Using Video Games to Teach Computer Science

Nate Andryesco
CS 490G / 590M

- Construct a video game that teaches some CS concept
  - Hopefully, the end result can be used by a professor to use in his class

- 15 people
  - Groups of 3
Team 1

- Undergrads
  - Aaron Link, Nate Logan, Brandon Stolle

- Puzzle game - Teaches recursion
  - Navigate a character through a series of mazes using the same set of instructions.
  - The set of instructions = The recursive function
  - The character and maze = The data
  - Each level = Each recursive call
Team 2

- Undergrads
  - Chris Hartman, Dan Krueger, Julie Whitsel

- Wario Ware style game – Minigames
  - Decimal to Binary conversion
  - Bug finding
  - Tree Traversal – Depth-first search
  - Constructing loops
Team 3

- Undergrads - “Team 11₂”
  - Leilah Jackson, Hans Livingstone, Ken Schmidt

- Myst style game
  - Teaches ranking algorithm complexity
Team 4

- Graduates - “Alpha Squad 7”
  - Nate Andrysco, Elizabeth Blythe, Paul Rosen
Team 4

- Mario Party style – Minigames tied together
  - Help MC Plus+ get some ill beats
  - Guide your character through a block of code and compete in minigames
Team 4

- Decimal to Hex conversion
Team 4

- Tree Balancing
Team 4

- Selection Algorithm
Team 4

- Graphics Pipeline
Team 4

- Graphics Transformations
Team 5

- Graduates
  - Mussabek Baimukham, Brian Hackbarth, Barry Whitman

- Third Person Shooter - Teaches security algorithm
  - Run around a maze which represents the internet’s topography
  - Alice and Bob scenario – Alice wants to deliver a message to Bob without anyone else seeing it
    - Evil packets attack you, trying to steal the message
Teh Winner

■ ???
Teh Winner

- Team #1

- Winners of 3 Xbox 360s
Technology

- XNA – For developing on Windows and Xbox
  - Game engine designed for graphics noobs
  - Released right before semester started
  - Develop in C# Express environment
    - Very, very good intellisense
    - Larger projects build very slowly
Course Comments

- XNA can be a pain
  - But do not have time to build everything from scratch
- Video game generation gap
- More time to plan in beginning
- Take suggestions from professors about game topics
  - Suggest to students that they create a game revolving around these suggestions
- Mix artists with programmers
  - May have to mix undergrads with grads
Critiques of Game Styles

- One big game (Teams 1/3/5)
  - Can spend more time on making it look nicer
  - Is it worth spending 4 months on a single game that teaches a single topic?

- Minigames (Teams 2/4)
  - Teach multiple things
  - Minigames probably cannot teach an in-depth concept
Older Educational Games

- Multiple of 5
- Where is Carmen Sandiego?
- Karen has a broken leg.
- Press ENTER to size up the situation
- Date: July 5, 1848
- Weather: hot
- Health: good
- Food: 1165 pounds
- Next landmark: 66 miles
- Miles traveled: 866 miles
- Press SPACE BAR to continue
Usefulness of Video Games in Teaching

- Last Siggraph – discussion on using graphics in CS curriculum
  - Talked more about using graphics to get students interested in CS
- Is time investment to develop worthwhile?
  - Robust framework that can easily be used to develop new teaching games
- Observational Learning
  - Add CS elements to a game but the user is not actually performing some algorithm
Usefulness of Video Games in Teaching

- Are these games actually teaching or are they just testing proficiency?

- User Studies
  - Have half a class use the game, the other half not
    - A game will make a student “study” longer, but is that time better spent reading notes?
  - Cannot compare between CS / engineering majors and non-majors

- This concept is still in infancy
  - Games are not accepted teaching tools by all faculty…
Discussion