OpenGL Final Project

Loïc Simon

Project Overview

Main Goals:

Develop a simple OpenGL game
Team-work

Optional Goals:

Implement fancy rendering/animation techniques

Project Milestones

D0 (today)

Teaming up:
4-5 per team + project leader

D0 +2 weeks

Game proposal:
Design document

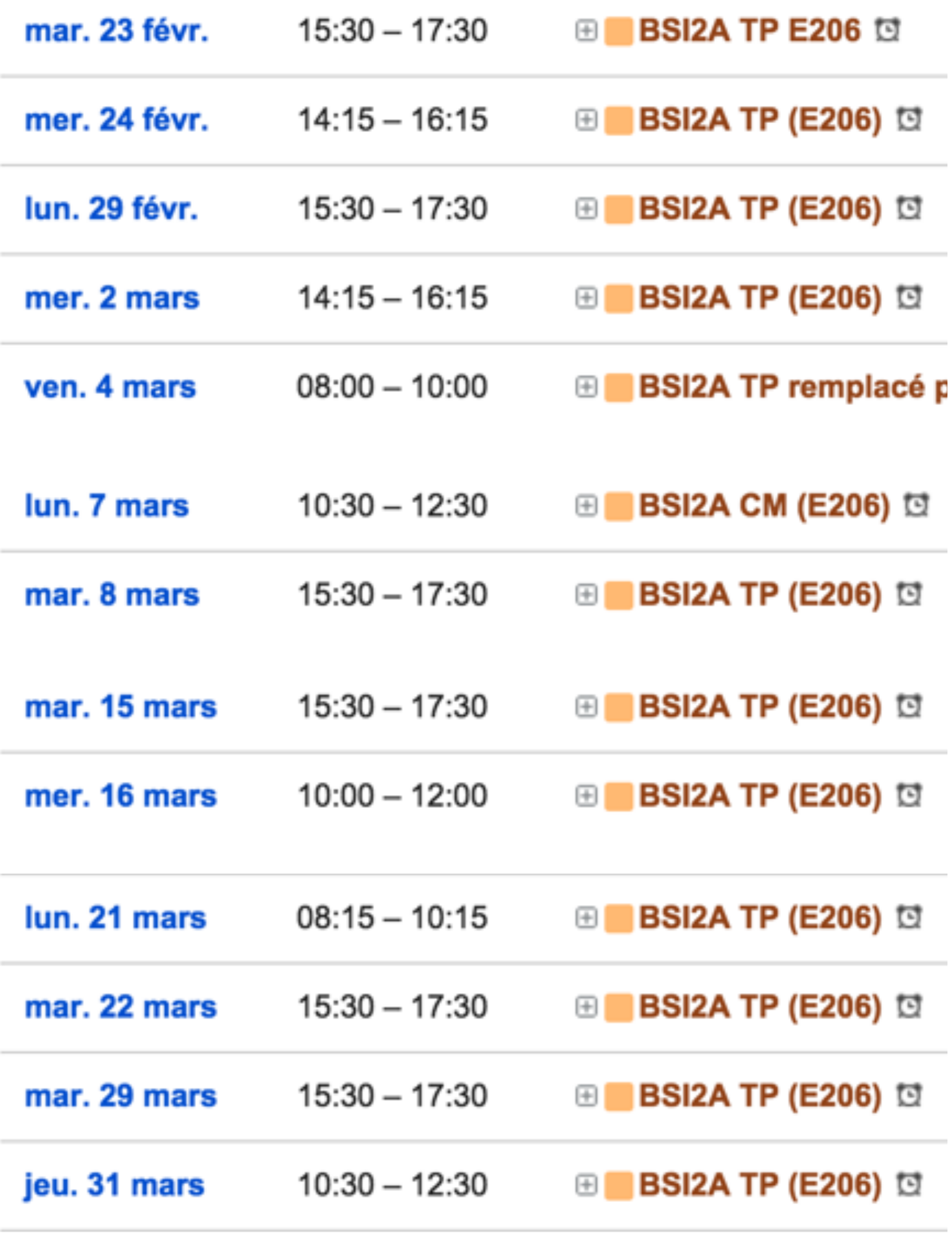
D0 +3 weeks

Project preparation:
Role assignment (MindMap)
Base code + git repositories creation (private + public)
Prototyping

D0 +4 weeks

Project sessions:
6/8 hours (3/4 sessions)

Lab & Lecture session



D0 (today)	mar. 23 févr.	15:30 – 17:30	BSI2A TP E206	Lab: *fromScratch / Minimal*
	mer. 24 févr.	14:15 – 16:15	BSI2A TP (E206)	Lab: *Minimal*
	lun. 29 févr.	15:30 – 17:30	BSI2A TP (E206)	Lab: *Textures*
	mer. 2 mars	14:15 – 16:15	BSI2A TP (E206)	Lecture: *Textures / Shading*
	ven. 4 mars	08:00 – 10:00	BSI2A TP remplacé p	Lab: *Texture / Shading* (PAG)
D0 +2 weeks	lun. 7 mars	10:30 – 12:30	BSI2A CM (E206)	Lab: *Shading*
	mar. 8 mars	15:30 – 17:30	BSI2A TP (E206)	Lab: *Shading*
D0 +3 weeks	mar. 15 mars	15:30 – 17:30	BSI2A TP (E206)	Lab: *Blender*
	mer. 16 mars	10:00 – 12:00	BSI2A TP (E206)	Lab: *Blender / Project*
D0 +4 weeks	lun. 21 mars	08:15 – 10:15	BSI2A TP (E206)	Project: Development
	mar. 22 mars	15:30 – 17:30	BSI2A TP (E206)	Project: Development
	mar. 29 mars	15:30 – 17:30	BSI2A TP (E206)	Project: Development
	jeu. 31 mars	10:30 – 12:30	BSI2A TP (E206)	Project: Doc / presentation

