An Integration Of The Linear And Hub-And-Spoke Flow Models For A Two-Dimensional Role-Playing-Game

Abstract: The paper describes the integration of linear and hub-and-spoke flow models for a two-dimensional role-playing-game. The research work deals with game level design setup using an open-world map environment that easy to explore the game scene with a series of story mission.

Index Terms: Science fantasy, 2D RPG, Linear, Hub-and-spoke

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1. INTRODUCTION

The game presented in this paper is a First Person Horror game. The games that inspired this proposal are Outlast 1 and Outlast 2. Taking in the idea of being trapped with psychotic people in a building and combining my idea of students in the middle of the horror, I managed to come up with a simple proposal of the game. This game tells a tale of 3 delinquents breaking into their university to steal unreleased copies of their final examination paper with the intention to leak them. However, they find a room and materials that would indicate that the university's staff members are part of a murderous cult. They are then exposed and flee for their life, changing their mission from stealing to surviving.

2. BACKGROUND STUDIES

[13] Yamaguchi et al, (2017) states that player who have experienced playing horror games will most likely be frightened due to their past experience. With that, being said, I attempted to include as much horror elements I can find from studying and analyzing previous games. The game Fe Ciega uses both linear model and branching model for the game's flow. As this game involves multiple endings, branching is required to meet the flow of the game. With branching, players will be able to choose between few options that would lead to different ending. Players will be able to walk, run and crawl in this game. Each playable character also has one special ability each. Parkour for Peter, shoving for Harrison, and crawling through tight spaces with Carrie. This games also include multiple mini-games.

3. GAME CONCEPT & DESIGN

3.1 Paper design/Map

This game takes place in a university campus ground. With that, I have created a map using 3D Studio Max to showcase the campus map. The map is displayed at Figure 1.

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- *Kim Wei Han, Asia Pacific University of Technology & Innovation, Jalan Teknologi 5, TPM, Kuala Lumpur, Malaysia.*
- *Leo David, Gertrude, Asia Pacific University of Technology & Innovation, Jalan Teknologi 5, TPM, Kuala Lumpur, Malaysia. E-mail: leo@staffemail.apu.edu.my*
- *Tet-Khuan, Chen, Asia Pacific University of Technology & Innovation, Jalan Teknologi 5, TPM, Kuala Lumpur, Malaysia.*
- *E-mail: tet.khuan@staffemail.apu.edu.my*

Fig. 1: Map of the university campus

The first mission of the game is where players have to enter the buildings to steal the papers. The main problem for the player would be the CCTV cameras. To take care of that, the player would have to slip into the main control room (blue) to take out the wire in the generator that powers the CCTV cameras.

Fig. 2: Main control room

Players will start out by hiding in the unused (green) block of the university.

Fig. 3: Unused block

They then proceed to sneak their way and avoid encountering any NPCs (guards) to the main control room which is the blue block. Upon arrival they will have to complete 2 mini-games to complete the first act. 1 lock-picking mini game and 1 wire

tracing mini game. The wire tracing mini game requires them to trace the main power source of the CCTV and cut the wires that connect to the main power generator. Upon doing so they will complete the first act. The second part of the mission is where the heist begins. Players make their way to the staff office in the first block. Players are then taken to the floor of the staff office in which they will begin exploring and searching for the papers. Players would have to complete a series of pick locking mini games with different difficulties to open drawers & safes. Players will then find a door hidden behind one of the shelves. The trio then moved the shelf to venture inside the hidden door. Only to find rooms full of weird and unexplainable items. Upon further inspection, gruesome images and books indicate that the school staff members are part of a murderous cult.
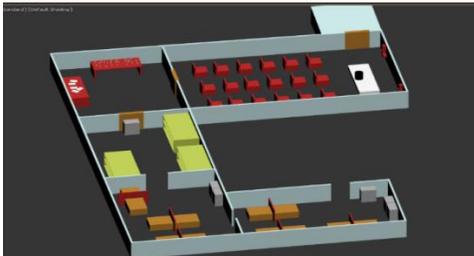

