CS354P

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INTRODUCTION TO GAME DEVELOPMENT

GAME DEVELOPMENT LEADS TO GAMES…

BUT WHAT IS REQUIRED TO DEVELOP A GAME?

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- Open world games?

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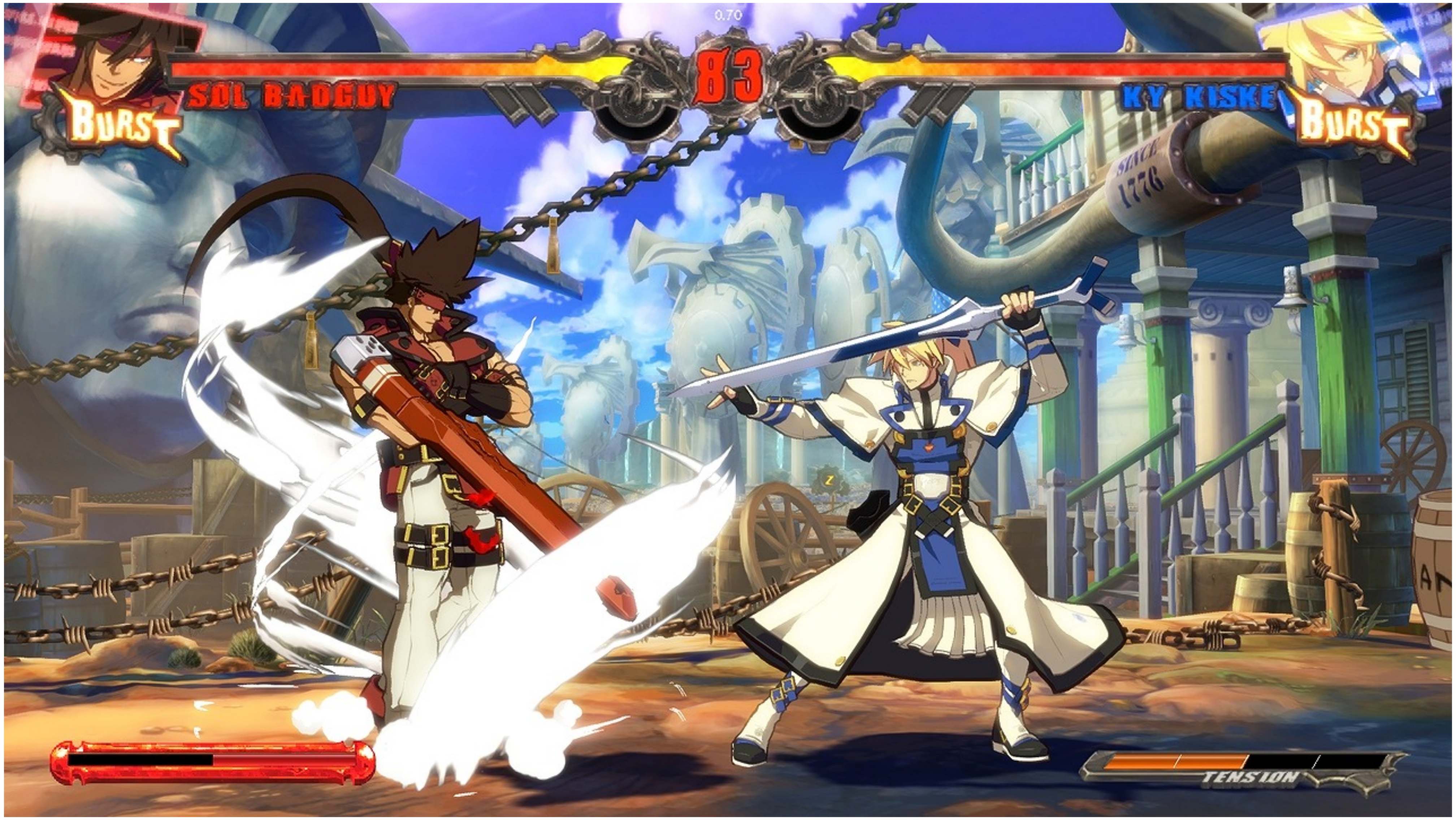
- Fighting games?



WHAT IS REQUIRED TO DEVELOP A GAME?

- Cellphone games?

