CSCI 1106
Lecture 05
Player Movement &
High Level Game Design
Announcements

• Game project starts next week
• Today’s Topics
  – Player Movement
    • Motivation for player movement
    • Mouse Movement
    • Keyboard Movement
  – High-level game design
    • The Unifying Theme
    • The Game Story
    • Game Mechanics
Player Motion

• All interactive games have player movement
  – Players can move their character or avatar on the screen
  – Players can react to the game and move their avatar

• How the avatar moves is dictated by the game
  – Laws and physics of the game
  – Goals and objectives
  – Environment and level of play

• Common ways to move the avatar are through
  – Mouse
  – Keyboard
  – Dedicated game controllers and joysticks
Direct Mouse Movement

• Idea: Make the player the "mouse"
  – The avatar appears where the mouse is pointing to
  – No need to control the velocity of the avatar
  – Position and velocity is managed by the mouse movement

• How:
  – Set the player sprite’s coordinates to the mouse coordinates at each FRAME event
Direct Mouse Movement

• **Pros:**
  – Easy
  – Not much code required

• **Cons:**
  – Restrictions on movement may be needed, e.g.,
    • Disallowing movement in some dimensions (paddle)
    • Checking if mouse is over the game panel area
  – Violates most accepted laws of physics
    • Avatar can accelerate and move instantly

• **How can we solve these problems?**
Mouse Movement using Easing

• **Idea:** gradually move avatar toward the location clicked on with the mouse pointer
  – A mouse click sets the target to move toward
  – Calculate distance between the avatar and target
  – Incrementally move the avatar toward the target
  – Note: the avatar isn’t guaranteed to reach the target because the target will change if another location is clicked first

• **Pros:**
  – Makes the physics of the game more realistic
  – Restricts avatar movement by ignoring clicks on illegal areas of the stage

• **Cons:**
  – Allows only coarse-grained movement
Implementing Easing

- Declare an EASING constant
  - \(0 < \text{EASING} < 1\)
  - Smaller constant implies slower movement
- Create a transparent “Target” sprite
- Set “Target" at avatar’s location
- On each FRAME event If the mouse is down
  - Move “Target” to mouse location
- On each FRAME event
  - If avatar's distance to “Target" is greater than 1
    - point avatar at target
    - move avatar an EASING fraction of the distance to the target
Keyboard based Movement

• **Idea:** Move the player with the keyboard
  – The arrow keys control the direction that the avatar moves
  – These directions allow the player to move diagonally as well
  – Need to respond to the KEY PRESS events or check if keys are being pressed.
  – More than one key can be down at the same time

• **Pros:**
  – Very precise movement

• **Con:**
  – Requires the player to learn the control keys
Implementing Keyboard Controls

• On a FRAME event
  – Check which of the arrow keys are pressed and move in that direction

  - up 0°
  - left -90°
  - down 180°
  - right 90°
High-Level Game Design

- **Game Elements**
  - Technology
  - Story
  - Mechanics
  - Aesthetics

- **Idea:** The elements work together to create a *unifying theme* in the game
Unifying Theme

• What experience do you want to convey?
  – e.g., pirate life, civilization simulation, a wild west adventure
• Structure your story and mechanics to reinforce your theme
• Examples:
  – Wild west
    • Lots of primitive actions
    • Lots of chance
    • A simple backstory
  – Civilization
    • Mostly strategic actions
    • Some chance, with medium small affects
    • An epic story
The Game Story

• There’s nothing like a good story to pull you in...
• A story is composed of:
  – A "world"
    • A place with consistent properties
    • e.g. physics, magic, culture, etc.
  – Characters
    • Individuals with likes/dislikes, personalities, and goals
    • Stock Characters: e.g. soldiers, clerics, plumbers
  – A quest
    • Why are we/they here?
• The story immerses the player
  – Transports them into the “world”
  – Whets the interest of the player (first 100 pages)
• Separates great games from ok games
Story Considerations

• Depth
  – How detailed or grand is the story to be?
  – Epic? (Star Wars)
  – Simple backstory? (Angry Birds)

• Delivery
  – How is the story communicated to the player?
  – Prologue? Snippets? Chapters?
  – Does the player choose the direction of the story?

• Pacing
  – Rate of story telling corresponds to speed of the game
Game Mechanics

• Idea: Use game mechanics to
  – Implement the game story
  – Support the unifying theme of the game

• Game mechanics comprise
  – Rules
  – Environment
  – Actions
  – Chance (Randomness)
  – Skills
Game Mechanics: Rules

• Written rules of play (what happens when I...)
  – User manual
  – Game code

• Unwritten rules
  – Etiquette
  – Sportsmanship

• Object of the game (how do I win the game)
  – Clear
  – Achievable
  – Rewarding/Fun
Game Mechanics: Environment

- **Spaces**
  - Discrete or continuous?
  - Boundaries?
  - Nested Spaces?

- **Number of players**
  - Computer
  - Human

- **Physics**
  - Interaction of objects
Game Mechanics: Actions

• Primitive Actions (private’s view)
  – Moving the player
  – Shooting

• Strategic Actions (general’s view)
  – Protecting a zone
  – Ambush ing

• Most games require combination of both types of actions
Game Mechanics: Chance

• Adds a surprising or unexpected elements
  – The so called "secret of fun”
• Consider how probabilities will factor into the play over the duration of the game
  – Power-ups
  – Density of projectiles
• Some predictability is useful! ?
• The “chance trade-off”
  – A lot of randomness: game is about tactics, short term
  – A little randomness: game is about strategy, long term
  – Good games have the right mix
Game Mechanics: Skills

• Idea: The right amount of challenge will keep the player interested

• Three types of skills:
  – Physical Skills
    • Strength, dexterity, coordination, and endurance
    • E.g. How fast can I hit that button?
  – Mental Skills
    • Memory, observation, and problem solving
    • E.g., The answer is ...
  – Social Skills
    • Reading and fooling opponents
    • Coordinating with teammates

• Many successful games combine skills from multiple categories
Game Genres

• Idea: A set of stock (standard) mechanics that are used by similar games is called *genre*

• Examples:
  – Card games
    • Take turns playing cards
    • Rules govern what the cards mean and who wins
  – Racing games
    • Drive a vehicle on a race course
    • Get across
  – First-person shoot-em up

• Right choice of genre supports the unifying theme