Object Oriented Methodologies: Requirements Analysis

General Approach
- Requirements (Use Cases and Class/Resp. Collaboration)
- Determination of classes and objects
- Attributes and Operations are defined
- Hierarchies and structures to organize classes
- Relations among objects are defined
- Interaction among the objects are modeled
- All the models are refined through scenarios and use cases

Use Case Diagrams

Example Use Case Diagram

Use Case Analysis notes
- One Use Case Diagram per capability
- One use case per system function
- Each use case explained through at least one scenario
- Each use case (or scenario) specified through one interaction diagram

Class / Responsibility / Collaboration
Telephone Connection Example

Scenario for ‘Connection’

- 1. Caller picks-up the ‘handset’ //activity
- 2. Waits until ‘dial-tone’ is heard //activity
- 3. Caller dials the number
- 4. Callee (called user)’s phone rings
- 5. Callee picks up
- 6. connection established (talk starts)

Method at Receiver !!! (Client/Server analogy)

- Display Map (coordinates, scale,..) (message)
- Google Maps (server)

State Diagram (Mealy Machine)

Soda Machine: accepts 5,10, & 25 cent coins for 35c-soda
Moore Machine

Cars coming from N
Red
Orng
Grn
Orng

N
W
E
S

Red light
timer

Sequence Diagram

:caller
:phone
:callee

Pick-up
Hear-dial-tone
Dial(phone-no)
Get-ring-indicator
Pick-up
Hello

Sequence Diagram - II

:caller
:phone
:callee

Get a free line()
dial-tone
Dial(phone-no)
ringing-indication
React to the ring()
Pick-up()

Sequence Diagram - III

pu1: phone user
p1: phone
p2: phone
pu2: phone user

Get a free line()
dial-tone
Dial(phone-no)
ringing-indication
Ring()
Accept()
Connect()

Message Numbering

- Hierarchical Numbering: 1.1, 1.5.2 ...
- Concurrent Messages: 2.a, 2.b ...
- Conditional messages: Guard: [a<8] 2.2
- No indication of reception time in Collaboration Diagrams.
- Different synchronization types are available

Class Diagram:
inheritance/association

Phone user
caller
callee
calls
From Analysis to Design

- Similar Media are used
- The details introduced in the models, start matching the question: ‘how’
- Classes are emphasized in Analysis, Objects in Design

Transition to Design

<table>
<thead>
<tr>
<th>Analysis model</th>
<th>Design model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>Objects</td>
</tr>
<tr>
<td>Attributes</td>
<td>Data structures</td>
</tr>
<tr>
<td>Operations</td>
<td>Algorithms</td>
</tr>
<tr>
<td>Relations</td>
<td>Messages</td>
</tr>
<tr>
<td>Behavior</td>
<td>Control</td>
</tr>
</tbody>
</table>

Design Levels