ENTER THE GAME ENGINE…

- Unified system for creating games
- Integrates workflow of multi-disciplinary team members
- Provides libraries/APIs for useful systems
- Built to support particular features a game requires (e.g. a visual novel engine will have entirely different considerations than an engine for arena-based shooters)

GAME ENGINES AND WORKFLOW

- Integrates workflow of multi-disciplinary team members
  - Art and animation pipeline
  - Level, systems and narrative design
  - Underlying code and technology to tie everything together

GAME ENGINES AND LIBRARIES

- Provides libraries/APIs for useful systems
  - Level and asset editors
  - Graphics (3D and 2D)
  - Physics
  - Animations
  - AI
  - Networking
  - Sound
  - GUIs
  - etc…

FUNDAMENTALS OF GAME PROGRAMMING

- Every engine is different
  - Learn to work **within the constraints of the system** rather than **fighting against them**
- Performance matters
  - Consider how your code effects frames-per-second, battery life, and download size
- Work within the project's scope
  - Weigh long-term **technical debt** against meeting approaching deadlines
- Build for the team, not yourself
  - **Understand and communicate** with other disciplines and programmers

WHAT THIS COURSE IS NOT

- Not a game design class!
- Not an engine-building class (that’s CS354r)
- Not a UE5 tutorial class (although we will use Unreal Engine 5)

WHAT THIS COURSE IS

- A way to see and interact with a large-scale software system (specifically a game engine)
- An introduction to the basics of C++, event-driven programming, and game engine features
- A chance to hone your ability to critique and design engines and engine features
- An environment to master team-based development and clear communication

COMMUNICATIONS

- We'll be using Discord for questions and answers to specific problems, and class communication/in-class discussion
  - Please join the server so you are able to receive announcements, keep up on issues, and ask questions
  - Students should work together before asking for teacher or TA involvement
- Grades and assignments will be done via Canvas

BOOKS AND RESOURCES

- Recommended “textbook”: “Game Engine Architecture” Jason Gregory
  - Good exposition of many engine technology and design
  - Not required but useful
- Other useful books:
  - “Game Programming Gems 1-8”
  - “3D Game Engine Design” David Eberly (lots of equations, less exposition, good math background and computer graphics)
- Websites:
  - www.gamasutra.com
  - www.unrealengine.com
- Game developer technical and trade news GDC Vault and Siggraph archives

GRADING

- Projects, reports, and labs (no tests)
  - 5 major projects
  - Groups of 3 assigned for the first 4
  - Self-forming teams allowed for the final project
- 8 labs with in-class work days
- Potential quizzes to check comprehension and attendance
  - I will not force anyone to come to class, but I will get grumpy if no one shows up :)

GRADING

- Groups will be graded as one, but adjustments will be made based on individual performance
  - Each group will be evaluated both on the project submissions and in-between milestones **submitted via git**
  - We will use commits to assess how much each group member contributed to the project
- For the final project, you will set your own milestones and goals
  - You will be graded based on how well you achieve your goals factoring in degree of difficulty
- Each milestone will involve turning in a report

WORKING IN GROUPS

- Working in groups is an acquired skill and the most important thing you'll learn in here!
  - For some information on group functioning, read http://www-honors.ucdavis.edu/vohs/index.html
- We assign teams – like in industry
- Group evaluation exercises throughout the semester will ensure an even distribution of work (and grades)
  - You must evaluate teammates (even if only to say nice things about them!)
  - Low performance and poor team evaluations can result in failing the class

PROJECT FORMAT

- We have a Windows lab with UE5 for students who do not have performant enough computers to work in Unreal
- Your reports **MUST** include screen capture of your program in action, a short report documenting key features and where they are implemented in the code base, and screenshots to simplify checking over the project
- UE5 projects are extremely heavyweight, so you **MUST** use version control for submitting your projects
  - We'll use GitLab, so make your repos private
  - You'll branch a "code-freeze" version for each project/milestone and submit repo information via Canvas. **Any modifications to the code-freeze branch after the project deadline will deduct from your late slips**
- Students tend to not respect the importance of documentation, so we're going to emphasize writing good documentation in this class

THE ENGINE

- We will be exploring game development and common programming paradigms primarily through Unreal Engine 5
  - www.unrealengine.com
- Why Unreal?
  - A commercial game engine with fully readable source code
  - Highly flexible and wide adoption in industry
  - Extremely complex -- will likely be the biggest software system you've worked with in your CS career
- Can build from source or use the binary installation
  - Note: we are not modifying the engine directly
  - Please be sure to use the requested version of UE5 to avoid potential build issues

PROJECT TOOLS

- Since we are understanding the game development pipeline, in addition to UE5, we will work with:
  - Source control (Gitlab)
  - Agile Development (Trello)
- We will cover how to set these up in class, but you will be responsible for going beyond the material when your project requires it

TOOLS FOR CONTENT CREATION

- Models and art are the biggest expense in real games
- This course doesn't require outside art assets, but:
  - You can use Blender in the lab or other programs on your own machines
  - Acknowledge any assets you download/purchase

SOME UNREAL DEMOS…

- UE4 demo from 2012:
  - https://www.youtube.com/watch?v=wYa8tHPhbDo
- UE5 gameplay demo:
  - https://www.youtube.com/watch?v=2ShnOuSFJsA