Fig. 4: *Staff office*

Suddenly a staff enters the room and discovers them. While escaping Carrie injures herself but they manage to get away from the NPC. In a hurry to escape, the trio are split up from each other Upon reaching, the main gate they also discover that the automatic gates have been shut and cannot be manually open and the walls are too high up to climb. They then see a group of NPCs walking towards the main gate so they proceed to hide in the main control room. While hiding they noticed that they have also accidentally damaged the wire that powers the main auto-gate. Their only choice left is to find parts around the campus to repair the wireAct III is split into 2 parts, as you will be able to play as 2 characters (Harrison & Peter). Players are given the option to choose whichever to play first, then playing the other when they have completed their first choice. The story for both levels will proceed as following: If the player chooses to play Act III (i) first, they will be playing as the main character Harrison. Harrison is assigned to head to block one (brown) in order to search for the tools to repair the cables. If the player chooses to play Act III (ii) first, they will be playing as Peter. Peter is assigned to head to the block 2 (white) in order to search for the spare cables. Players will have to sneak their way from the power room to the maintenance room located in block 2(white). Once Players have completed the tasks in these two missions, they are presented with a side quest, should they accept it they will unlock a secret stage which will lead to a secret ending. After completing the 2 parts, the school staff make a shocking announcement through the PA system. It is discovered that Carrie, the injured character, has been captured. The staff also makes an offer in exchange for Carrie, in which the player has to kill Peter in order to save Carrie. The player is then directed to meet Peter at the bridge (pink).
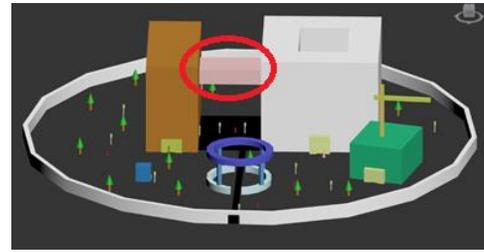

Fig. 5: *Bridge*

After meeting Peter at the bridge (pink), the player is presented with 2 choices. Option 1: kill Peter, option 2: work with peter to save Carrie. Option 1 will lead to Ending 1, and option 2 will lead to Ending 2.

3.2 Environment
This game centralizes in a self-created map of a university. There are various hiding spots throughout the university grounds. In addition to that, there are also multiple NPCs roaming the university grounds, both indoors and outdoors. In the campus, buildings there are elevators in each building and level to serve as checkpoint and respawn points.

Fig. 6: *Sample elevator for checkpoint and respawn [12]*

Fig. 7: *Sample hiding locker [3]*

Fig. 8: *Sample bathroom stall used for hiding [1]*

3.3 Beginning & Ending

Act 1: The player begins in the unused (Green) block together with the other characters and end this level at the main control room. Act II: The player begins this level from the main control room (blue) and ends up being separated from the other characters by the end of the level. Act III (i & ii): For both parts, the player will start from the main control room (blue). Carrie is injured and is not able to move. By the end of the level, the staff will make a gruesome announcement through the PA system. This kick starts ACT IV. Act IV: This level starts by the player being presented 2 choices. The story will resume depending on which choice the player makes. If they have completed the side missions, they automatically begin this level by playing as Carrie. The secret stage is completed when Carrie is reunited with the other characters and escapes with them.

