Lecture 1

Game Development

College of Science and Technology
Department of Computer Science

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Google Classroom

Course Pre-requisites

- Basic vector mathematics
- Programming concepts
- Willingness to learn to programme
- Love playing and testing games

Rules of the Game

Respect: treat everyone and yourself with kindness.

Responsible: come prepared, stay on task, and take ownership of your work.

Listen: pay attention to what are saying

Teaching

Lectures

Tutorials

Labs

Assessment

Weekly Quiz

Lab activities

Poster design

Presentations

Exams

Module Outline

Games Foundation

The Unity Ecosystem

Introduction to C#

Physics Engine

Prefabs & Instantiation

Advanced Input & Character Control

UI & HUD Design

Animation & State Machines

2D Development

Audio & Particle Systems

AI & Pathfinding

Data Persistence

Optimization & Publishing

Today

What is a Game
- Defining the modern definition
- Looking at the aims and outcomes of a game
- Core elements of a game

The landscape of game dev and why is it important
- Why study game dev
- Real world applications and implications
- Interdisciplinary and transferable skills

Taxonomy of games
- Different game types and genres
- Game categories
- Platforms

Game design and production

Learning Outcomes

By the end of this lesson you should you should be able to:

Define the modern concept of a game and its core elements.

Identify different game genres and their unique characteristics.

Outline the primary phases involved in the game development life cycle.

Describe the various layers of the player's perspective, such as the interface and sensory layers.

What is a game?

What is the modern definition of a game?

A form of interactive entertainment where **players** must overcome **challenges** by taking actions that are governed by **rules** in order to meet a victory/win **condition.**

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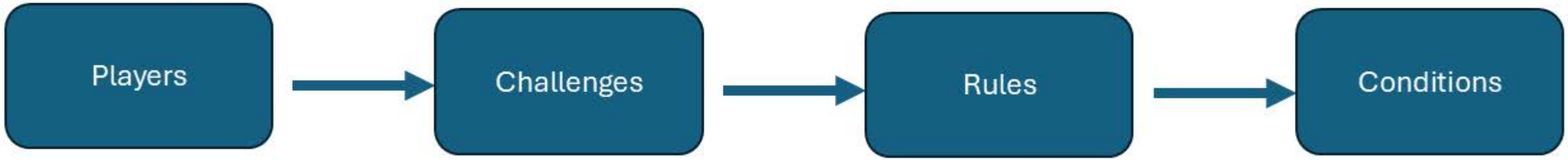


Players

How many players are there in the game?

How many players are there at a single point in time?

Who or what is the player in the world?

- Specifies a notion of identity

Challenges

What obstacles must the player overcome?

Is there more than one way to overcome them?

- Specifies the fundamental gameplay

Rules

How does the player affect the world around them?

How does the play learn the rules?

- Specifies the boundaries of the game

Goals

What is the player trying to achieve?

Is it defined by the game or the player?

- Specifies the players' focus

What is a game?

Entertainment
Storytelling [interactively]

‘Technology improves storytelling, but it does not replace it!

Again, what is a game?

People play games to escape reality

- Middle-earth does not exist
- You're not Messi or Ronaldo or Michael Jordan, or a top-level sniper
- But it is fun to pretend

