How to Build Serious Games

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Introduction

- What is a serious game?
- Discussion: ‘How to Build Serious Games’
  - Designing ‘Immune Attack’
- Design issues for educational games
- Conclusions
What is a serious game?

- Broadly defined as a game whose primary objective is to educate the user about a real-life topic
  - School teaching, politics, military...

- Looking only at the perspective of games as educational tools in schools
Immune Attack

The process of making a serious game
About the paper

- *How to Build Serious Games (2007)*
  - Development of ‘Immune Attack’

- Develop a PC-based video game
  - Accurately represents the science of human immunology
  - Must remain fun and engaging to the user
“Educational computer games offer new possibilities for communicating complex concepts at the root of good science.”

- Combine the educational value of textbooks with the absorbing nature of computer games
Educational Problems

- Large number of cell types
- Complex processes and interactions between cells
- Intricate vocabulary
- High school and freshmen – 15–19 year olds.
  - Will require some level of sophistication
  - Can assume some prior knowledge
The team

- Composite team of many disciplines:
  - Biology
  - Immunology
  - Pedagogy
  - Game design
  - Learning science

- Three member institutions
  - The Federation of American Scientists (FAS)
  - Brown University
  - University of Southern California (USC)

- Chose to do programming in-house rather than hiring commercial game company
Three key considerations:

- Engaging gameplay (relative to current commercial offerings)
- Valid educational content
- Action spans multiple physical and temporal scales
  - From millimetre to nanometre

Important to find the right balance between *education* and *entertainment*
Approach

- **3D environment**
  - Discovery type game e.g. Freelancer or Descent
  - Earn the right to proceed
  - Trade-off between realism and educational value

- **Battlefield metaphor**
  - Invading bacteria and viruses
  - Friendly immune system
  - Not approved by immunologists!
Players usually ignore introductory text

Clear visual and auditory media

Learning done through interaction with molecules
  • Must be realistic say immunologists!

Assistance through My Learning Assistant
Testing

- Alpha release tested in 5 US high schools – 220 students

- Strong support from teachers
  - Greater accessibility for students, when compared to textbook

- Beta version in production and wider tests proposed
Problems

- Designed their own engine
  - Limitations in existing software
  - Very time-intensive process

- Conflicts between different groups
  - Particularly immunologists against game designers
  - Scientific integrity vs ease of integration and playability

- Bad lifecycle methodology
  - Spent 9 months with little progress
Education vs Entertainment

The differences in the design process
Gaming Objectives

- The aim of traditional non-educational games is *entertainment*

- Although science may be used for the basis of problems in games, they usually rely on prior knowledge to solve

- Often there are compromises in the educational integrity of games for the sake of entertainment
What are the differences in the ways textbooks and games transmit information?

Books are one-way processes
- Information has to be well structured
- No feedback
- Author defines the learning objectives

Games are interactive
- Allows users to explore the topic
- Can provide help on specific areas
- Learning objectives can be more dynamic
Limitations of Games

- Games can’t be too realistic
  - Problems with physical and computational complexity
  - May be detrimental to playability

- Is a break from reality *required*?
  - Players lose interest because the game is too realistic
  - Sense of escapism
The educational basis of games comes from how similar the concepts you want to transfer are to nature:
- Immune attack: not all of the environment is 100% realistic, but the important educational concepts are.

Many games have realistic components that could be used as educational tools:
- This does not make the games educational!
- E.g. Half-Life 2, Test Drive Unlimited
Making the information educational

- Educational game designers need to carefully consider the process by which knowledge is transferred.

- This can challenge assumptions about the pedagogical methods used by the educators.
How does this relate to *Immune Attack*?

- **Compromises in realism**
  - Cell reduction and simplifications
  - Fixed cell animations
  - No soft surface physics or accurate 3D models

- **Entertainment Value**
  - Nanobot floating through body
  - Mini action games
How does this relate to *Immune Attack*?

- Pedagogical Methods
  - Encourage use of MyLearningAssistant
  - Hints and Tips System
  - Use of puzzles to help identify weaknesses in user knowledge

- Immune Attack attempts to address many serious game design issues
  - Lack of experience, time and resources
  - Good alpha test response and sound fundamentals
Conclusions

Designing a Serious Game
Conclusions

- Immune Attack took a structured approach to designing this educational game
- Created diverse and knowledgeable team, though there were multiple conflicts in expertise
- Good design goals, even though not yet fully realised
- Realisation that serious games do not have to be completely realistic
References


Questions?