

Game Balancing: Health Points

Note: There are 11 rooms in the game and 10 rooms that contain enemies.

Mathematical model for health:

Game analysis before changes:

Player initial health: 100hp

Average enemy damage to player per battle in hp:

- Dust bunny: 36 hp
 - Probability of appearing in a room:
 - Level 2 = 75%
 - Level 3 = 55%
 - Level 4+ = 35%
- Teddy bear: 83 hp
 - Probability of appearing in a room:
 - Level 2 = 25%
 - Level 3 = 45%
 - Level 4+ = 65%

Room #: (Player health at beginning of room + potions in room) - [(3 battles*probability of getting bunny)(bunny damage per battle) + (3 battles*probability of getting teddy)(teddy damage per battle)] = player hp for that room

-> This equation will help us see whether the amount of hp the player has is enough to play the game

- Room 1: $(100\text{hp} + 2 \times \text{mini potion } (25\text{hp})) - [3 \times 1(36\text{hp}) + 3 \times 0(83\text{hp})] = 42 \text{ hp}$
- Room 2: $(42\text{hp} + \text{mini potion } (25\text{hp}) + \text{mega potion } (50\text{hp})) - [3 \times 0.75(36\text{hp}) + 3 \times 0.25(83\text{hp})] = -26.25\text{hp}$
- Room 3: $(-26.25 + \text{mini potion } (25\text{hp}) + \text{mega potion } (50\text{hp})) - [3 \times 0.55(36\text{hp}) + 3 \times 0.45(83\text{hp})] = -122.7$
- Room 4: $(-122.7 + \text{mini potion } (25\text{hp}) + \text{mega potion } (50\text{hp})) - [3 \times 0.35(36\text{hp}) + 3 \times 0.65(83\text{hp})] = -172.65$
- Room 5: $(-172.65 + \text{mini potion } (25\text{hp}) + \text{mega potion } (50\text{hp})) - [3 \times 0.35(36\text{hp}) + 3 \times 0.65(83\text{hp})] = -222.6$
- ...

We can see a mostly linear relationship in the player's health over time. In the equations above we can see a mostly linear decrease in the amount of hp the player has left after each room, which shows that currently the game is unbalanced (the player's health is not balanced with the enemies' damage), thus changes have to be made.

Theoretical analysis

- Overworld is non-deterministic since the enemy spawns in random locations.

- Battle system mixes deterministic and non-deterministic traits. Deterministic traits include it being a turn based battle where the turn of the player and enemy is done after doing one move and each specific move does the same amount of damage each time regardless of the turn number or enemy. The non-deterministic part is shown in the enemies. The enemy does not choose the same move all the time and makes the best choice 70% of the time, and makes the second best choice 30% of the time.
 - Since the enemies are non-deterministic and do not make predictable moves all the time, it would be a good idea to give the player more hp either initially or through items to make the game more balanced.

Change log

Area of change	Reason for change	Description of change	Results/Progress in game
Player health	Health is initially too low	Initial player health increased to 150 from 100	Player dies after second battle in room 2
Player health	Teddy bears attack cuts a lot of hp	Initial player health increased to 200 from 150	Player dies after third battle in room 3
Health potion	Players loses a lot of hp in third room	Increase the amount that health potions heal. Mini potion 25->50. Mega potion 50->75	Player dies after third battle in room 4
Enemy health	Dust bunnies are relatively easy to defeat but teddy bears are very strong. Decreasing the bears' health will make them a bit easier to defeat	Decrease initial hp of teddy bear enemies from 110 to 90	Player dies after one battle in room 6
Health potion	The player loses more health in the later rooms	Add another mega potion in room 5 underneath the Christmas tree and one in room 6	Player is able to make it to the end of the game.

In conclusion, the theory does hold up in practice.