Le génie pour l'industrie

UNIVERSITÉ DE VERSAILLES SAINT-QUENTIN-EN-YVELINES

Applying an Assessment protocol to the COSMIC Automation Prototype-Tool

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Agenda

- Context
- The assessment protocol for automation tools implementing the COSMIC ISO 19761 measurement method
- Applying the assessment protocol to the COSMIC automation Prototype-tool
- Conclusion

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Context: ETS- UVSQ-Renault research project

- **Automating functional size measurement is an issue for organizations with a large number of projects to measure within a very short time frame, either for project estimation purposes or for productivity studies.**
- **To tackle this issue, Renault S.A.S has developed in partnership with ETS and UVSQ, an automation Prototype-tool for the COSMIC method.**
  - Functional requirements modeled in Simulink are used as inputs to the tool.
  - Of course, such an automation tool must be verified for accuracy.

- **Previous research on the assessment of automation tools that measure functional size are scarce:**
  - A single generic assessment protocol proposed for IFPUG (Mendes & Abran).

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Assessment protocol for automation tools implementing COSMIC – ISO 19761

1. **Compare the total size with the same samples measured manually, using the same measurement procedure.**

2. **Compare all the individual functional processes and data group movements, for verification purposes, at the detailed level of the measurement process.**

3. **Identify and analyze the source of the detected errors and correct.**

This 3-phase verification protocol must use samples that include most types of input cases that could be encountered.

An assessment protocol for automation tools implementing the COSMIC – ISO 19761 measurement method

- **If no difference is detected in Phase 1 between the manual measurement result and the automated one, experience has shown that, even though the parallel measurement results may be equal at the total CFP level, there can be many differences at the detailed level!**
  - Therefore, if the verification stops at phase 1, it is considered to be a high-level one, not a detailed one.
  - To fully verify an automation tool, the verification protocol of automation tools should include all 3 phases.

An assessment protocol for automation tools implementing the COSMIC – ISO 19761 measurement method

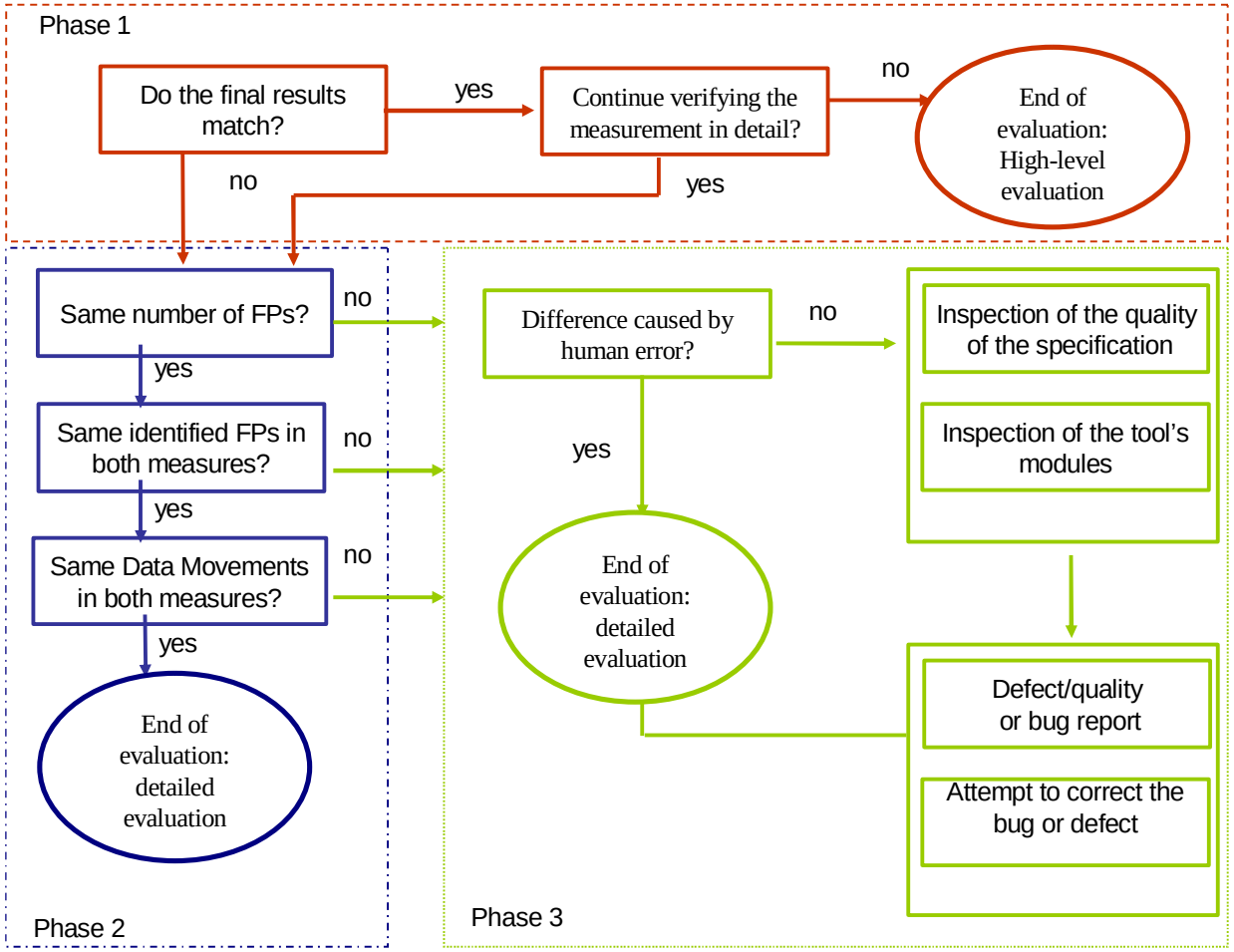
- **Phase 1: Comparison of the total sizes in CFP**
  - The results (in CFP) produced automatically by the prototype and those obtained from the manual measurement of the same input, are compared.

