2IO23 – Design-Based Learning Specification and Games

Herman Haverkort Tim Willemse

13 November 2012

Course Information

Coordinators: Herman Haverkort and Tim Willemse

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Course Information

Course Page

- these slides
- a detailed schedule
- project guides and documents containing guidelines
- important course announcements

Tuesday 8.45 - 17.30 Metaforum

Wednesday 8.45 - 12.30 Metaforum

Friday 8.45 - 17.30 Metaforum

Objectives of this DBL project

- Prepare for the Software Engineering Project (2IP35)
- Apply the techniques from Software Specification in the scope of a larger assignment
- Experience the complexities of developing correct distributed systems and pleasing computer graphics
- Become aware of the importance of developing (formal) specifications for, e.g., outsourcing software development

Setup

Two teams collaborate to develop a game. One team acts as a client; the other team acts as the producer.

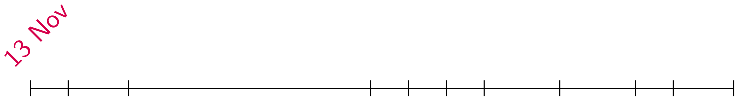
- Role client:
  - provide an informal game description
  - assess and ensure the quality of the products developed by the producer
- Role producer:
  - document design decisions (and their motivation)
  - formally specify the game description
  - implement the game

Setup

- Assignment I —practice—
  - practice the client-producer development model within a team
  - each team splits in two subgroups; each subgroup solves and formalises one small assignment
  - the quality of the solutions, the documents, etc. will be assessed by the other subgroup.
- Assignment II —the real thing—
  - each team is client for one assignment and producer for another

Schedule

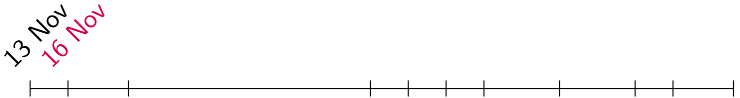
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Opening
- Hand out assignment I.
- Hand out assignment II to clients.

Schedule

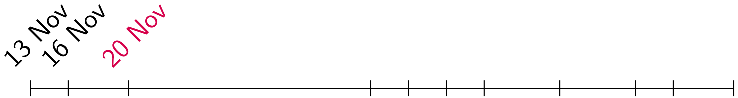
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable (client): informal game description

Schedule

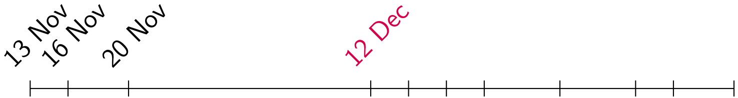
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable: final reports assignment I.

Schedule

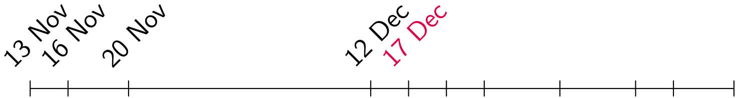
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable (producer): formal specification

Schedule

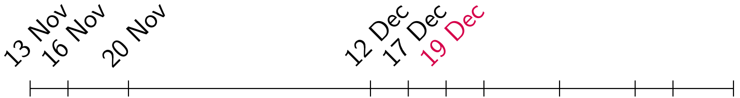
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable (client): assessment of the formal specification of the producer

Schedule

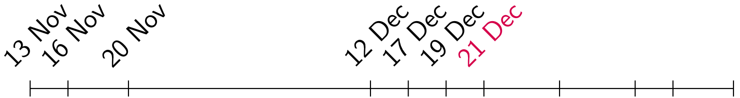
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable: assessment of the formal specifications of two other teams

Schedule

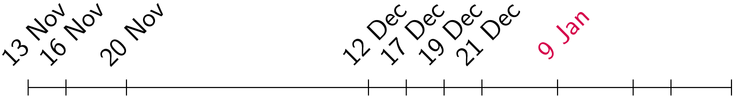
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable (producer): final version of the formal specification

Schedule

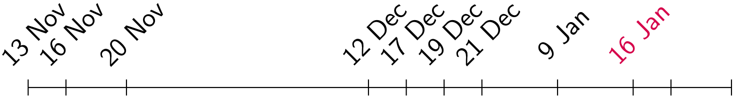
Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable (client): testcases for assessing the quality of the implementation

Schedule

Deadline deliverables: at the end of the day (23.45); hand in via Peach

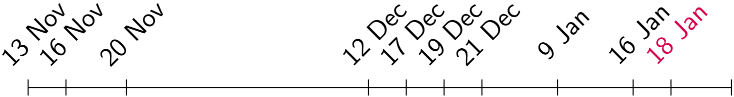


13 Nov
16 Nov
20 Nov
12 Dec
17 Dec
19 Dec
21 Dec
9 Jan
16 Jan

- Deliverable (producer): final document and implementation

Schedule

Deadline deliverables: at the end of the day (23.45); hand in via Peach

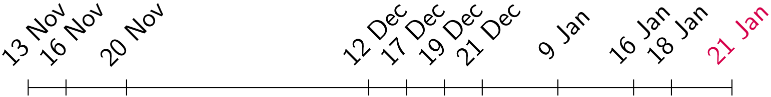


13 Nov
16 Nov
20 Nov
12 Dec
17 Dec
19 Dec
21 Dec
9 Jan
16 Jan
18 Jan

- Deliverable: presentations and game demonstration

Schedule

Deadline deliverables: at the end of the day (23.45); hand in via Peach



- Deliverable: slides of the final presentation

Deliverable Assignment I

A well-written document containing:

