

Validation of the knowledge management system for the parameterization of discrete-event simulation models in operational use

Introduction

As part of Mayank Singh's master's thesis and Kilian Vernickel's doctoral project, a knowledge management system for parameterizing discrete-event simulation models in operational use was researched and developed at Fraunhofer IGC. The system is to ensure that a simulation model always represents the real production system and can be used for predictive experiments. In this context, a corresponding system should record the changes between simulation and reality as well as support the process of adapting the simulation model through targeted knowledge acquisition.

Aim of the questionnaire

The questionnaire aims to validate the knowledge management system for parameterization of discrete-event simulation models in operational use.

Notes on editing: There are no wrong answers to the questions asked.

The questionnaire contains three different types of questions:

1. **Multiple Choice:** For these questions, several answer options can be ticked and the free text field can be filled in.

Beispiel: Als plangetriebene Vorgehensmodelle verwenden wir ...

- ☐ ...the V-Model.
- ☐ ...the V-Model XT.
- ☒ ...the Waterfall-Model.
- ☒ ...Six Sigma.
- ☐ ... a proprietary approach: Adapted V-model
- ☐ ...another procedure: _____

2. **Tabular questions:** Please answer these questions with the degree of agreement
Example: In the future ...

| | Not at all | No | Some -what | Yes | Definitely Yes | No statement |
|--|--------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|
| ... a stronger customer focus will become necessary. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ... services around the product are becoming increasingly important. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

3. **Open questions:** Please answer this question in your own words.

1.1. In which industry is your company mainly active?

- 1.2. What is your experience with the tools/activities mentioned below?

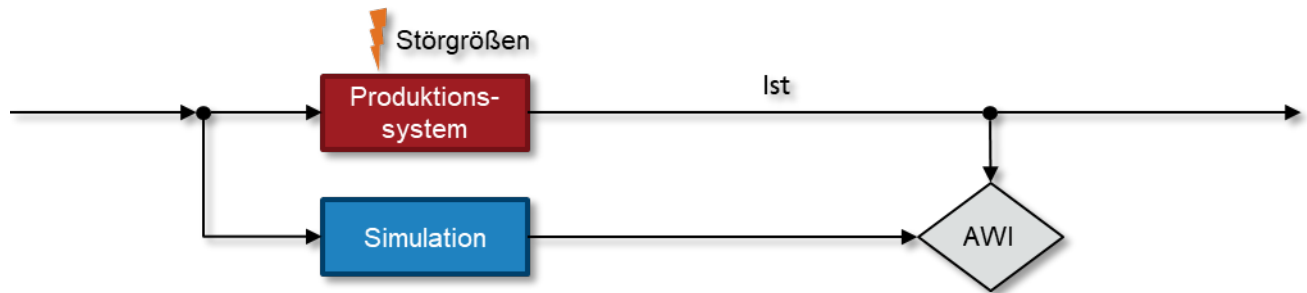
[illegible]

2. Explaining the different parts in the demonstrator (production line, simulation model, etc.)

[illegible]

3. Presentation of all deviations between the real production system and its simulation model.

System architecture:



- AWI: Deviation detection (Abweichungsidentifikation), based on live data from the production system and the simulation model
- Mapping of sensor data from the production line with parameters from the simulation model

[illegible]

Imagine you are a worker within the project DAMOKLEZ and work on the station "Transport_1".

[illegible]

5. Presentation of details of the deviations (Historical Chart, dates, ...)

Example of a deviation in station *Transport_1* for the worker *Kilian_Vernickel*.

Hi Kilian_Vernickel

Deviation is DeviationID_Transport1_1202 which Occured in ('Transport1', ['Gripper', 'Conveyor_1', 'lightsensor_start']) Process

Do you have knowledge about the deviation?

☒ Yes
☐ No

If you do not have any knowledge, can you suggest someone who has the knowledge (Ignore if no Knowledge about expert)

Name of suggested expert

Cause Of Deviation
Machine

Deviation Type
Planned

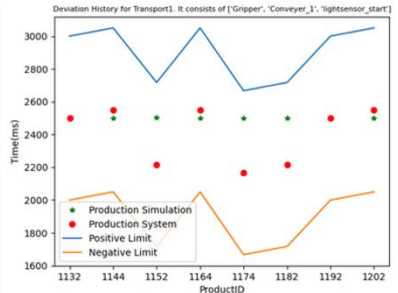
Deviation Description
Machine got corrupted

Deviation starts from
03/29/2022 11:40 AM

Deviation will stay until
03/29/2022 11:40 AM

Submit

Deviation History for Transport1. It consists of ['Gripper', 'Conveyor_1', 'lightsensor_start']



| | Not at all | No | Some-what | Yes | Definitely Yes | No state ment |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The information provided to me is sufficient for me to share my knowledge about the deviation. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I found it easy to tell between what I know and what I don't know about a deviation. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The deviation-field should provide more information | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If yes : The following information is missing/ could be added: (please describe) | | | | | | |

Consider that you are the simulation expert, you have control of the parameters in the simulation, and you are responsible for providing an accurate simulation model.

[illegible]

7. General evaluation of the whole system

[illegible]

| | | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| system, which can't be seen in the historical data, can be taken into account in the simulation model. | | | | | | |
| Please answer the statement: The system fastens the process to interpret failures of the real production system. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you think there is more potential in the stored knowledge for other use cases in the production/ companies environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you have any further comments/ ideas? | | | | | | |

Thank you very much for your participation!