Design decisions

Some examples include

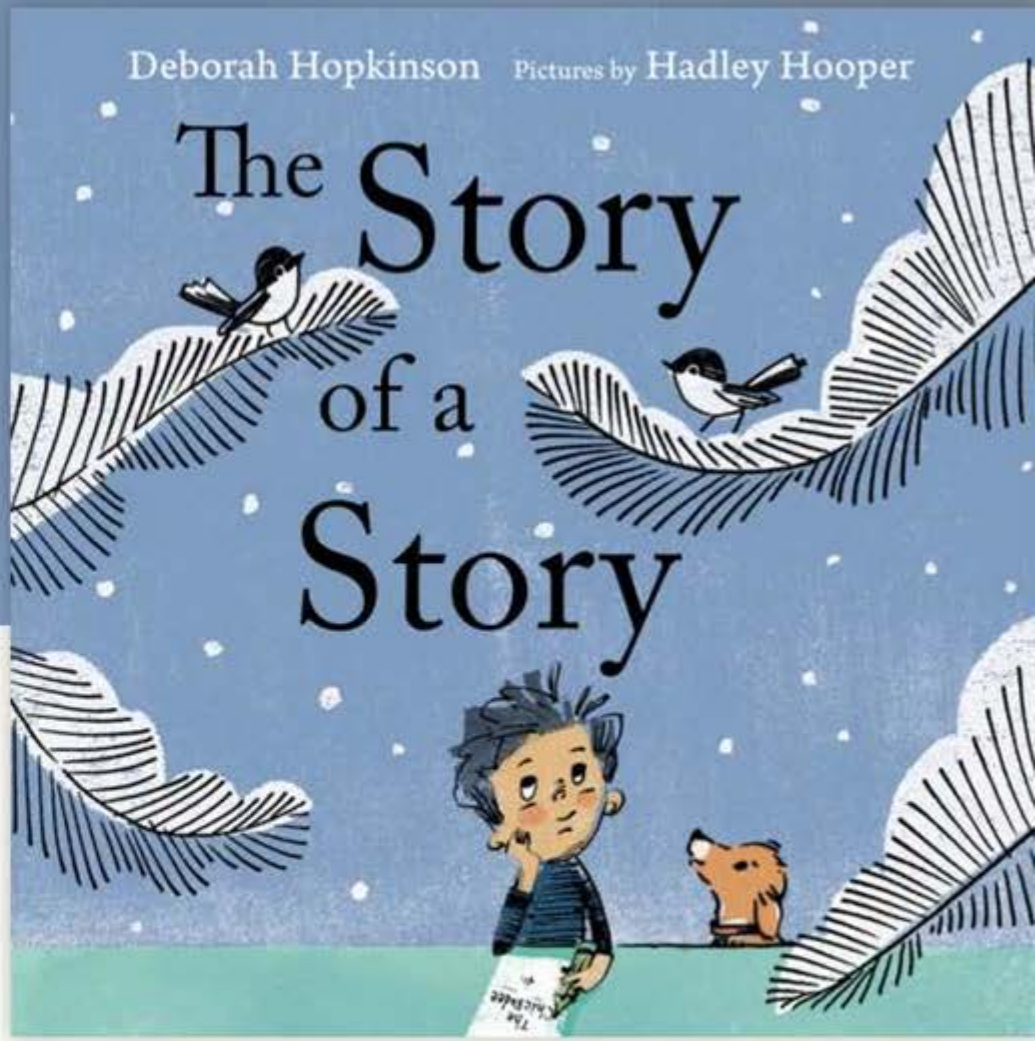
- how are the challenges put together?
- what is the interaction context

Setting

What is the nature of the game world?

What is the perspective?
(2D, platformer, 3D, top-down..., etc.)

Story



What narrative will the player experience?

How is it connected to the gameplay?

Play length

How short a game can I play and still have fun?

minutes, hours, days… ?

Why study game development?

Real world applications
Some game simulations mimic real world elements e.g.
driving, flight etc.

Huge market with many opportunities to make big money
massive market growth

Thriving and evolving industry
frontier of technology -> graphics rendering, networking, real-time physics,

It is becoming easy to develop games for mobile, especially Android OS.

Learning transferable skills

Why study game development?

Learning transferable skills

- technical, logical, lateral thinking
- creativity,
- graphics design
- sound engineering
- interpersonal skills
- programming concepts
- problem- solving skills
- critical thinking

Types of games

If we step back a little, we would see the origins of games and what our motivations could be.