- **Phase 2: Comparisons at the detailed levels**
  - Verification of the # of functional processes obtained automatically and manually.
    - If no difference in the # of functional processes, each automatically obtained functional process is verified against its manually obtained “peer” to determine whether or not there is a difference in their names (or their identifiers)
    - If every functional process obtained automatically matches its “peer” obtained manually, then their functional sizes are compared. A difference indicates that 1 or more data movements in the functional process must be responsible.
    - It is also necessary to verify whether or not there were any human errors in those results.
    - At the end of this phase, any data movement responsible for an error is isolated.

An assessment protocol for automation tools implementing the COSMIC – ISO 19761 measurement method

- **Phase 3: Identify the source of errors and correct**
  - A detected error could have 2 sources:
    - automated measurement error or
    - error in the requirements in input to the measurement process.
- **This phase consists of:**
  - Inspecting the module of the automation tool that is responsible for the error.
  - Inspecting, in parallel, the requirements-input to detect a possible defect that may be causing the error.
- **Once an error is detected:**
  - If the error was caused by the automation tool: correct the tool and the appropriate specification is re-measured with the new version of the tool, and then re-verified.
  - If the cause of the error is in the specification itself, the defect is recorded for possible future enhancements to the specification and/or a specific functionality (or a bypass of this defect in the tool).

Assessment protocol for automation tools for the COSMIC – ISO 19761 measurement method



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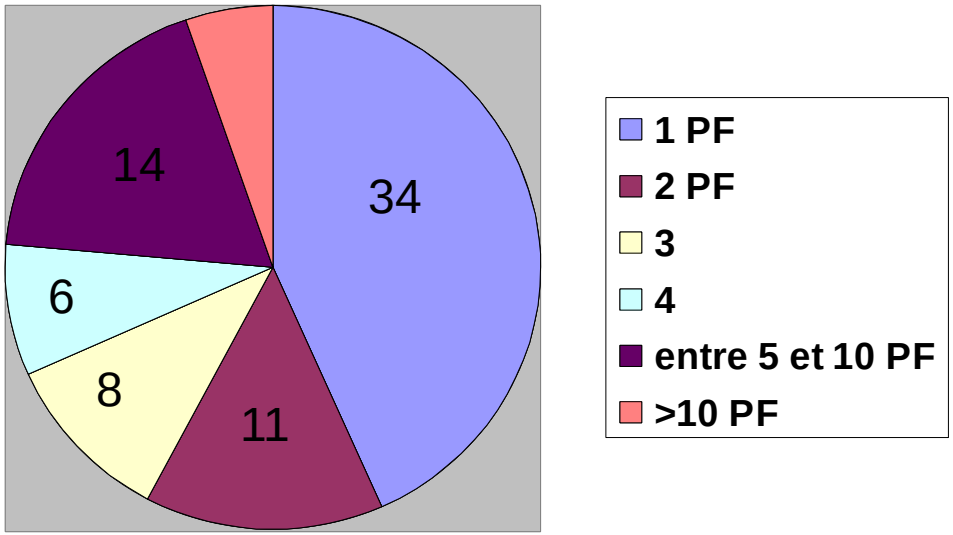
Applying the assessment protocol to the COSMIC automation Prototype-tool

- **The protocol was applied to 77 distinct specification models.**
  - Various sizes of specifications among software functions that represent different ECMs (Engine Control Modules) from the department in which the automation tool was initially used.



Applying the assessment protocol to the COSMIC automation Prototype-tool

7 our 77 modules had measurement differences

Requirement ID	Size obtained manually	Size obtained using the tool	Difference %
5	115	113	**2%**
13	62	71	**13%**
28	66	68	**3%**
53	52	53	**2%**
54	47	46	**2%**
62	29	52	**44%**
70	16	17	**6%**

All others (70)	**-**	**-**	**0%**

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The assessment protocol demonstrates that for the automation tool:

- **91% of the input specifications = 100% accurate automated measurement results**

- **For 7 of the 77 set of specifications (9% of the input specifications):**
  - Size differences vary from 2% to 12%:
    - limitations in the Simulink libraries used in the prototype.
  - An outlier with a measurement difference of 44%:
    - A specification incompletely modeled by the specification staff.
    - This specification needs to be corrected before being measured.

Summary

Accuracy of the automation tool
(after testing)
= + 99%

Requirement/Models	Total Size obtained manually (CFP)	Total Size obtained using the tool (CFP)	Difference %
76 'correct' specification-models	1729	1739	Less than 1%
All specification-models (77)	1758	1791	1.8%

Questions?

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