Deliverables

Design document + role assignment (Mind map):

Two weeks before starting the project

Code / documentation:

gitlab / github repository of project leader
Readme.md
wiki / web page (optional)

Auto-evaluation:

Leader assessment of failure/success (per participant)
Grading

Presentation (10min per group):

Updated design document or README.md
Live demo

Design document

Overview
Goal / controls / mockup / feature

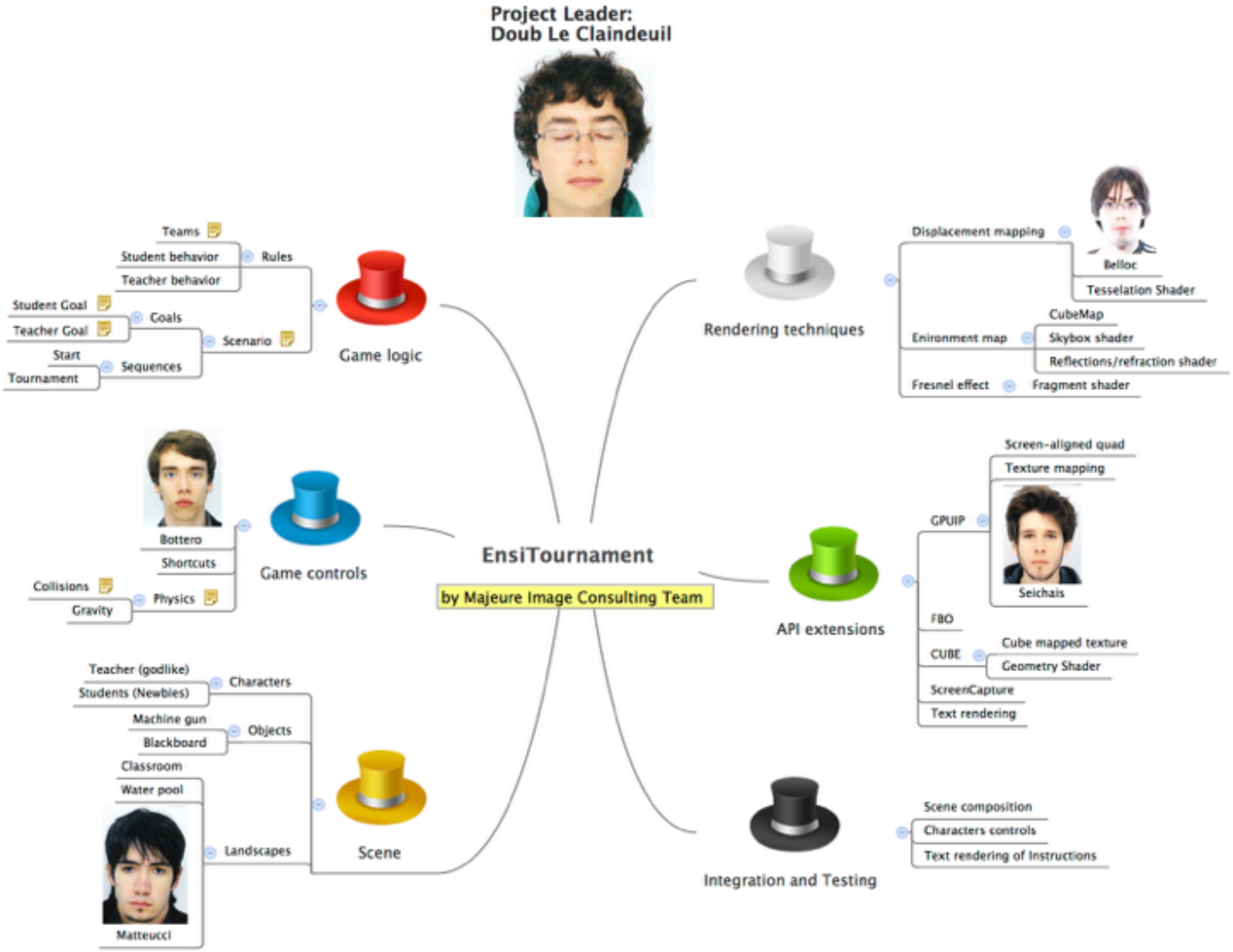
Description
Type of game / principle

GamePlay
Rules / challenges

Controls
interaction with game objects

Technical details
Scene configuration / Effects / functionalities

Mind map (role assignment)



Project Leader:
Doub Le Claindeuil

EnsiTournament

by Majeure Image Consulting Team

- Game logic
  - Rules
    - Teams
    - Student behavior
    - Teacher behavior
  - Scenario
    - Goals
      - Student Goal
      - Teacher Goal
    - Sequences
      - Start
      - Tournament
- Game controls
  - Bottero
  - Shortcuts
  - Physics
    - Collisions
    - Gravity
- Scene
  - Characters
    - Teacher (godlike)
    - Students (Newbies)
  - Objects
    - Machine gun
    - Blackboard
  - Landscapes
    - Classroom
    - Water pool
    - Matteucci
- Rendering techniques
  - Displacement mapping
    - Belloc
    - Tesselation Shader
  - Enironment map
    - CubeMap
    - Skybox shader
    - Reflections/refraction shader
  - Fresnel effect
    - Fragment shader
- API extensions
  - GPUIP
    - Screen-aligned quad
    - Texture mapping
    - Seichais
  - FBO
  - CUBE
    - Cube mapped texture
    - Geometry Shader
  - ScreenCapture
  - Text rendering
- Integration and Testing
  - Scene composition
  - Characters controls
  - Text rendering of Instructions