1. A textual, informal problem description and analysis thereof

Deliverable Assignment I

A well-written document containing:

1. A textual, informal problem description and analysis thereof
2. A formal specification of the informal problem

Deliverable Assignment I

A well-written document containing:

1. A textual, informal problem description and analysis thereof
2. A formal specification of the informal problem
3. A written and well-motivated assessment of the formal specification

Deliverable Assignment I

A well-written document containing:

1. A textual, informal problem description and analysis thereof
2. A formal specification of the informal problem
3. A written and well-motivated assessment of the formal specification
4. Testcases based on the formal specification

Deliverable Assignment I

A well-written document containing:

1. A textual, informal problem description and analysis thereof
2. A formal specification of the informal problem
3. A written and well-motivated assessment of the formal specification
4. Testcases based on the formal specification
5. An implementation of the solution

Deliverable Assignment I

A well-written document containing:

1. A textual, informal problem description and analysis thereof
2. A formal specification of the informal problem
3. A written and well-motivated assessment of the formal specification
4. Testcases based on the formal specification
5. An implementation of the solution
6. A test report.

Deliverable Assignment II

Deliverable Assignment II

Deliverable Clients

1. Informal problem description

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverables Producers

1. A formal specification of the informal game description; pay attention to:

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverables Producers

1. A formal specification of the informal game description; pay attention to:
   1.1 state: define the state of the game and formally define transformations of state information (class diagrams + Z)

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverables Producers

1. A formal specification of the informal game description; pay attention to:
    - 1.1 state: define the state of the game and formally define transformations of state information (class diagrams + Z)
    - 1.2 protocols: mutual exclusion for consistency of state; ordering/sequencing of state transformations (State Charts)

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverables Producers

1. A formal specification of the informal game description; pay attention to:
   - 1.1 state: define the state of the game and formally define transformations of state information (class diagrams + Z)
   - 1.2 protocols: mutual exclusion for consistency of state; ordering/sequencing of state transformations (State Charts)
   - 1.3 consistency: use the same notation and naming conventions everywhere

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverables Producers

1. A formal specification of the informal game description; pay attention to:
   - 1.1 state: define the state of the game and formally define transformations of state information (class diagrams + Z)
   - 1.2 protocols: mutual exclusion for consistency of state; ordering/sequencing of state transformations (State Charts)
   - 1.3 consistency: use the same notation and naming conventions everywhere
2. An implementation and a test report

Deliverable Assignment II

Deliverable Clients

1. Informal problem description
2. Quality assessment of three formal specifications
3. A collection of testcases

Deliverables Producers

1. A formal specification of the informal game description; pay attention to:
   - 1.1 state: define the state of the game and formally define transformations of state information (class diagrams + Z)
   - 1.2 protocols: mutual exclusion for consistency of state; ordering/sequencing of state transformations (State Charts)
   - 1.3 consistency: use the same notation and naming conventions everywhere
2. An implementation and a test report
3. Final presentation (address issues of formalising, (informal) communication; demonstrate the game; executed testcases)

Example

Example (Formal Specification)

$$N == z \mid d\langle\!\langle N \rangle\!\rangle \mid sd\langle\!\langle N \rangle\!\rangle$$

Let $m, n : N$ be arbitrary. We define the operation $a : N \times N \to N$ as:

$$\begin{aligned}
a(m, z) &= m \\
a(z, n) &= n \\
a(d(m), d(n)) &= d(a(m, n)) \\
a(d(m), sd(n)) &= sd(a(m, n)) \\
a(sd(m), d(n)) &= sd(a(m, n)) \\
a(sd(m), sd(n)) &= a(sd(a(m, n)), sd(z))
\end{aligned}$$

Example

Example (Formal Specification)

We define a new data structure to represent natural numbers by the constant 'zero' (z), the operation 'double' (d) and 'double plus one' sd; we use Z's typedef construct for this:

$$N == z \mid d\langle\!\langle N \rangle\!\rangle \mid sd\langle\!\langle N \rangle\!\rangle$$

The addition of two natural numbers, which we represent by an operation $a : N \times N \to N$, is defined by induction. Let $m, n : N$ be arbitrary variables.

$$\begin{array}{lll}
a(m, z) & = m & \{m + 0 = m\} \\
a(z, n) & = n & \{0 + n = n\} \\
a(d(m), d(n)) & = d(a(m, n)) & \{2m + 2n = 2(m+n)\ \} \\
a(d(m), sd(n)) & = sd(a(m, n)) & \{2m + 2n+1 = 2(m+n)\ +1\ \} \\
a(sd(m), d(n)) & = sd(a(m, n)) & \{2m+1 + 2n = 2(m+n)\ +1\ \} \\
a(sd(m), sd(n)) & = a(sd(a(m, n)), sd(z)) & \{2m+1 + 2n+1 = 2(m+n)+1)+2(0)+1\}
\end{array}$$

Questions?