2IOE0 Interactive Intelligent Systems

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TU/e

edition 2020-Q2

Please switch-off your microphone
ask questions via chat

1. canvas
   1. http://www.win.tue.nl/˜wstahw/2IOE0
   2. http://www.win.tue.nl/˜wstahw/2IOE0/studyguide.html

2IOE0 = **Two** **I**ndia **O**scar **E**cho **Zero**

1. Work in a team of upto 6 students.
2. Apply knowledge of previous courses.
   - 2IV60 Computer Graphics
   - 2ID90 Artificial Intelligence
   - If you did not complete these courses, you can **not** participate!
   - However,
     - some of you are accepted based on partial grades of 2IV60
     - some of you are conditionally accepted, waiting for 2IV60 grades.
3. Process guided by tutors.
   - Three TA's:
     - Milan van Gool
     - Ruben Wolters
     - Tom Kafoe
   - Two Lecturers:
     - Andrei Jalba
     - Huub van de Wetering
4. Realize an interactive intelligent system.
   - 2020-Q2: a game

Introduction

Team composition

- Time slots
  - all team members should be available in block **E**:
    - (Monday evening)
    - Tuesday afternoon
    - Thursday morning
- Team formations are fixed based on known grades for 2IV60 and 2ID90.
  - Find your team in canvas.

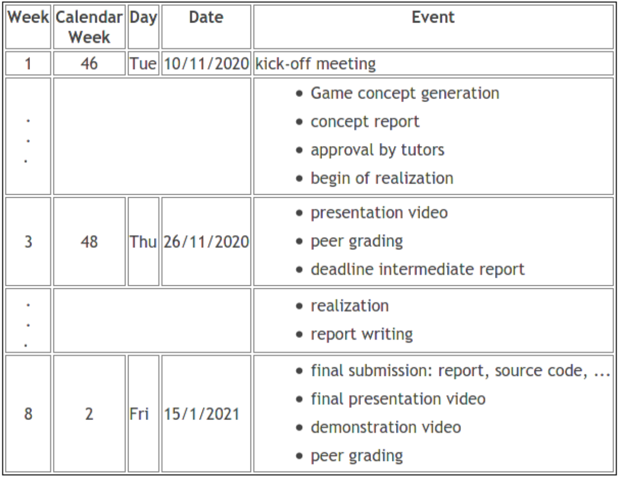
Introduction

Team resources

- Each team has a project room.
    - Inform the lecturers, when you decide not to use a room.
- Each team is monitored by a tutor.
    - Role of tutor is to guide the process.
    - All tutors together approve initial game concepts.
    - Tutor is not necessarily an expert in AI and/or CG.

Introduction

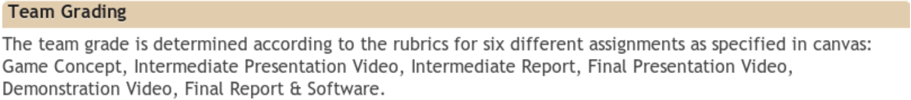
Project execution - excerpt from study guide



Week	Calendar Week	Day	Date	Event
1	46	Tue	10/11/2020	kick-off meeting
⋮				• Game concept generation • concept report • approval by tutors • begin of realization
3	48	Thu	26/11/2020	• presentation video • peer grading • deadline intermediate report
⋮				• realization • report writing
8	2	Fri	15/1/2021	• final submission: report, source code, ... • final presentation video • demonstration video • peer grading

Introduction

Grading - excerpt from study guide

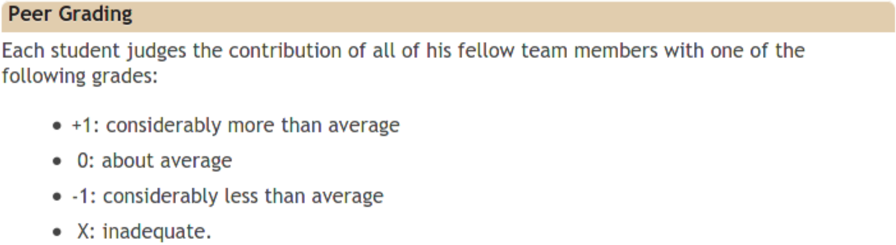


Team Grading

The team grade is determined according to the rubrics for six different assignments as specified in canvas: Game Concept, Intermediate Presentation Video, Intermediate Report, Final Presentation Video, Demonstration Video, Final Report & Software.