Gitlab / Github: Readme.md

Overview

Goal / Type of game / Authors
Build / Run instructions

GamePlay / Controls / Demo

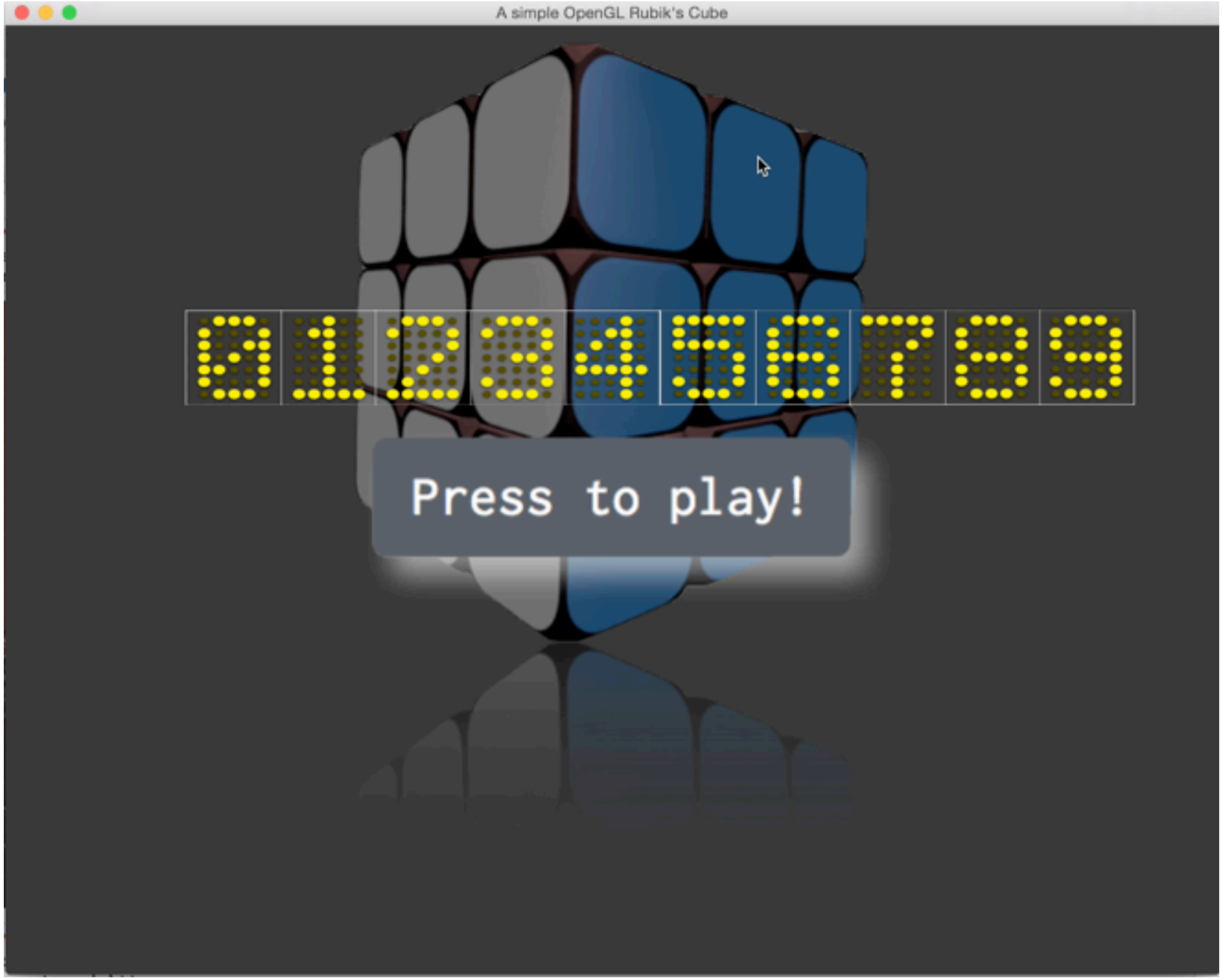
Rules / challenges
Key / mouse bindings
Video or gif (gif conversion: `ffmpeg -i f.mov -pix_fmt rgb24 f.gif`)

