How to Estimate Software Size and Effort in Iterative Development

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Size Estimation Methods

- Two major groups:
  - analogy based
  - model (algorithmic) based
Analogy based
Model based

Effort = surface * 1,1

Effort = surface * 1,1 + (surface/5) * 2,5
Universal Size Estimation
Process

- ASPECT-ORIENTED DEVELOPMENT
- OBJECT-ORIENTED DEVELOPMENT
- STRUCTURED DEVELOPMENT
- SOFTWARE ABSTRACTION MODEL

GASS

- FSM METHOD
- COSMIC FFP
- MK II FPA
- FPA

SOFTWARE SIZE
The iterative problem
The solution for iterative size estimation

- Representation of software system at different abstraction levels
- Combining early size estimates with more accurate size estimates through the iteration
- Improving the estimate with lessons learned in previous iterations.
Abstraction levels with UML
The idea - simplified view

**EARLY ESTIMATION**
- UC1
- UC2
- UC3

**ITERATION #1**
- CLASS DIAGRAM (UC1 & UC2)
- UC3

**ITERATION #2**
- CLASS DIAGRAM (UC3)

Size = Size(CD) + Size(UC3) + d

Size = Size(UC1~UC3)

Size = Size(Effort) + Size(CD)
The problem of true value

• What is the correct software size?
• It is easy to measure distance! What about software size?
• Usual approach
  – Effort = Size * Productivity
  – Use of industry repositories- ISBSG*

Authors would like to thank ISBSG for supporting the research and providing the latest data - R10.
Accuracy improvement

**Improvement of Estimates through Iterations**

- **Y-axis**: Size (FP)
- **X-axis**: Iteration (#)
- Comparison between Estimate and Actual values over iterations.
Case study

- Approach tested on 3 projects
- Programming language: Java
- Projects' statistics:

<table>
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<tr>
<th>SLOC</th>
<th>NOC</th>
<th>NOM</th>
<th>GUI</th>
<th>Effort (h)</th>
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<tr>
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<td>37</td>
<td>16 JSP</td>
<td>166</td>
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<td>Project 3: 1307</td>
<td>20</td>
<td>30</td>
<td>9 SWT</td>
<td>205</td>
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</table>
Estimation Error

Change in Estimation Error through Iterations

- Project 1
- Project 2
- Project 3
Discussion of results

• Although the sample is small, the results are promising.
• The change in productivity could influence the accuracy - the problem of true value!
• The method could help project managers manage and report on time before it is too late (consistent with the PRINCE 2 manage by exception approach).
**Conclusion**

- Size estimation in an iterative environment is difficult
- Traditionally well known and accepted methods could not be used
- The presented approach is a combination of two popular methods
- For the application of the method on industry projects, tool support is crucial.
- Open to help vendors implement the approach in development tools that support UML 2.0