Introduction

Grading - excerpt from study guide



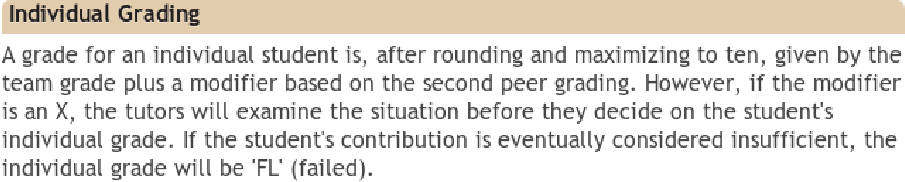
Peer Grading

Each student judges the contribution of all of his fellow team members with one of the following grades:

- +1: considerably more than average
- 0: about average
- -1: considerably less than average
- X: inadequate.

Introduction

Grading - excerpt from study guide



Individual Grading

A grade for an individual student is, after rounding and maximizing to ten, given by the team grade plus a modifier based on the second peer grading. However, if the modifier is an X, the tutors will examine the situation before they decide on the student's individual grade. If the student's contribution is eventually considered insufficient, the individual grade will be 'FL' (failed).

Interactive Intelligent System: Game

- Game should contain challenging/non-trivial/interesting elements of
  - Computer Graphics
    - animation, modelling, rendering, algorithms, efficiency, HCI, ..
  - Artificial Intelligence
    - searching, planning, learning, ...
- Validation tools earn you credits
  - if properly demonstrated and reported upon.
- Implementations have to be done in java.

Interactive Intelligent System: Game

- From both CG and AI **two** techniques are chosen.
  - from a given list (or approved by tutors)
- They should play an **essential** role in the realization of the game.
- The quality of their realization should be validated.
- This year we have as additional requirement;
  - 1 of the two AI techniques has to be: -
  - 1 of the two CG techniques has to be: -
- So, no special requirements, but the complexity of the chosen techniques should be sufficient.

Terminology

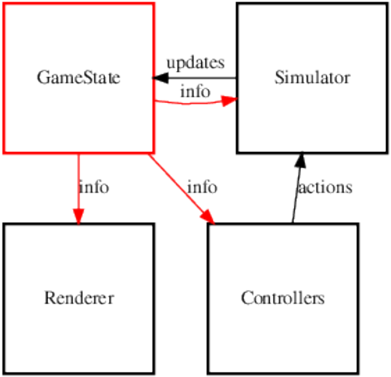
PC or player character:

- character controlled by a human player
- e.g. pac-man

NPC or non-player character:

- the other characters
- e.g. the ghosts in Pac-Man

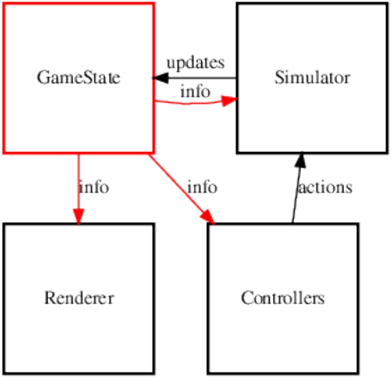
General Game Architecture



Game state:

- contains current state of the world
- may be queried on state of objects in the world

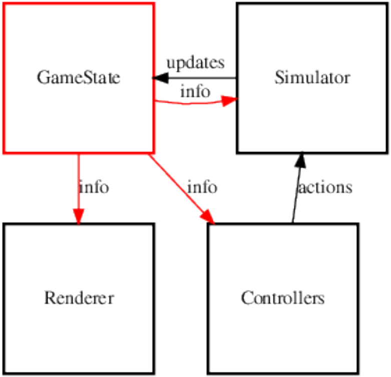
General Game Architecture



Controller:

- each character has at least one
- selects actions
- PC: controller interprets “joy stick” events
- NPC: controller is character’s brain: AI, ...