Technical details

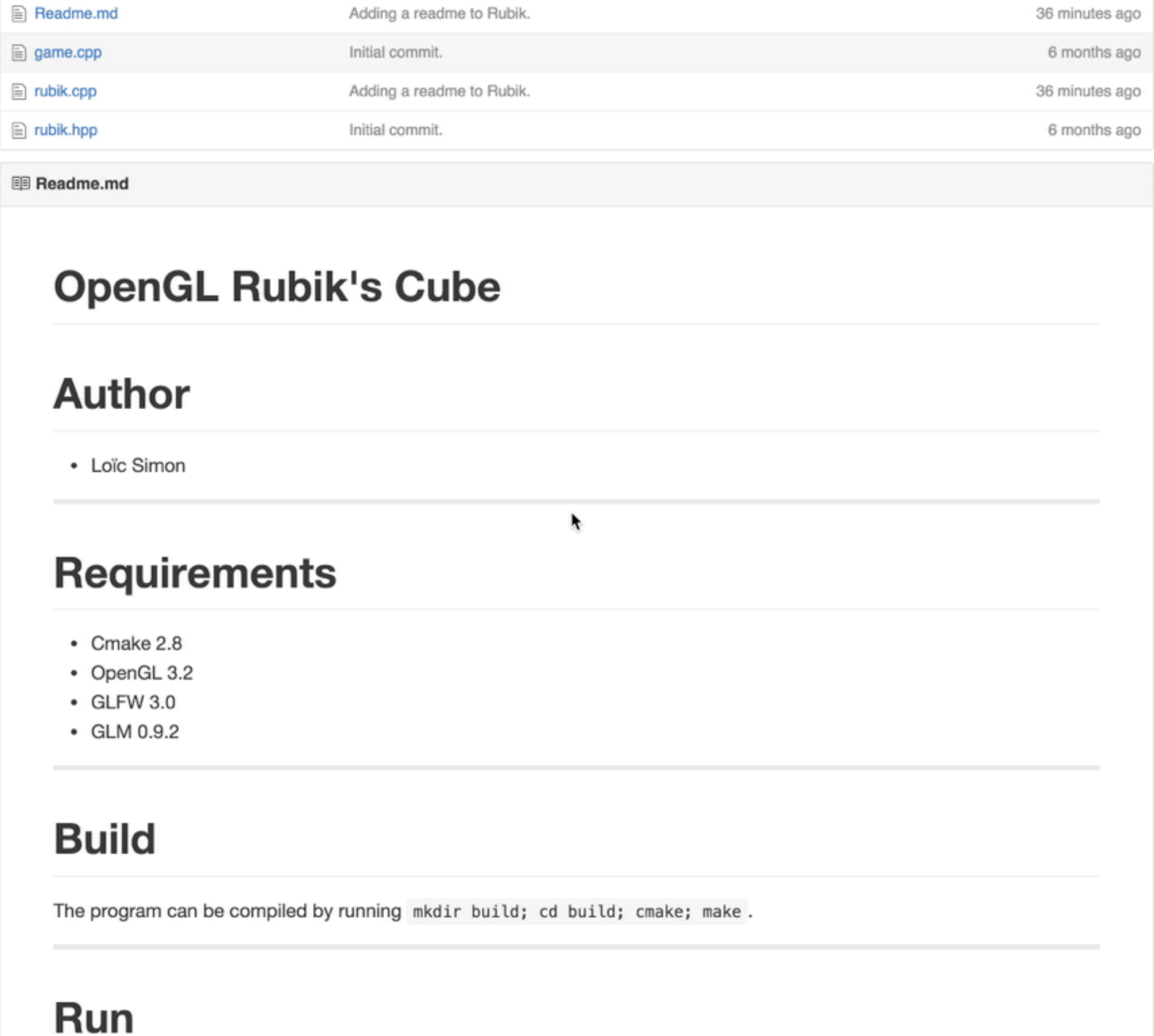
Scene configuration / Effects / Advanced functionalities
Screenshots

License disclaimer

Annotated demo



[illegible]



Readme.md	Adding a readme to Rubik.	36 minutes ago
game.cpp	Initial commit.	6 months ago
rubik.cpp	Adding a readme to Rubik.	36 minutes ago
rubik.hpp	Initial commit.	6 months ago

Readme.md

OpenGL Rubik's Cube

Author

- Loïc Simon

Requirements

- Cmake 2.8
- OpenGL 3.2
- GLFW 3.0
- GLM 0.9.2

Build

The program can be compiled by running `mkdir build; cd build; cmake; make`.

Run

Auto-evaluation / Grading

Group leader

Grade all other participants: $x_k \in [0,5]$

Write a short paragraph to explain the grading

Class instructor

Grade the project as a whole $y \in [0,20]$

Final grade

Group leader: y

Participant k: $z_k = x_k - \mu_x + y \in [0,20]$ where $\mu_x = \text{mean}(x_k)$

Design Document Example

Rubik’s Cube

Overview

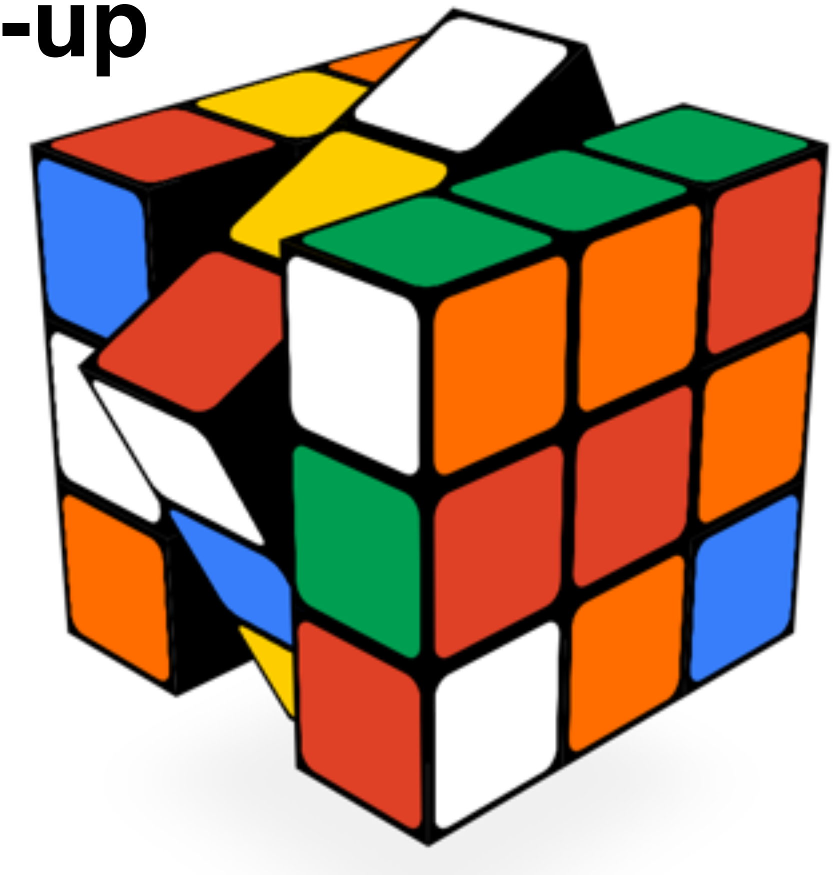
Title

RubikGL

Goal

Solve from random configuration as fast as possible

Mock-up



Controls

Event	Effect
Arrow keys	rotate cube
Mouse	Control slices
h	help
Esc	Quit game

Features

- Manual control
- IA solution (Hints)
- Animated transitions

Description

- Rubik’s cube is a single player game
- The goal is to get the cube in order

Game Play

- The game is played in single player mode, with several level.

