YIPIKAYE! STUDIOS

Game Design – Mazes

Abstract

Mazes offer a thought-provoking experience that tasks the player with finding a way out of these intricately designed labyrinths. There should be an underlying level of complexity presented that does not permit the player to simply navigate through the maze quickly. The maze designer must take this element into consideration as well-placed paths could make the difference between a good maze design and a great maze design. We investigate the different types of mazes both in 2D and 3D best suited for our augmented-reality[1] (AR) mobile game, determine the core elements essential for a maze to work and present early concepts.

Research

There exists an array of mazes varying from size and complexity, to specific applications such as an area of research. Mazes aren't just limited to human participants with animals, specifically rats, able to be partakers. Their use is normally in psychological based experiments to study spatial and navigation learning [1]. Our focus will be on mazes designed for humans.

Ball-in-a-maze

- Dexterity puzzles which involve manipulating either a maze or one or several balls so that the ball/s are manoeuvred towards a goal [2].

Block maze

- A maze in which the player must complete or clear the maze pathway by positioning blocks. Blocks may slide into place or be added [1].

Linear/railroad maze

- A maze in which the paths are laid out like a railroad with switches and crossovers. Solvers are inhibited to moving forward only. Often, a railroad maze will have a single track for entering and exiting [1].

Logic maze

- Sometimes called, 'maze with rules', these are logic puzzles with all the aspects of a tour puzzle [3] that fall outside the scope of a typical maze. These mazes have special rules, sometimes including multiple states of the maze or navigator. Examples of logic mazes include tilt mazes, area mazes and multi-state mazes [4].

[1] Augmented Reality is a technology that superimposes graphics, video, audio or other sensory enhancements over the user's view of the real world all in real time.

Higher dimension mazes

- It is possible for a maze to have three or more dimensions. A maze with bridges is 3-D. and some natural cave systems are 3-D mazes. Any maze can be mapped without changing its topology[2] [1].

Picture maze

- A maze puzzle that forms a picture when solved. In *figure 1*, we are presented with a traditional maze in its unsolved state. Upon finding the answer path, we discover what looks to be a watering can [6].

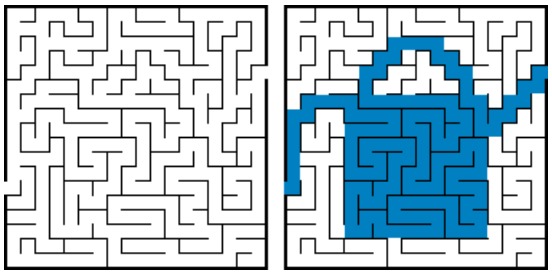

Figure 1. (i) A traditional maze which when solved, (ii) reveals the image of a watering can.

There are even more maze types than the above listed such as a loops and traps maze, Hamilton maze and number maze, but the focus will be on the ones we can implement successfully into our AR driven game. Since we desire a controllable character to be directed through a maze, the ball-in-a-maze puzzle would not be appropriate as a) it would mean manipulating the maze for the character or object to move around and b) the precise controls required for navigating through the paths are essential since stealth elements will be incorporated into our game.

A block maze's concept of altering the maze to successfully navigate through it bodes well with the theme of augmentation. In terms of gameplay mechanics, we would need to consider how much freedom we would provide our player with as misuse of this ability could inevitably lead to a broken game. Integrating shortcuts in the form of 'thinning walls' hinted by visual signs would seem permissible rather than shifting of the entire environment.

A railroad maze poses the challenge of having you move forward only. For our type of game that wouldn't be suitable. As an alternative, sound could be used to spur the player forward i.e. guards footsteps and their cautious mutterings.

Ridden with patrolling enemies and obstacles with just the aid of a temporary light emitter. Our game will contain mazes with traditional elements with the addition of components that suit the theme we are aiming to deliver with our product.

[2] The mathematical study of the properties that are preserved through deformations, twisting and stretching of objects. Tearing however is not allowed [5].

Unlike the bird's-eye view of a 2-D maze, a 3-D maze poses the challenge of hidden areas due to orientation; some areas of the map will be more visible than others. Our team discussed solutions to this including enabling the player to change position to get a better view of the maze further explored in the short paper 'Limitations of ARKit in Augmented Reality' [7].

Conceptual Designs

Based on the research conducted, initial drawings where done to design a maze.

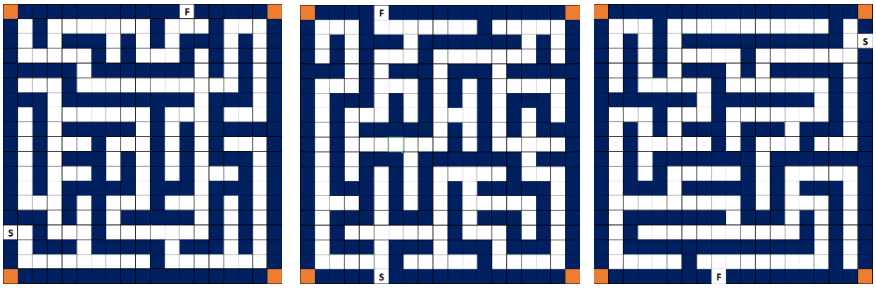

Figure 2. Mazes created in Microsoft Excel by following a methodology presented on the internet.

By carefully following the instructions online [8], 3 distinct mazes were created as shown in *figure 1*. The orange marks at the corners of the square represent the only light sources available for the player bar the light ability. The lighting will also offer a sense of orientation of where the character is amidst the darkness. Since we were designing a maze to be integrated into a game, the dead ends created may not always be just as the name describes but may contain a valuable item that will help our character's pursuit in finding the labyrinth's exit. Of course, not every branch off the ideal path will lead to pleasant findings with snares and traps setup to catch the player out.

Conclusion

Designing a maze is a delicate process as the designer can choose to lead the player in whatever fashion they deem necessary for the application. A maze doesn't have to be overly complex to be great but it's essential that it dose pose a good enough challenge that the player would want to try again. Not all maze types are suited for the augmented reality. We would have to think of smart ways to implement the most suitable types in a way its flaws aren't a hindrance to the player's enjoyment but rather adds to it by the way of encouraging them to explore the breadth of the level.

References

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Figures

[1] Picture maze - Wikipedia. 2017. Picture maze - Wikipedia. [ONLINE] Available at: https://en.wikipedia.org/wiki/Picture_maze. [Accessed 20 October 2017].

[2] Bukachi, A., 2017. Maze Designs.