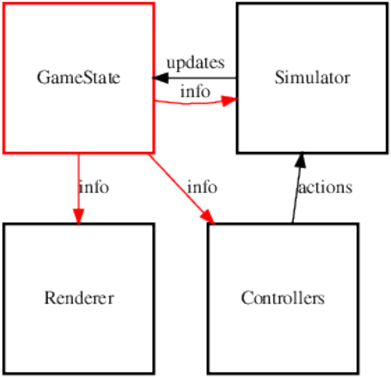
General Game Architecture



Renderer:

- renders the game state
- outputs images (and sounds)

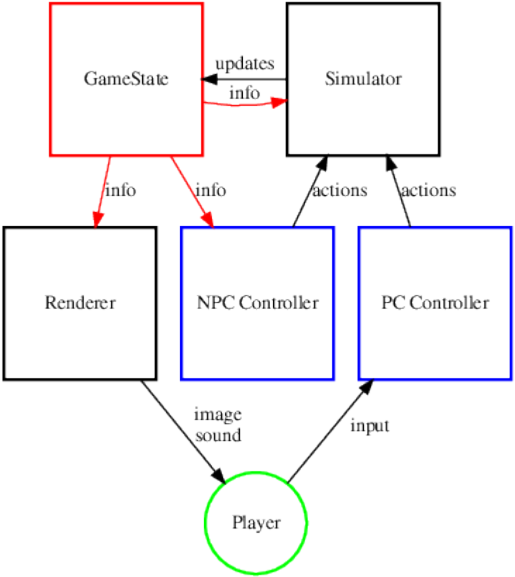
General Game Architecture



Simulator:

- encodes how game state changes
- responds to actions of the controllers

General Game Architecture



Controllers

- either programmed or learned
- reactive controller:
  - stateless
  - function of its input
- stochastic controller
  - more interesting to play against non-predictable NPC
  - randomness may break symmetry to avoid, e.g. being trapped in a corner
  - mimicks noise in real world
  - for instance, add randomness to controller's output

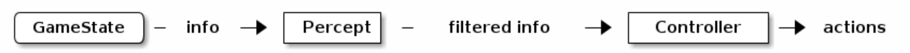
- several controllers together may determine the next (game) action, e.g.
  - one controller determines goal of NPC
  - a second controller searches a path to the goal
  - a third controller computes next move.

Controllers

Percept

A percept

- functions as a filter/facade for the game state.
- game state is only available via its methods.



GameState – info → Percept – filtered info → Controller → actions

- may be replaced by another percept, for example,
  - one which uses other info from gamestate,
  - a 'confused' one with randomized values if (N)PC has taken a hit on the head.

Game Concept

- Players: how many? Any requirements? Special knowledge, roles ... ?
- Objective: What is the objective of the game?
- Procedures: What are the required actions?
- Rules: Any limits on player actions? Rules regarding behaviour?
- Conflict: What causes conflicts?
- Outcome: What are the possible outcomes?
- ...

Try to be exact and complete, but also clear.

Game Concept

- All video game types are allowed:
  - action, adventure, role-playing, simulation, strategy, sports, ...
- But,be realistic
  - Not everything is possible in one quartile.
- **Make the CG and AI shine!**
  - Their roles should be essential and provable.

Game Realization

- Build modular
  - decide on interfaces
  - document interfaces
- Use fast prototyping
  - iteratively build your game
  - first build the validation tools!!
- Play testing
  - find problems
  - tune parameters

First Team Actions

1. Organize team communication
2. Make weekly appointment with tutor.
    1. together decide on mode of communication ...
    2. tutors will be announced today
3. Read the studyguide & FAQ.
4. Brainstorm on game concepts.
    - Hints:
        - Do not make your game needlessly complicated.
        - Focus your work on the CG & AI components.
5. Work out a **game concept** on paper.
6. Get approval of tutor(s)
7. ...

References

1. Artificial Intelligence for Computer Graphics, John David Funge.
2. Game Design Workshop, Tracy Fullerton.