- At each level, a random permutation of the cube is presented and the player must come back to the original configuration in a given amount of time.

- Difficulty (number of required movements) increases with levels.

Controls

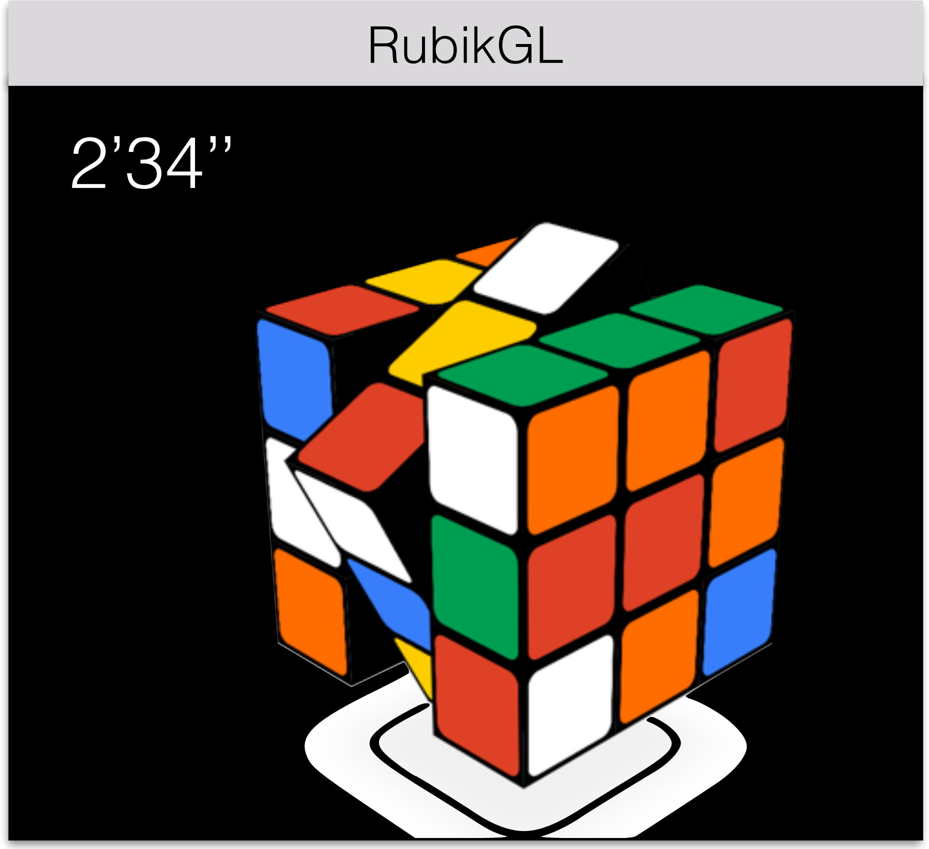
- The player can control each slice of the cube by picking and draging
- He can also rotate the whole cube around with the arrow keys

Technical details

viewport configuration

- The viewport is composed of a single area with the cube at the center

- A time counter will be rendered at top-left corner



Technical details

Rendering

- Standard local shading (ambient+Lambert+Phong)
- Three positional light sources
- Particle-system fire around cube upon solving

Technical details

Animation

- Slices are controlled with pick and drag
- Upon mouse releases, animation towards closest non blocking configuration
- In case of failure, animation starts with:
    - solution steps
    - “Game Over!” text overlay

Game development

advices

Resources

Example

Labs framework: Rubik's cube
online book: http://www.learnopengl.com/#!In-Practice/2D-Game/Breakout

Book

SFML Game Development. Haller, Jan, and Henrik Vogelius Hansson. Packt Publishing Ltd, 2013.

Start simple

Prototyping

Simple game

Rubik's cube not Quake 3!

Simple modes

Single player doesn't require network management!

Easy interaction

Need picking? Start with lame std::in!

In short, start with a rough prototype!