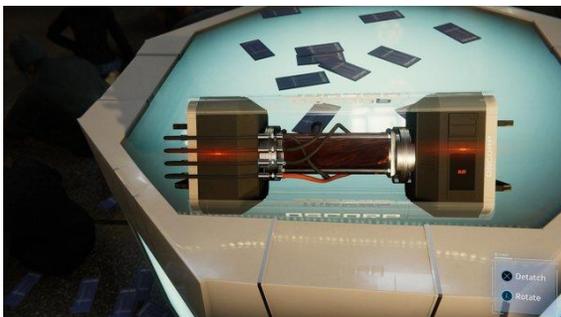*Fig. 9: Sample image of lock picking mini-game [11]*

Fig. 10: Sample image of wire tracing mini-game [5]

3.4 Goals

Act I: Disable the CCTV by cutting the cable that powers them. Act II: Sneak into the staff office and steal the unreleased copies of exam papers. Act III: The goal of Act III (i) is to search for the tools to repair the cable. The side quest is to obtain the images and tapes discovered earlier in Act II.
The goal of Act III (ii) is to search for spare cables. The side quest is to capture images for the cult members during their meeting. Act IV: In the beginning player, make their choice among the presented option. Option 1 has no objectives, as it is a cut scene. Option 2 requires the player to search for Carrie in order to rescue her. If the secret stage is unlocked, players will play as Carrie to escape from NPCs and reunite with Harrison and Peter.

3.5 Challenges

1. Players will be facing are the NPCs, as they will be randomly roaming the map. Players must avoid contact with NPCs, as it would trigger the NPCs to chase them.
2. If NPCs are too close to players when hiding, the hiding will be ineffective. For example, if players hide in the lockers when NPCs are close to them. The NPCs will open the locker and attack them.
3. If the players are outside of buildings, the streetlights are another challenge. If they are in the range of the lights, the guards will easily spot them.
4. NPCs will take 2 hits to kill players. Players will also have limited stamina, when the white HUD appears, the running function will be disabled causing the players to be able to only walk. With that, it will be easier for NPCs to catch up with players.
5. In the secret stage, Carrie's movement will be slowed down due to her injured leg, if the player is spotted by NPCs, the player will not be able to escape them

3.6 Characters and NPCs

There are 3 playable characters. Harrison, Peter and Carrie. Players will be playing as Harrison mostly throughout the entire game and will only be playing as Carrie if they have unlocked the secret stage.

Figure. 11: Sample image of Harrison [2]

Fig. 12: Sample image of Peter [6]

Fig. 13: Sample image of Carrie [9]

NPCs in this game include university's security guard, staff members and the headmaster.

Fig. 14: Sample image of university security guard [4]

All enemies being that are being introduced here will be controlled by A.I. [8]A study by Miyashita et al, (2017) states that a good performance and a humanlike behavior are important factors of the AI agents, and both of them should be achieved simultaneously. Supervised learning framework trains an AI agent using historical play data of human agents as training data. Supervised learning agent exhibits a more human-like behavior than reinforcement learning agents because of imitating training data. However, its performance is often no better than human agents. Their final results proves that a shared network could obtain the balance of reinforcement learning and supervised learning while training

3.7 Resources
The items obtainable from main mission are:
a. Tools
b. Spare wires
   Item obtainable from side quest are:
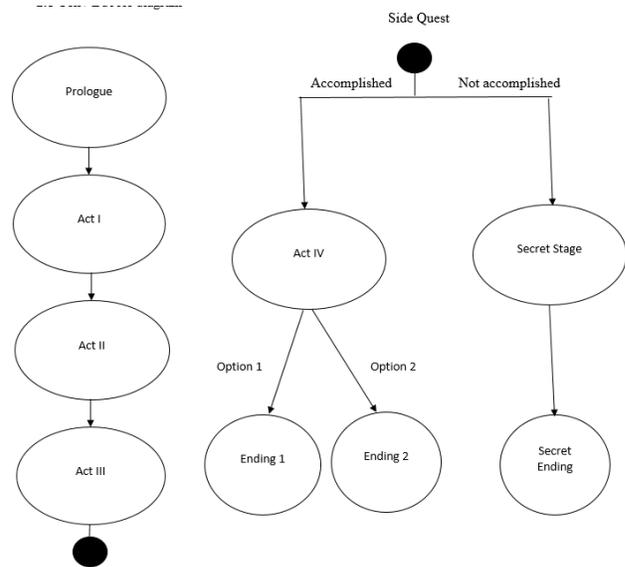a. Images
b. Tapes
c. Documents

