AUGMENTED REALITY PROJECT

MINESWEEPER3D

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<u>Origin</u>

Minesweeper is originally a two dimensional tile based game where player should sweep the mined tiles.

<u>Idea</u>

Minesweeper3D idea came out by the idea of extending the two dimensional world into three dimensional world. Third dimension features are applied using augmented reality. Player points the camera to a marker and interacts with 3D model of the tiles.

<u>Structure</u>

1. Unity end
   - A marker is placed in front of the ARCamera object. Vuforia libraries are used to apply augmented reality features.
   - Tiles are generated in runtime as GameObject's.
   - Apart from tiles, text GameObject structure is used to fill the necessary blanks after a tile/s is destroyed.
2. Back end
   - Point3D class
     - **int** x
     - **int** y
     - **int** z
   - Cube class
     - **GameObject** cube
     - **Point3D** point
     - **bool** blasted
     - **bool** mine
     - **string** neighborCount
   - NxNxN **Cube** space

Operations

The game's source code has certain initializers like difficulty, random mine generation and enabling god mode. Some of pre-compiled versions of these are demonstrated through the Android platform.

When the game starts user can interact the object from all angles (except below of the marker). The game is designed to move the player to the different angles to actually win the game. The game relies players to move around to decide whether or not the tiles have the mines.

Each update function call, an object click listener checks for any input. Clicks are captured via ray casting. When a tile is clicked (touch on mobile) following algorithm is executed:

1. If the tile is marked (by holding a click)
    1. Change the color of the tile
2. Else the tile is clicked
    1. If the tile has mine, **game over**
    2. Else,
        1. Destroy the tile
        2. If the tile neighbors have more than zero mines place a text object that represents the neighbor mine count
        3. Else recursively apply step 2.2 of the algorithm for each neighbor.

The text objects are rotated to the camera in each update call by calling the rotation procedures.

If user clicks any mined tile, the game ends by freezing that moment. No menu or scoreboard is presented.

Conclusion

With this game, a classic 2d tile game is extended into a new dimension using augmented reality. Similar projects may exist but there are no 3d minesweeper project that takes advantage of augmented reality according to my inquiry. This project became a unique way to play the game.

The gameplay can be improved by adding menu, options, scoreboard and so on. Randomly placing mines algorithm can also be improve for better gameplay. I presented a primitive gameplay to receive any feedback. If everything will be all right, I'm planning to release the game to Google Play.

The game's code is open source and can be found in https://github.com/alozta/minesweeper3d-VR