Interactive Wiki for Special-Purpose Machines

Thomas Herpich and Valentin Plenk

Thomas Herpich, Institute of Information Systems / Hof University

thomas.herpich.2@hof-university.de
Presenter – Thomas Herpich

- Hof, Germany
- Master – Applied Research in Computer Science

- Research fellow at:
  - Institute of Information Systems at Hof University
  - Research Group: Cyber-Physical Systems
Project Overview

- Collect data from multiple machines
- Create instructions for operators
- Map instructions to error situations
- Find appropriate instructions for new situations
- Around 7500 Variables per machine
- Refresh interval: max. 10 ms
Data Analysis

- Build instructions from data
- Check: Data changes during fixing
- Result: No changes
New Assistance System
Interactive Wiki for Special-Purpose Machines

- Wiki based system:
  - Every user can create / edit pages

- Wiki page:
  - Description of the error
  - List of steps how to fix it (== Instructions)
  - Created by the operators

- Pages are mapped to situations

- System finds appropriate page for new errors
- Distinguish with all available data
New Wiki - Algorithm

- User Interface
- Knowledgebase
- Interaction and Classification
Knowledgebase – Classification

- KB: Mapping from previous situations to wiki pages
- Build a Machine Learning model from KB
- Use the model to classify new Data

- Comparison between data of situations:
  - Distance based
  - Decision tree

Decision tree – titanic
Classification – Random Forest

- Used in this software
- No feature selection
- Multiple decision trees
- Voting system
UI - Software

- Web application accessible from all PCs in the company
- JavaEE and Primefaces
  - Fast and reliable framework for prototyping
- Databases: MySQL and InfluxDB
# UI – List of pages

<table>
<thead>
<tr>
<th>Title</th>
<th>Eine erste Seite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desc.</td>
<td>Diese Seite ist nur als Test für die Wiki-Software gedacht!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Last Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Step 1 - (Hauptmaschine)</td>
</tr>
<tr>
<td>2: Step 3 - 2 - (Peripherie 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>Tool blunt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desc.</td>
<td>Check the last products from the machine. This is how it should look like:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Desc.</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.wassner.de/produkte/motorenbauteile/motorenbauteile/?L=1%20%27A%27D">http://www.wassner.de/produkte/motorenbauteile/motorenbauteile/?L=1%20%27A%27D</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Last Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Step 4 - (Hauptmaschine)</td>
</tr>
<tr>
<td>2: Step 3 - 2 - (Peripherie 1)</td>
</tr>
<tr>
<td>2.1: Step 4 - (Hauptmaschine)</td>
</tr>
<tr>
<td>3: Step 1 - (Hauptmaschine)</td>
</tr>
</tbody>
</table>
UI – Main page

110637 - FEHLER 6/QUITTI
110184 - ÖLPUMPE EINSCHALTEN - ÖLDRUCK?
110079 - NOT-HALT VORSCHUB
110184 - ÖLPUMPE EINSCHALTEN - ÖLDRUCK?
110079 - NOT-HALT VORSCHUB
110184 - ÖLPUMPE EINSCHALTEN - ÖLDRUCK?
110079 - NOT-HALT VORSCHUB
110184 - ÖLPUMPE EINSCHALTEN - ÖLDRUCK?

Diese Seite ist nur als Test für die Wiki-Software gedacht!

1: Step 1 - (Hauptmaschine)

2: Step 3 - 2 - (Periphere 1)
Results

- System runs 24/7 in full production
- Current data:
  - 6 Pages created
  - Mapped to 20 situations
  - Limited due to global pandemic
- Extended test scheduled in October 2020

- User experience: Different changes on request done
- Classification algorithm: no useful test results until now
Thank you for your attention