Integration

One step at a time

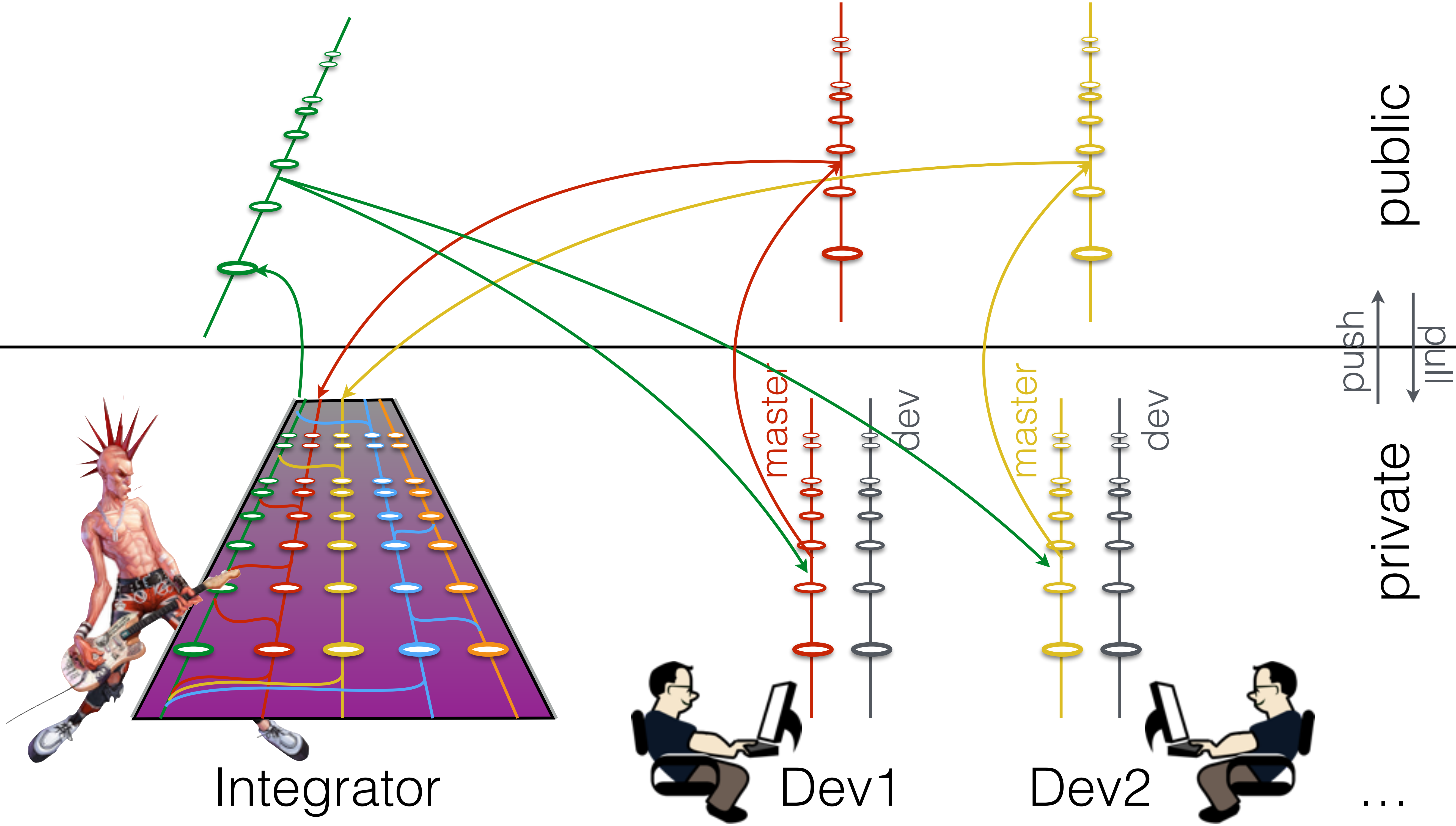
Examples

Add a time countdown
Randomness
2 players on same keyboard

Be patient

One feature at a time
Do integration often!

Gitor Hero


public
push
pull
private
master
dev
master
dev
Integrator
Dev1
Dev2
…

Fancy Features

Overview

- Here, you will find
  - a list of optional features
  - each is associated with several tutorials

Disclaimer

- It is more important to have a *working game* than fancy features
- Some features are more complex than others
- Most require modifying the lab’s framework

Better gameplay

Text rendering

http://www.learnopengl.com/#!In-Practice/Text-Rendering

Picking

http://ogldev.atspace.co.uk/www/tutorial29/tutorial29.html

http://antongerdelan.net/opengl/raycasting.html

Audio

http://www.learnopengl.com/#!In-Practice/2D-Game/Audio

Rendering (easy)

Fancier light casters

http://www.learnopengl.com/#!Lighting/Light-casters

Billboarding with GS (new shaders)

http://ogldev.atspace.co.uk/www/tutorial27/tutorial27.html

Instanced rendering (new glDraw routine)

http://www.learnopengl.com/#!Advanced-OpenGL/Instancing

http://ogldev.atspace.co.uk/www/tutorial33/tutorial33.html

Rendering (hard)

Shadow mapping (frame buffers)

http://ogldev.atspace.co.uk/www/tutorial23/tutorial23.html

http://ogldev.atspace.co.uk/www/tutorial24/tutorial24.html

https://open.gl/framebuffers

Displacement Mapping with TS

http://ogldev.atspace.co.uk/www/tutorial30/tutorial30.html

http://prideout.net/blog/?p=48

Animation / simulation

Path instancing

[easy] http://prideout.net/blog/?p=56

Skeletal animation (model loading)

