Analytical Convertibility of Functional Size Measures: a Tool-based Approach

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Different Functional size measurement units exist
Convertibility is an issue
Analytical convertibility
Tool support
Lessons learned
Conclusions
IFPUG Function Points

Functional User Requirements

Data Functions
- RET
- DET

Transaction Functions
- FTR
- I/O DET
COSMIC Function Points

Functional User Requirements

Functional Process Type

Sub-process types

Data Movement Type

Data Manipulation Type
Convertibility

- Given the measure in IFPUG FP of a software application, what is its size in CFP?
- Answering this question is important for practical reasons.
  - E.g., given historical datasets containing measures in FP, one would be able to reuse them in a COSMIC-based context.
- So, we would like to be able to convert measures of size from FP into CFP
  - With little effort
  - With good accuracy
Statistical convertibility
Analytical convertibility

Direct approach:
\[ \text{CFP} = f_{\text{COSMIC-FPA}}(\text{FP}) \]

Alternative approach:
\[ \begin{align*}
\text{Identify } & \text{BFC}_{\text{COSMIC}} \text{ by exploiting the knowledge gained via FPA} \\
\text{Compute } & \text{CFP} = f_{\text{COSMIC}}(\text{BFC}_{\text{COSMIC}})
\end{align*} \]

Difficult, if at all possible

The real problem

Easy: just apply COSMIC rules
Analytical convertibility

The proposed approach:

\[
\begin{align*}
\text{BFC}_{\text{COSMIC}} &= f(\text{BFC}_{\text{FPA}}) \\
\text{CFP} &= f_{\text{COSMIC}}(\text{BFC}_{\text{COSMIC}})
\end{align*}
\]

- Relatively easy, if we can establish a mapping between FP and COSMIC concepts
- Easy: just apply COSMIC rules
### FPA – COSMIC concept mapping

<table>
<thead>
<tr>
<th>FPA</th>
<th>COSMIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DET (in data file)</td>
<td>Data attribute</td>
</tr>
<tr>
<td>RET</td>
<td>Data Group</td>
</tr>
<tr>
<td>Logic Data File having one RET</td>
<td>Data Group</td>
</tr>
<tr>
<td>Transaction</td>
<td>Functional process</td>
</tr>
<tr>
<td>FTR</td>
<td>Data Group(s) read or written in the execution of a functional process</td>
</tr>
<tr>
<td>DET (in transaction)</td>
<td>Attribute of a Data Group that is subject of an Entry or Exit when executing the corresponding functional process</td>
</tr>
<tr>
<td>Set of DET crossing the boundary of the application as part of a transaction</td>
<td>Data movement of type Entry or Exit</td>
</tr>
<tr>
<td>FTR access within a transaction</td>
<td>Data movement of type Read or Write</td>
</tr>
</tbody>
</table>

Note: the table indicates what is usually true!
Tool support

SW modeling for FPA
Data modeling
Tool support

SW modeling for FPA
Transaction modeling
Conversion

From BFC\textsubscript{FPA} to BFC\textsubscript{COSMIC} (data)

Note: the tool \textit{allows} the user to convert a logic data or a RET into a data group

The user \textit{decides} to do it or not.
Tool support

Result of data conversion
Conversion

Transactions are Functional processes

Note: the tool allows the user to convert a transaction into a functional process

The user decides to do it or not.
Tool support

Specifying data movements
Currently done manually
Could be partly automated

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Tool support

COSMIC size

![COSMIC size tool support](image)
Conclusions

We exploit the knowledge produced by the FPA counting process and the similarity of FPA and COSMIC concepts in a procedure that guides the measurer in **deriving COSMIC BFC from FPA BFC** thus greatly simplifying the COSMIC sizing.

The procedure is supported by a **tool**, which **incorporates the knowledge of how FPA concepts map onto COSMIC concepts**, thus easing conversions.
We found out that even though the data groups and functional processes can be identified very easily on the basis of the FPA software model, identifying the type of data movements in which each data group is involved is not so immediate.

To overcome this problem, two strategies are possible:

- **Double measurement**
  - Each process is measured according to both FPA and COSMIC methods.
  - This procedure costs very little more than applying a single measurement method.
  - Process data movements are identified by applying rules that exploit all the details of transactions that were recorded.
  - This procedure could be automated by a sort of expert system.
Questions?