Achieving balance in the ARPG genre of video games with asymmetrical choices

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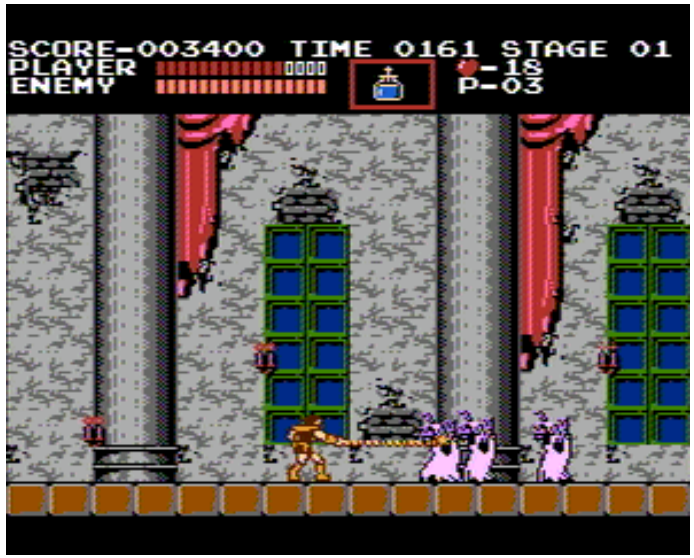
Action-adventure role playing game

- Players develop a character
- Complete in-game tasks
- The character becomes more powerful
- Complete harder tasks more quickly

- Emphasis on combat encounters
- Player versus monster: reduce the monsters' hit points to zero before losing your own.

Classic example: Castlevania

- The character progresses through a series of levels.
- Linear design: there is only one direction to go.
- Character progression: 3 weapon upgrades available:
- Exactly one choice available to the player: which item to use.



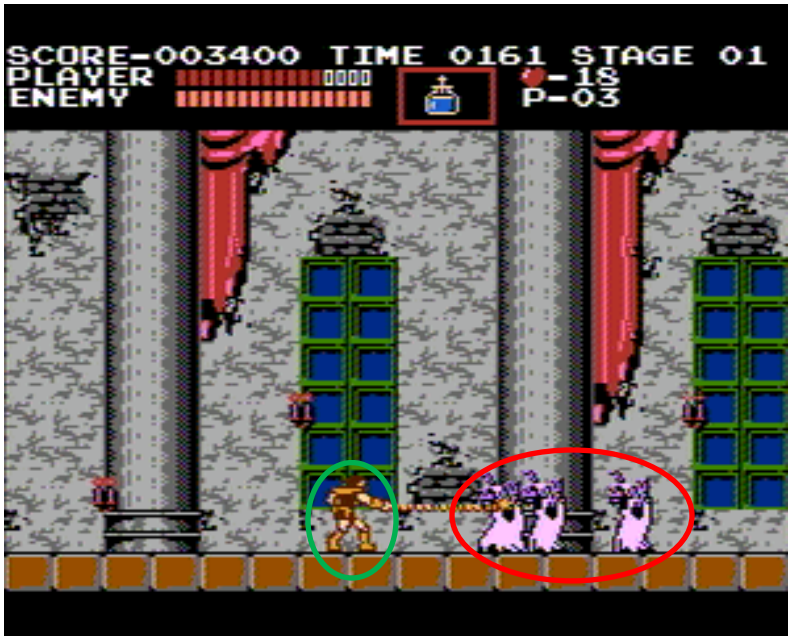
Modern example: Diablo III

- The character progresses through a series of levels.
- Nonlinear design: the player has many directions to go.
- Character progression:
  - Character gains levels (unlocks skills)
  - Items the character uses
- Two primary decisions to make:
  - What skills to use?
  - What items to use?

Same Basic Idea

- Complete tasks, become more powerful, complete harder tasks.
- Underlying question: What's the best character build?

- Castlevania has 5 builds.
- Diablo III has millions of builds.



Resource generation and consumption

- There is some resource available for use.
  - Energy, mana, spirit, power, etc.
- Some acts generate resources.
- Some acts use resources.

- Underlying question:
  Which resource generator(s) do you use?
  Which resource consumer(s) do you use?

Modern Example: Diablo III

+35

+33

+39

+35

Choose one generator, and one consumer.

Which is the best combination?