Types of games – Physical games

Sports and physical activities
Tag, hide and seek
Football,
Tennis
Combat sports (boxing, MMA)
Basketball etc.

Types of games – Board games

Chess,
Monopoly,
Checkers
Settlers of Catan
Guess who,

Types of games – Card games

Poker
Solitare
Pokémon
Concan
YuGiOh

Types of games – Mental games

Riddles

- "What goes on four legs in the morning, on two legs at noon, and on three legs in the evening?“

Mind puzzles

- River crossing puzzle (wolf, sheep, cabbage)

Types of games – Video games

From Mobile,
Web
PC,
Console
TV

Genres of Games

Platformer
Shooter
Open-word
Survival Horror
Stealth
RPG
ARPG
MMORPG

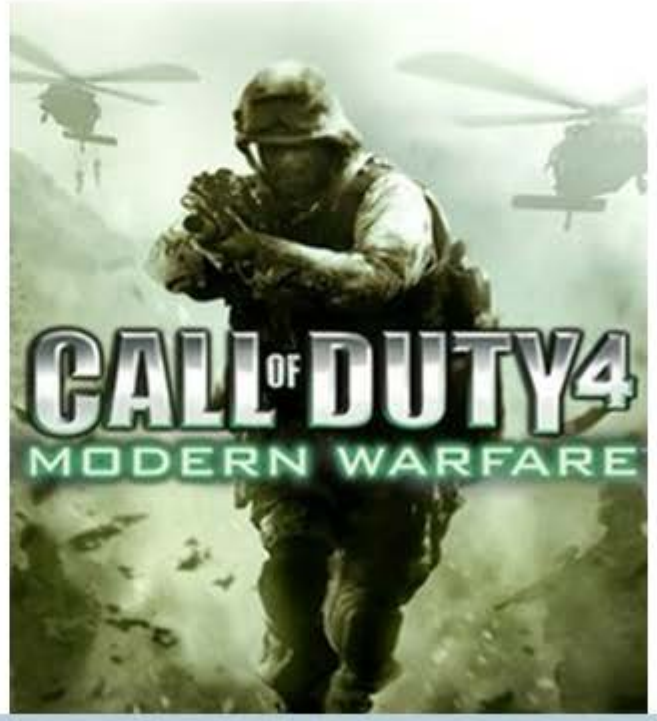
RTS
Turn-based strategy
MOBA (Battle Arena)
Simulations
Puzzles
Sports
Racing, pure adventure, battle royale

Genres of Games - Platformer

Where players navigate environments by running, jumping, and climbing across suspended platforms, overcoming obstacles, defeating enemies, and solving puzzles to reach an objective.

Genres of Games - Shooter

Where players use firearms or other projectile-based weapons to defeat enemies. Typically tests a player's reflexes, accuracy, and spatial awareness.



Game Dev considerations – The What

What is your vision?
What are you trying to achieve?
What message are you sending out?

What makes your game different from anyone else's?
- Why should we play your game?

Game Dev considerations – The Who

Who will play your game? - Your audience

Will they believe in your vision? - Will they spend their money and time in your game?

Accessibility? By considerate

- Some people are colourblind, epilepsy by flashing lights and screen, some are deaf – subtitle, mute – not forcing voice.
- Some are physically impaired - option to remap controls and

Game Dev Considerations – The How

How will they play your game?

What are the constraints?

Hardware constraints, e.g. mobile doesn't have buttons, small screen,
Not everyone has PC to play your game.

How are games developed?

Game development is codifying your imagination.

Where you do not observe it but actively try to build it, defining its physics, logic and morality.

How are games developed? CONT.

Phases

Write a Game Design Document that outlines the story, mechanics, and characters.

Use Unity to build "gray boxes" (simple cubes and spheres) to see if the movement or combat feels good before proceeding further. Testing the waters.

Create sketches to decide the visual "vibe" of the game.

Write the program logic for physics, gameplay, and UI.

Create models, textures, and animations, sound, music, etc.

