Introduction to
Mobile App Development

MODULE 5:
Game Development Concepts

https://www.youtube.com/watch?v=4YMD6xELI_k
Google Maps: Pokémon Challenge

Module 5

1. Terminologies
2. Game Categories
3. Game Components
4. Physics concepts
5. Game Design
6. Flowchart Activity

3

Terminologies

Common Terms

- Frames: One iteration of drawing the screen
  - Frames per second (FPS): Higher means smooth animation/action http://frames-per-second.appspot.com/
- Buffer: An area of memory where graphics are drawn
  - Double buffered: Graphics are drawn in the background, then the buffer is swapped to the front
- GPU: Graphics processing unit
  - A GPU is highly parallelized
- NPC: Non Player Character

Game Categories

Game Categories

RTS

- Real time strategy (RTS):
  - Build structures
  - Move units into place
  - Collect resources
  - All while the action happens
- Example: Starcraft II, Age of Empires
- How to win: Act/counter fast, tactics

Game Categories

FPS

- First person shooter (FPS):
  - Walk around, shooting enemies
  - Camera view is in first person mode
    - i.e. You are the protagonist
- Examples: Black Ops, Gears of War
- How to win: Be fast, accurate

Game Categories

Open world

- Open world:
  - Walk/drive around
    - Initiate missions in your preferred order, or not
    - Cause general mayhem
    - Often use a third person camera
- Examples: Grand theft auto, Minecraft
- How to win: Depends on the game style

Game Categories

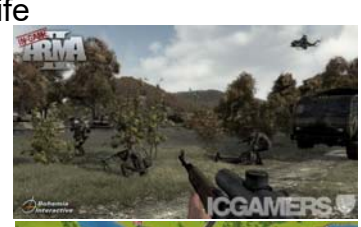
RPG

- Role Playing Game (RPG):
  - Customize a character or party
  - Complete quests/missions
  - Often your choices affect the game, and your character
- Examples: Pokemon, Skyrim
- How to win: Keep battling to level up, put a lot of thought into your party

Game Categories

Simulation

- Simulation
  - Designed to simulate something accurately
    - e.g. Flying an F22, living a life
- Examples: Simcity, Arma
- How to win: Strategy, study

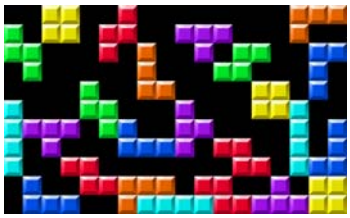


Game Categories

Thompson Rivers University

Puzzle

- Puzzle
  - Each level introduces a problem to solve
    - Often, the problem requires abstract or lateral thinking
- Examples: Tetris, Portal
- How to win: Strategy, bend the rules?



