hjkl

Tee Chin Yeo & Bharath Chandra Sudheer (Y1 Computer Science students)

Proposed Level Of Achievement : Apollo 13

Motivation:

From Google's claim of already achieving quantum supremacy to IBM's Qiskit offering to one day give companies API access to their own quantum computing runtimes, there is a lot of exciting news and headlines that still seems almost mystical. However, a lot of the material online is either difficult to digest and not for those without a physics background or they are fluffy pop science articles. We want to take the time to really understand how this works, and try our hand at some quantum computing concepts.

Aim

To make principles of quantum physics and quantum computing a little less strange and a little more fun.

Concept

Our aim is to make a game that both explains quantum principles, is fun to play, and gets us (as developers) familiar with quantum computing.

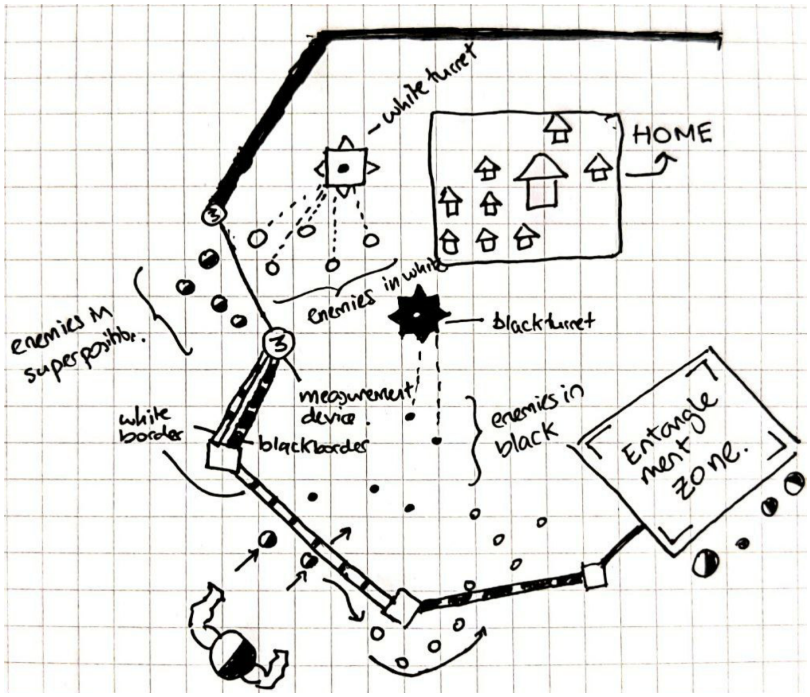
We have found a mentor who is willing to support us in this, Junye Huang, a Quantum Developer Advocate at IBM. We have yet to decide on what kind of game we want to produce, but the following is one of the options we are considering:

Quantum Defence

Defend the base against waves of attacks by enemies with turrets, gates, borders and strategy. Along the way, learn more about how these mechanisms are inspired by real life quantum computing applications.

A tower defence game with enemies, defences and structures in superposition or in their measured state. The enemies and items can be in one of 4 states, visually coded as red, green, blue or yellow. When they spawn, they appear in superposition until their state is measured, which happens when they take damage.

Some of the structures and game mechanics will be simplifications of techniques used in real life quantum computing, such as entanglement and quantum state manipulation (e.g. with Hadamard gates). Over the course of the gameplay, gamers should be able to learn these concepts and be more comfortable with them, even if they do not understand quantum mechanics.



(black and white used in place of the eventual red-blue-green-yellow for simplicity)

Timeline:

March - April:

- Research and draw up game mechanisms based on quantum computing.
- Create at least one toy project on the chosen game engine to gain familiarity.
- Use Qiskit (python module) to build and simulate quantum logic circuits for game mechanics and determine superpositions and states during gameplay.

May:

- Create basic game mechanics (turrets, enemy movement, projectile, bases etc)
- Export a barebones game to internally test.
- Use a test driven software development workflow to keep adding features

June:

- Extend the project to include different kinds of enemies, defensive structures, turrets and other game mechanisms
- Select and incorporate music, sound effects and graphics for use in the codebase.
- Beta release for play testing and gathering feedback

July:

- Fix bugs & incorporate workable suggestions and improvements
- Prepare for final release

Tech Stack:

1. Unity/Godot game engine
2. Qiskit

Qualifications:

Bharath Chandra Sudheer:

I have worked on a couple of projects during my internship at Dedoco (part time internship concurrent with Y1S2) and served as Team Lead in developing a full stack decentralised blockchain application in NUS Fintech. These have brought me some experience in software development workflow and good programming practices. I've also made simple games on the command line before using Python and C, and I'm very keen to try out some more advanced game development.

Yeo Tee Chin:

I have made simple games with Unity and Godot Engine. One of the games that I have created is a 2D platformer game that runs on Corgi Engine on Unity. I handled the UI/UX aspect of the game and the entire storyline. I have also made games with PyGame. Currently, I am the Head of Techne in Tembusu college and have some experience conducting simple workshops. Making games has always been one of my goals and I very much look forward to creating this different kind of game.