How are games developed? CONT.

Phases

Level design, NPC’s, world environment integration.

Alpha testing and debugging stages.

Optimisation tests

Launch!

Game engines

A software framework for the development of video games. Includes support programs and libraries, and other components that unite the entire project.

Examples: Godot, Unreal, **Unity**, CryEngine, GameMaker, etc...

Game Engine

There are advantages and disadvantages to all game engines.

Some are specialised in 3D while others are in 2D, and some support both.

Some are paid, and some are free, depending on the licence

Some have very steep learning curves

Not all game engines can develop games for all platforms; some are only for PC.
Not cross platform

Not all support networking/online…

Components of a good game engine

Rendering system – graphics
- 3D geometry or 2D sprites
- lightings, shadows, texturing,

Physics system – how objects behave
- collision detections, friction, velocity, gravity,

Audio system – playing sound files
- deciding audio files, mixing, layering multiple sounds
- spatialisation – volume and pitch based on the listener's position relative to the sound source

Input management system –
- keyboard and mouse, touchscreen

Scripting system – support for programming languages, or visual scripting

IDE -

Game from players perspective

Interface layer
Gameplay
Sensory layer
World and environment
Progression layer

Diegetic ...?

Game from players perspective

Interface layer – the bridge between the player & the game software

Controls – keyboard, mouse, controller, touchscreen,

HUD – health bar, mini map, score counter, item counter, objective markers,

UI – menus and settings, inventory, skill tree,

The camera, controls what the layer can and cannot see.

Game from players perspective

Gameplay

The mechanics, the actions the player can do, e.g. **jump**, move, **climb**, shoot, etc…

Physics, the player knows if an **object is light or heavy**, fast or slow.

Game from players perspective

Sensory layer

Visual feedback, VFX, **particles** (from bullets, **smoke**, explosions), lightings and shadow, animations

Audio feedback, sound effects of collisions, impacts, **voice acting**, music changing the tone of the story and narrative

Haptics, controller or mobile vibrations, players feel damage, recoil, proximity to item

Game from players perspective

World and environment

Level design and **geography** of environment.

NPC's – non playable characters, friends and **enemies**, ops

Interactive objects, doors, chests, items, levers, non static items.

Game from players perspective

Progression layer

The **economy**, currencies used in the game, gold, gems, and credits. Resources such as, wood, iron, leather,

Player progression system. **Level ups**, experience points **XP**, new skills learnt, new skin and armour, achievement badges,

Narrative delivery – cutscenes, environment energy, dialogues

Game from players perspective

Diegetic

- things that exist within the game's story world,

.....visible and audible to both the player and the characters

Class work

Spend 5-10 mins writing about what makes your favourite game so special and unique. What has attracted you into liking and spending time on it. Then share with the class.

Unity Game Engine

Broad platform support: Windows, macOS, Linux, iOS, Android, all major consoles (PlayStation, Xbox, Nintendo Switch), and web browsers

Asset story with many free packages available to download

Support for both 2D and 3D games

Large community support and forum

Summary

This lecture introduces game dev where developers build virtual worlds by defining their physics, logic, and morality. A game is defined as interactive entertainment where players use rules to overcome challenges and reach a win condition. The course explores why this field is vital, noting its massive market growth and the transferable skills it builds, such as technical logic, creativity, and problem-solving.

Students will learn to distinguish between various genres like platformers and shooters, while considering essential design factors such as vision, target audience, and accessibility for players with impairments. We also examined the technical layers of games like the interface, sensory feedback, and the distinction between diegetic and non-diegetic elements. It outlines the professional development lifecycle, which begins with a game design document and moves to asset creation.

References

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https://dev.to/code2bits/pac-man-patterns--ghost-movement-strategy-pattern-1k1a

Design Patterns - https://www.oodesign.com/

Game programming patterns: https://www.habrador.com/tutorials/programming-patterns/