Game Categories

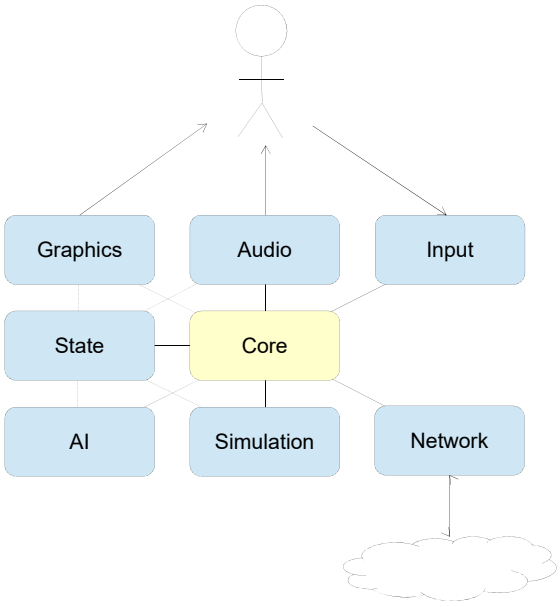
Thompson Rivers University

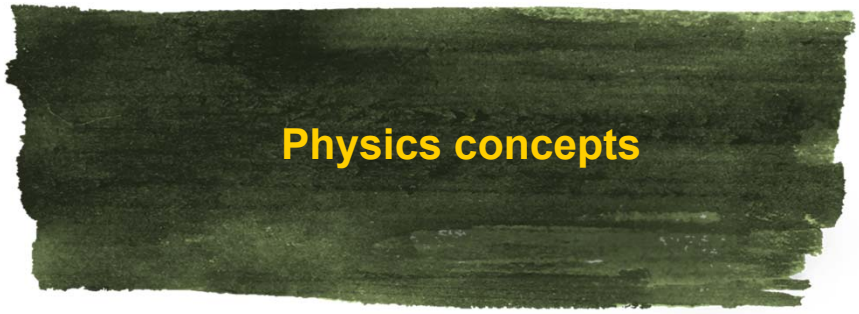
Fighting

- Fighting
  - Two or more opponents are pitted against each other
  - The idea is to make the two opponents characters equal in power
  - The difference lies only in skill
- Examples: S. smash bros., Street fighter
- How to win: Be quick, learn advanced moves

Game Components

Game Components





15

Physics concepts

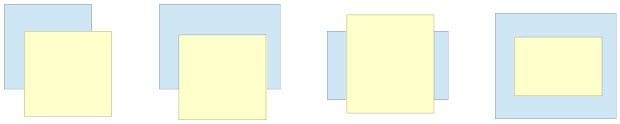
Actions

- Physics concepts
  - Collisions
  - Bouncing
  - Acceleration
  - Gravity

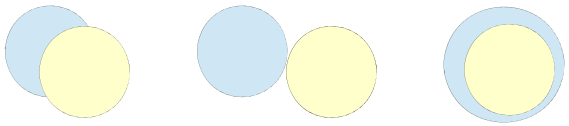
Physics concepts

Collisions

- Physics concepts
  - Collisions
    - e.g. Is the missile touching the jet?
    - Rectangular collision detection



    - Circular collision detection



Physics concepts

Bouncing

- Physics concepts
  - Bouncing
    - Transferring direction
      - $\Theta_{incidence} = \Theta_{reflection}$
    - Transferring speed
      - The speed should be identical
    - Deformation
      - The shape of the object may be compressed
      - For some shapes, inadequate
    - Acceleration
      - During deformation, motion is not solely based on object's speed
      - Material elasticity, mass, and speed

Physics concepts

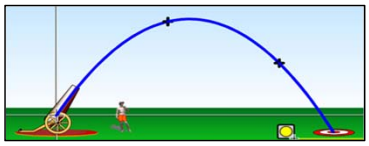
Acceleration

- Physics concepts
  - Acceleration
    - When thrust is involved (e.g. rockets), the object accelerates
    - For some games, velocity-thrust is not natural
    - Acceleration is change in speed/velocity over time (e.g. m/s/s)
    - Δv = a * (1s/1000ms) * ms_elapsed
    - e.g. rocket accelerating 3m/s/s for 100ms
    - `Δv = 3m/s/s * (1s/1000ms) * 100ms`
    - `   = +0.3 m/s`

Physics concepts

Gravity

- Physics concepts
  - Gravity
    - Gravity applies a vertical acceleration on free-falling objects of a_{grav} = -9.8 m/s/s
      - a_{grav} < 0.0 m/s/s means downward
    - As objects are accelerated downward
    - Their path traces a parabolic curve*



http://phet.colorado.edu/sims/projectile-motion/projectile-motion_en.html

21

Game Design

Questions

- Basics:
  - Objective
  - Story
  - Game setup
  - Progression rules
  - Exit conditions