[hard] http://ogldev.atspace.co.uk/www/tutorial38/tutorial38.html

Particle systems

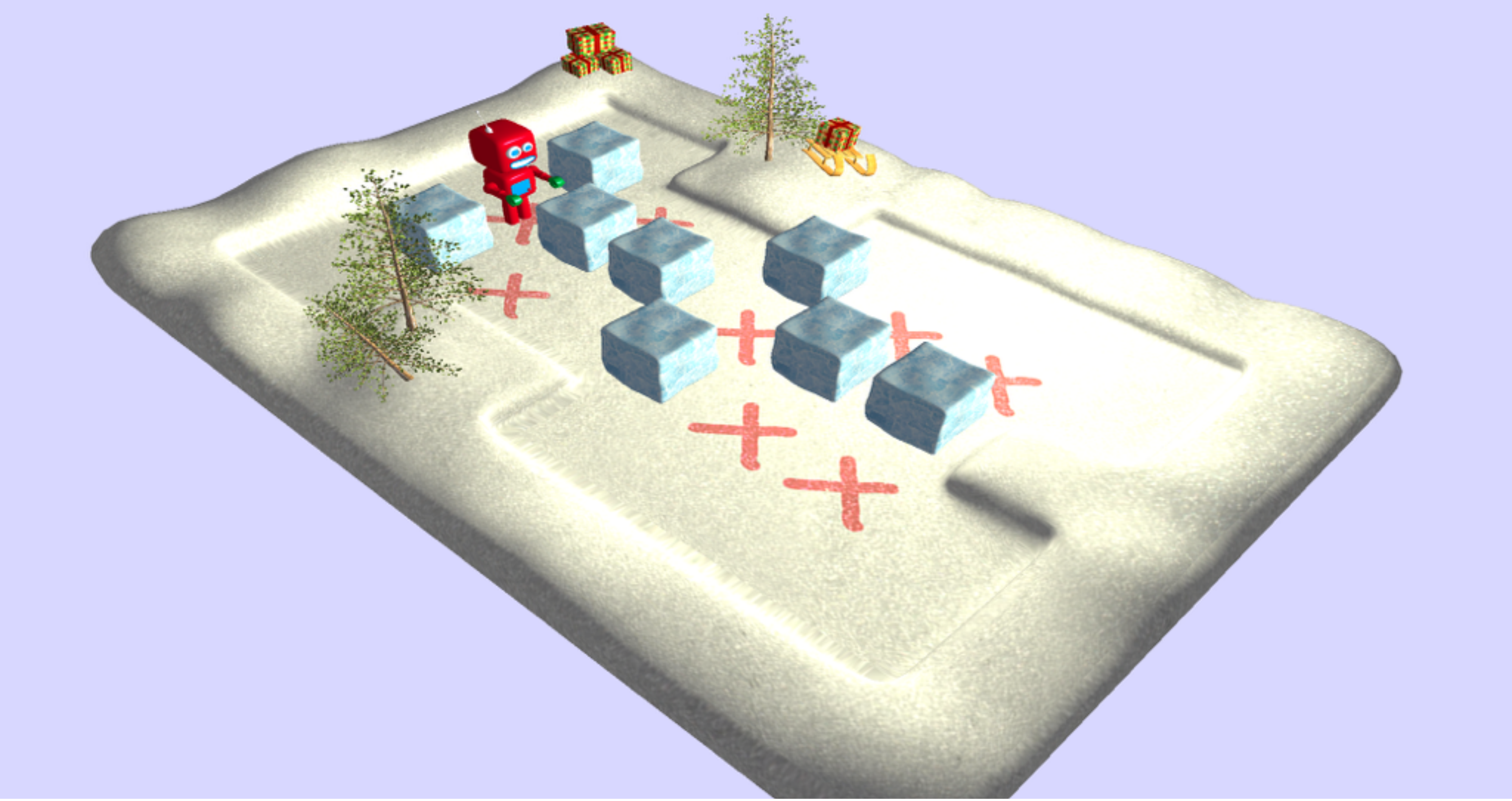
[easy] http://www.learnopengl.com/#!In-Practice/2D-Game/Particles
[hard] http://ogldev.atspace.co.uk/www/tutorial28/tutorial28.html

“Happy hunger games!”