−170

−75

−140

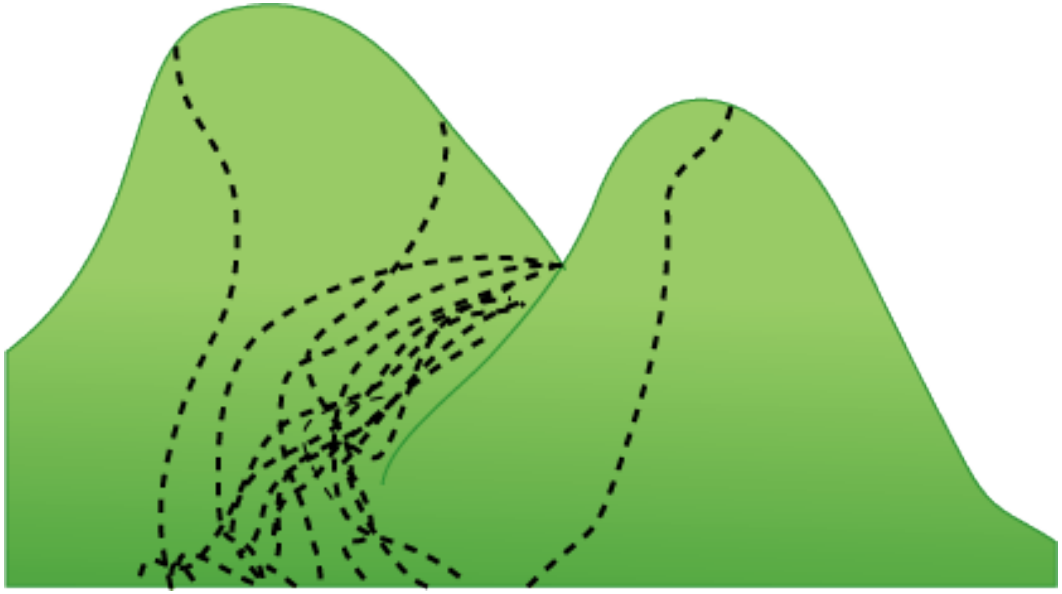
Build Diversity in action role-playing games

Key Assumption

- Players will choose the most efficient path

Goal

- All paths will be equally efficient



Build Diversity in action role-playing games

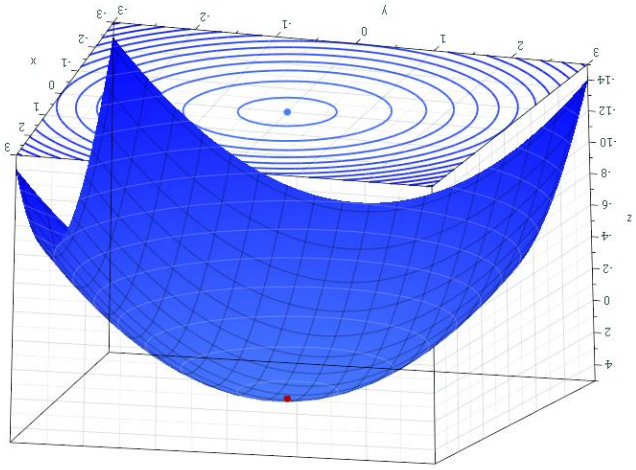
Minimize: Differences in efficiency

Subject to: Varying character classes

Varying character skills

Varying character spells

Varying character abilities



Note that character advancement (experience, items, dungeon level) are not part of this problem

Simplest toy model (with resources)

Minimize

$$\sum_{\mathcal{P}\times S}(T(p,s)-\bar{T})^2$$

Subject to

$$T(p,s)\Big(X(p)\cdot U(p,s)+X(s)\big(1-U(p,s)\big)\Big)\geq h$$

$\mathcal{P}$ is the set of generator skills (primary)
$\mathcal{S}$ is the set of consumption skills (secondary)
$X:\mathcal{P}\cup\mathcal{S}\to(0,\infty)$ is the damage of each skill.
$U:\mathcal{P}\times\mathcal{S}\to(0,1)$ is the percentage of time that the build (p,s) can be used
$T:\mathcal{P}\times\mathcal{S}\to(0,\infty)$ is the amount of time during battle using build (p,s)

Including kiting, death, and aoe.

