape	Pass
4	Game ending or Time out case	Terminate the game and diplay the current score out of total number of shapes shown	Pass
5	Display of top scores	Correct display of top 5 scores	Pass

6) Video links
   - https://photos.app.goo.gl/a22UyLm9izzEbT5K6
   - https://photos.app.goo.gl/M9morKopyzp4jV9J9 (Time out case. Displaying list of current top scores)

7) Future Work
   - Tie break based on time, not just score.
   - Better image source.
   - Enhance the depth data. Currently it detects unwanted objects sometimes.
   - Better linear interpolation, without using hardcoded numbers. (The screen size fits the sensor and the projector. Previous linear interpolation data does not fit perfectly)
   - Calibration interface
   - Some kind of sound effect when a high score is made.
   - Level (easy, medium, hard)
   - Friendly interface to add more country