–President Snow

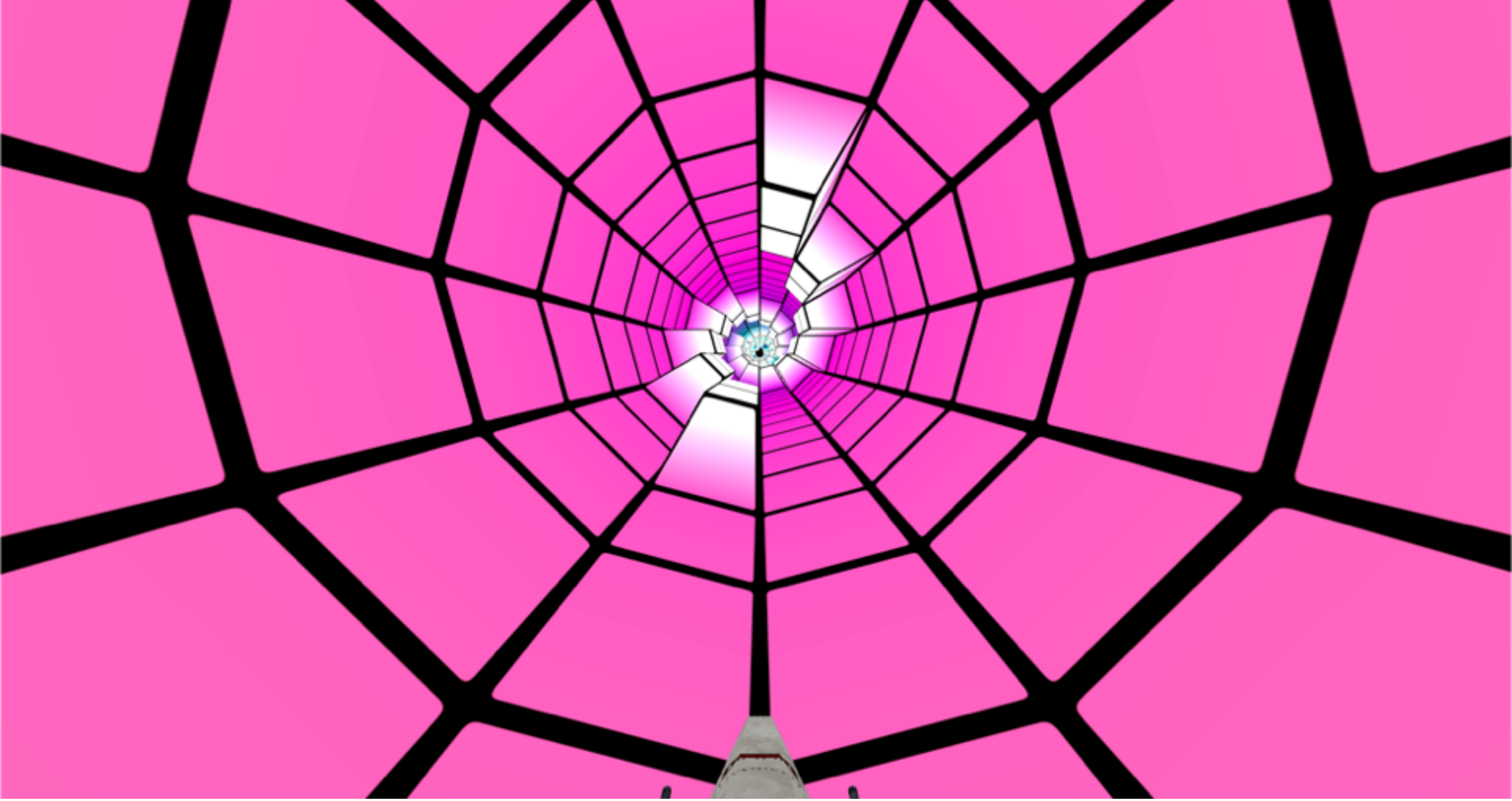
Hall of fame

2015



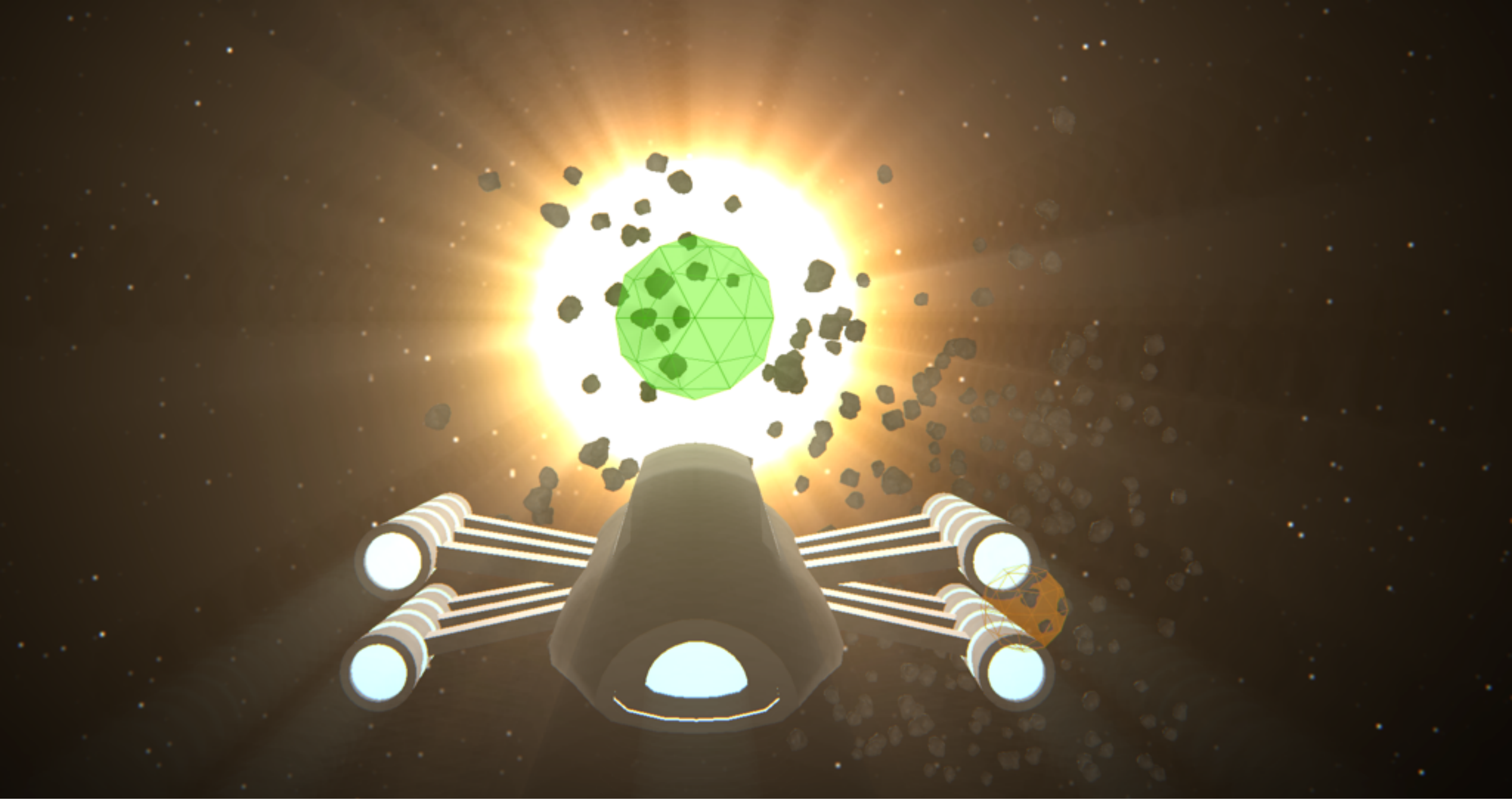
SokobanGL

R. Tourrel, G. Zerathe, A. Schoentgen, B. Nougier
& V. Trellu



TunnelGL

E. Louvat, G. Boeda, P. Vandrome, R. Garcia
& M. Esnault



KuiperRace

J. Anger, H. Benjelloun, A. Benkeddad, E. Bourrand
& S. Lerouzic