Game Design

Thompson Rivers University

Details

- Basics:
  - Objective
    - For the entire game, and each level
    - What goal is the player trying to achieve?
      - Solve a puzzle
      - Conquer enemies
      - Run away from enemies
      - Build a defensive network
      - Show off your killer dance moves
      - Defend against invaders
  - Story
  - Game setup
  - Progression rules
  - Exit conditions

Game Design

Thompson Rivers University

Details

- Basics:
  - Objective
  - Story
    - Think of a story that explains your goal
    - "Defend against invaders"
      - You have a lot of pizza pockets
      - The apocalypse happens :(
      - Desperate people want your pizza pockets
  - Game setup
  - Progression rules
  - Exit conditions

Game Design

Thompson Rivers University

Details

- Basics:
  - Objective
  - Story
  - Game setup
    - What do you have to start? (also levels)
      - RTS: Resources?
      - RTS: Buildings?
      - RTS: Units?
      - FPS: Weapons?
      - Board game: Pieces?
  - Progression rules
  - Exit conditions

Game Design

Thompson Rivers University

Details

- Basics:
  - Objective
  - Story
  - Game setup
  - Progression rules
    - Real-time (e.g. Plants vs. Zombies):
      - Build new units
      - Destroying enemies
      - Collect resources for upgrades, building units
    - Turn-based (e.g. Pokemon):
      - One move is allowed
      - Then, it is the opponent's turn
      - After battle: experience, levels
  - Exit conditions

Game Design

Thompson Rivers University

Details

- Basics:
  - Objective
  - Story
  - Game setup
  - Progression rules
  - Exit conditions
    - How do you know if the game is over?
    - Angry birds:
      - Winning conditions: all pigs killed
      - Losing conditions: no more birds
      - Other issues: collect enough points for 2 or 3 stars?

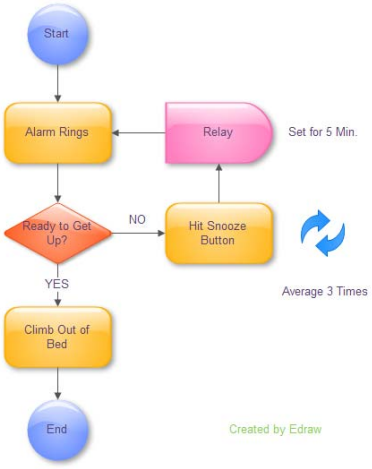
Thompson Rivers University

28

Flowchart Activity

Flowchart: Definition

A graphical representation of a computer program in relation to its sequence of functions

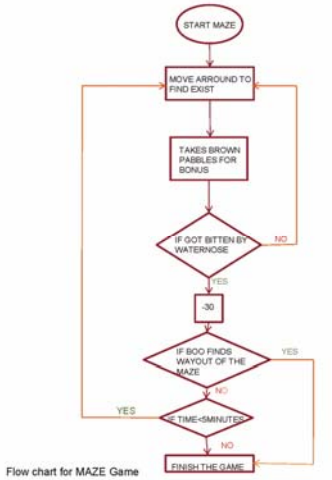


REF: www.edrawsoft.com

29

Flowchart Activity

Flowchart - Example 1



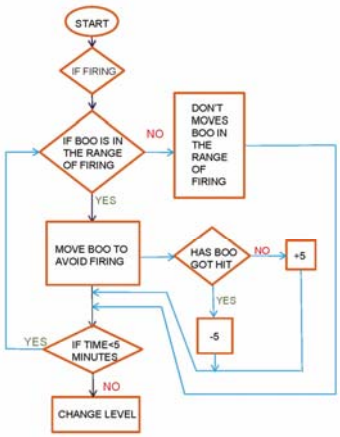
Flow chart for MAZE Game

REF: TOY & GAME DESIGN by Parag Sarma at Coroflot.com

30

Flowchart Activity

Flowchart - Example 2



Flow chart for Firing Game

REF: TOY & GAME DESIGN by Parag Sarma at Coroflot.com

Flowchart Activity

Activity

Create your own Game Flowchart!


End of Module 5