4. IMPLEMENTATION & TESTING

4.1 Heads up Display
There are no health bars and stamina bars in this game. When players take damage or run out of stamina, the screens
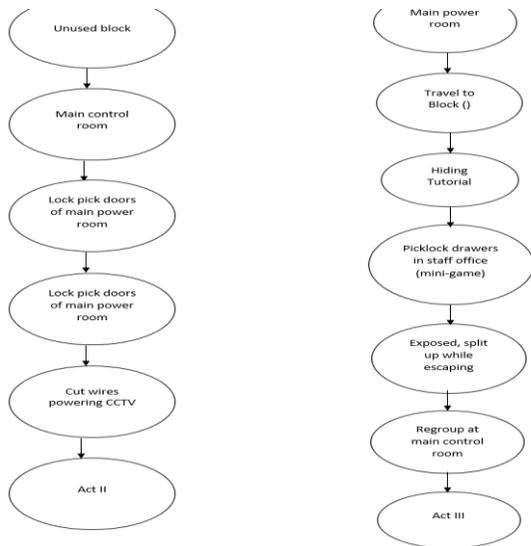
edges and sides will be covered in red for health damage and white for stamina depletion.

Fig. 13: Sample image of health loss HUD [7]

Fig. 14: Sample image of stamina loss HUD [10]

4.2 Gameplay Walkthrough

Fig. 15: Flow of the entire game

Fig. 16: *Act 1(Left) & Act II (Right) bubble diagram*
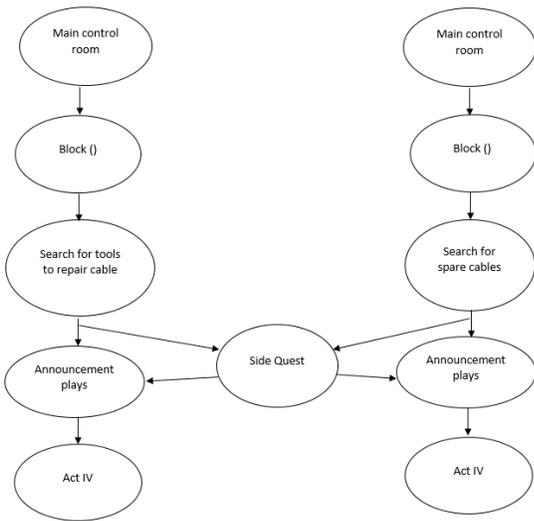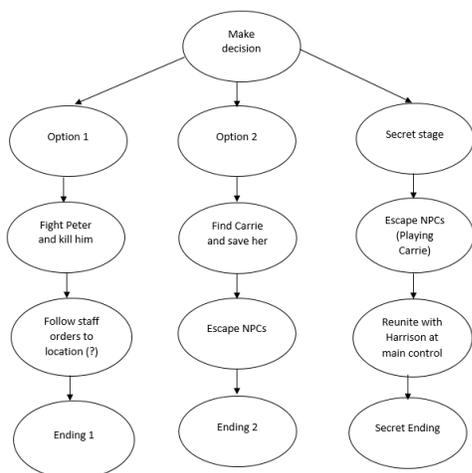

Fig. 17: *Act III bubble diagram*

Fig. 18: *Act IV bubble diagram*

5. CONCLUSIONS & FUTURE ENHANCEMENTS

This game had presented the integration of linear and hub-and-spoke flow models for a two-dimensional role-playing-game. The research work deals with game level design setup using an open-world map environment that easy to explore the game scene with a series of story mission. For the further enhancement, the development of an extension or sequel to the game can be made with more enriched storyline and side missions, with the same implementation of the flow models in the research.

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