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BSc. Computer Science

Summer Research Summary

Isometric RPG/TBS Game

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Abstract

During my research performed over the summer period; I have found a few excellent sources about the design of my game. I focused mostly on the design, as this part of a games' development lifecycle must be completed for me to continue the development of my project.

Achievements Adapted to Player Type

The first piece of research I reached was a paper by *Georg Volkmar, Johannes Pfau, Rudolf Teise, and Rainer Malaka.* This paper covered player enjoyment and engagement in RPG game design. They introduced a novel approach to the achievements commonly found in most other games, through adaptive achievements.

Adaptive achievements pertain to the idea of gaining an understanding of a player's type and then using that to create achievements that fit. In this paper, the BrainHex model was used to describe the different types of players [1]. This model describes seven player types: *A Seeker (Enjoys exploring the game world), Survivor (enjoys game experiences that associate with terror and/or fear), Daredevil (Enjoys taking risks to obtain a thrill), Mastermind (A player who enjoys solving puzzles, and identifying efficient strategies), Conqueror (someone who enjoys overcoming challenging enemies, and also other players), Socialiser (spending time with other players they trust.),* and *Achiever (A player who focuses on completing objectives)*. It is important to note that the BrainHex model does not assign a single type, but instead categorizes players as a combination of these archetypes.

To test their theory, they devised a test which involved the creation of a simple computer role-playing game. A 2D orthographic game called *forknight,* this game involved players taking control of a character equipped with a fork-like weapon where players would have to fend off enemies and complete various challenges [2].

Players were then told to complete the BrainHex online questionnaire[1]. These results were then transferred into the game prototype, without telling any of the participants what results they got, as this may harm the results. The group of participants was split into two; an experimental group (where they were given fitting achievements based on the BrainHex result), and a control group (where they were given non-fitting achievements randomly).

The players were then given three achievements; two *primary class* and one *secondary class*. Participants were then told to complete the game within the twenty-minute testing phase, with the achievements only being optional sub-goals.

<u>*Results*</u>

Their results showed no significant difference in *interest-enjoyment, perceived competence,* or *tension-pressure.* However, they did find that *effort-importance* was rated higher in the *experimental group* than the *control group.* Furthermore, they also found significant effects when asking participants *"It feels like achievements matched my personal preferences,"* and *"I tried hard to fulfil the achievements,"* with *"Fulfilling the achievements felt rewarding"* having a noticeably significant difference in favour of the *experimental group* [2].

<u>*Summery*</u>

They found that the results of the test showed that achievements adapted to player type did not necessarily make the game more enjoyable, but more engaging and increasing player motivation [2]. There is, however, the issue of implementing the BrainHex archetype into a live game, you simply cannot ask for players to fill out a questionnaire before they get to play the game. They did, however, mention that they do plan to research extracting a players' *primary* and *secondary type* automatically.

[1] http://survey.ihobo.com/BrainHex/

I found this source to be a great inspiration for how I should go about designing the game to make it more engaging and to increase player motivation.

Game Challenges and Difficulty Levels

The second piece if interesting research I found was one on the difficulty in RPG game levels. It explores other games and how they achieve a fun and enjoyable difficulty. It examined RPGs from a design perspective and highlighted the challenges designers face, most notably, balancing the *novel* with the *familiar.* It also explores designing for more open-ended play and various player types.

They also mentioned a formula for levelling up: $XP\ (Total)\ N\ =\ XP\ (Total)\ N-1\ +\ (1000\ *\ Current\ Level)$

where XP (Total) N = Experience points total for progressing into Level N.

This formula was created for the advanced dungeons and dragons TRPG.

Furthermore, they describe difficulty optimization using *static* difficulty levels. This is where the player is given difficulty options in the main menu and usually affect the games experience greatly. They also mention that researchers found that pre-defined and static difficulty levels do not provide a good level of challenge to keep the player interested for the whole duration of the game [3] [4], but with the use of dynamic adjustments, static difficulty levels helped give the player some form of control over game challenges [5].

Dynamic game difficulty is the use of some sort of algorithm to predict what a player might do next in a game. It uses this information to adjust the difficulty at a much finer resolution than a static difficulty level [6]. They do, however, note that this process may negatively affect some types of players, who may feel frustrated if the feeling of achievement is lost [5].

<u>*Summery*</u>

This piece of research has given me insight into the difficulty of my game, and that difficulty of a game should be uniformly adjusted to make it more challenging and enjoyable. They also finally mention that challenges should be adjusted; keeping them believable and consistent throughout the game [5].

Simulation of Artificial Intelligence in a Computer Game

Another major source I found, was one describing the use of fuzzy finite automaton to create a more believable AI for a computer game [7]. This paper interested me since my game will contain enemies; which will need some sort of algorithm to control pathfinding, choosing an appropriate strategy in combat, and even dialogue.

The journal article lists a set of rules for each state of a non-player character (or animat): Combat, Escape, Exploration, and a list of rules about the output set of strategies: Melee, Ranged Attack, Pursuit, Treatment, Escape, and finally, World Exploration.

To test, they created an RPG android game (using Java), and then implemented a fuzzy generating state machine. After implanting this algorithm, results showed that the behaviour of the animat in various game situations looked logical. The test also showed that transitions to the different states and animat strategies are carried-out smoothly and do not look too robotic [7].

Summery

This source has been an immense help in teaching me the nuisances with game AI and supplying a great resource into how I could use this research to implement my version of enemy game AI.

References

[1] C. B. a. R. L. Lennart E Nacke, " BrainHex: A neurobiological gamer," *Entertainment Computing,* vol. 5, no. 1, pp. 55-62, 2014.

[2] G. a. P. J. a. T. R. a. M. R. Volkmar, "Player Types and Achievements -- Using Adaptive Game Design to Foster Intrinsic Motivation," in *Extended Abstracts of the Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts*, Barcelona, Association for Computing Machinery, 2019, pp. 747-754.

[3] M. &. G.-M. P. &. G.-C. P. &. D.-A. B. Gómez-Martín, "Adjusting game difficulty level through Formal Concept Analysis," in *Research and Development in Intelligent Systems XXIII*, 2007, pp. 217-230.

[4] G. a. R. G. a. S. H. a. C. V. Andrade, "Extending reinforcement learning to provide dynamic game balancing," in *Proceedings of the Workshop on Reasoning, Representation, and Learning in Computer Games, 19th International Joint Conference on Artificial Intelligence (IJCAI)*, 2005, pp. 7-12.

[5] B. a. S. Ö. Bostan, "Game challenges and difficulty levels: lessons learned From RPGs," in *International simulation and gaming association conference*, 2009, pp. 1-11.

[6] D. a. B. V. Thue, "Modeling Goal-Directed Players in Digital Games," in *AIIDE*, 2006, pp. 86-91.

[7] E. V. S. a. N. V. Shalaginova, "Simulation of artificial intelligence in a computer game," *Journal of Physics: Conference Series,* vol. 1399, pp. 33-50, 2019.