Minimize

$$\sum_{\mathcal{P}\times S}(A(p,s)-\bar{T})^2$$

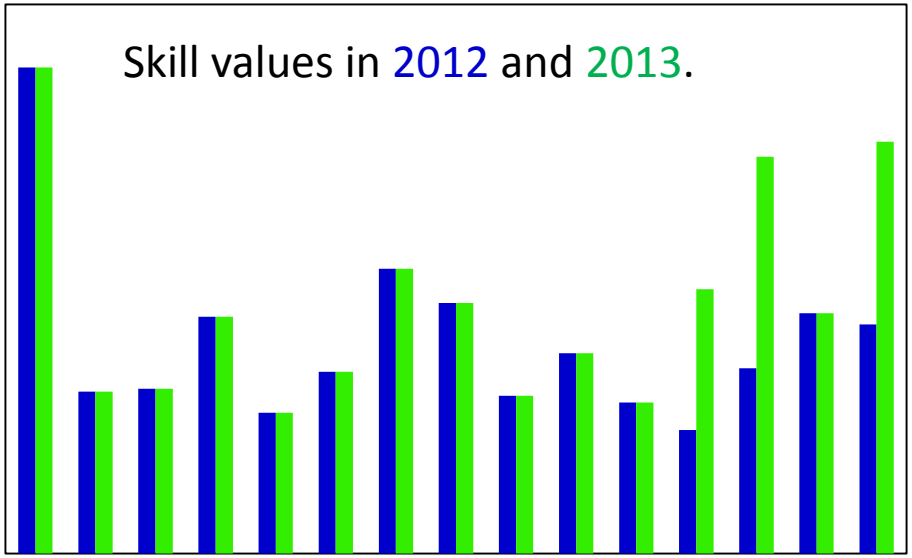
Subject to

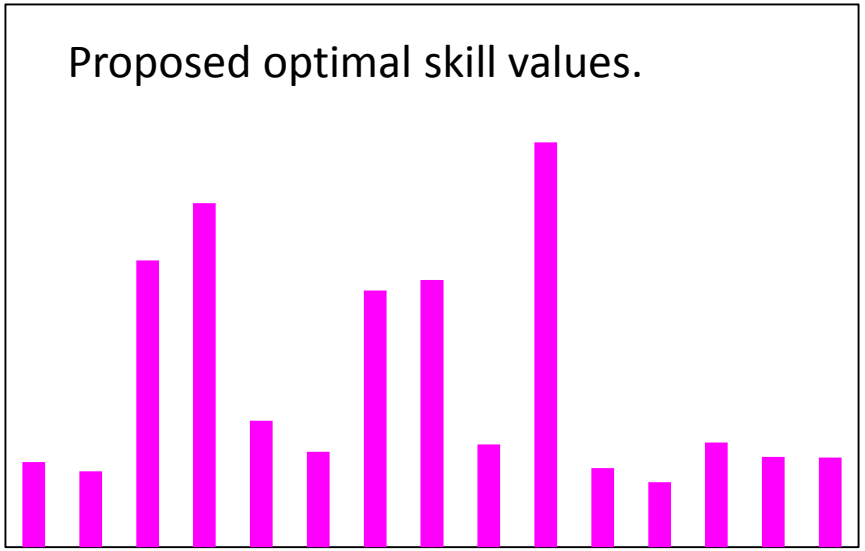
$$T(p,s)\cdot K(p,s)\cdot\Big(X(p)\cdot U(p,s)\cdot S(p)+X(s)\cdot\big(1-U(p,s)\big)\cdot S(s)\Big)\geq h$$

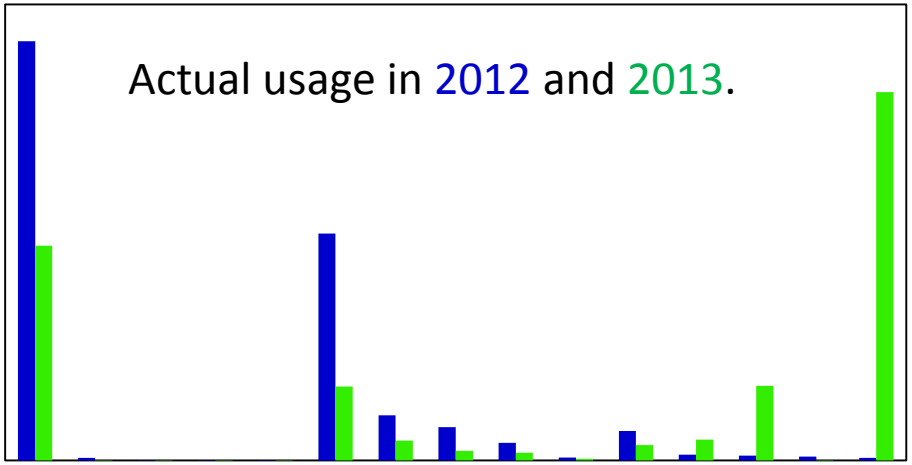
$$A(p,s)=T(p,s)+d\cdot D(p,s)$$

$K:\mathcal{P}\times\mathcal{S}\to(0,1)$ is a factor characterizing how the percentage of time in combat spent on the offense.
$S:\mathcal{P}\cup\mathcal{S}:\to[1,\infty)$ is a factor characterizing area of effect damage.
$D:\mathcal{P}\times\mathcal{S}\to(0,\infty)$ is a factor characterizing the chance of death.
d is the penalty (in time) due to death.

Example: Diablo III (WD secondary skills)







Thank You!