WHAT ARE WE TALKING ABOUT?

PI:= Physical Packet + Information Packet

Communication between PI objects and warehouse equipment
IS TODAY’S WAREHOUSE PI READY?

- IT Integration from ERP to the machine / equipment
- Communication and Coordination of Controls
- Internet-Technologies and PI / Internet-of-Things

PI Readiness

SSI SCHAFFER
IS TODAY’S WAREHOUSE PI READY?

IT Integration from ERP to the machine / equipment

Communication and Coordination of Controls

Internet-Technologies and PI / Internet-of-Things

PI Readiness

Looks good !(?)

So, are we ready to go for large scale PI roll-out?
Well, there is this small challenge left…
WHAT IT MEANS TO COMMUNICATE

This is what PI readiness requires:

Device A

Event → Create message

Communication infrastructure

Understand message → Reaction

Device B
Event → Create message → Communication infrastructure → Understand message → Reaction

- Shared communication technology (e.g. Internet Technology)
- Common language (vocabulary, grammar)
- Common understand of expected reaction (Example: „Do you know the time?“)
THANK YOU!

Dr. Max Winkler

WORKSHOP 4.3: PI READINESS OF WAREHOUSE TECHNOLOGY
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WEARABLE SOLUTIONS FOR EFFICIENT MANUAL LOGISTICS PROCESSES

Olaf Poenicke
Graz, July 05, 2017
OVERVIEW

1. Fraunhofer IFF on one slide

2. Wearable Assistance using the RFID-Wristband

3. Wearable Assistance using Smart Glasses

4. Integrated Wearable Solution (Project AR-LEAN)

5. Relevance of Wearables for the Physical Internet
Fraunhofer IFF on one slide
Applied Research from Magdeburg

- The Fraunhofer Institute for Factory Operation and Automation IFF in Magdeburg was founded in 1992
- Today it is one of more than 60 Fraunhofer Institutes in Germany
  - IFF is part of the Fraunhofer Cluster Production
- At IFF more than 150 employees are researching and developing reliable technologies and solutions for efficient, sustainable and interconnected manufacturing
Wearable Assistance in Logistics and Manufacturing

Motivation

▪ The practice in many manufacturing and logistics companies:
  ▪ A multitude of individual manufacturing steps are performed for a product per workstation.
  ▪ Since there is demand for a variety of products and models, different products are manufactured at one workstation. In logistics processes the variety of these products needs to be handled without picking and putting errors.
  ▪ The demands on workers’ flexibility are increasing steadily and demands for accuracy and productivity are rising at the same time.

▪ Wearable Assistance Solutions provide high potential for efficient and accurate processes!
  ▪ Context visualization
  ▪ Work step verification

From what area / location do I pick a product / part?

What products / parts should I pick? Did I pick the correct part?

Have I chosen the right storage location?
Wearable Assistance using the RFID Wristband

Overview

The **RFID-Wristband**, a mobile RFID reader worn directly on the wrist, makes it possible to:

- identify objects tagged with UHF-RFID automatically in process with “free hands”
- exchange read data and job data through wireless interfaces (e.g. ZIGBee)
- give user feedback via LED and acoustic signals
- build assistance solutions (e.g. in combination with pick-by-vision etc.)

☑️ With its low weight and individual straps for single users the RFID-Wristband is highly ergonomic.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tr>
<td><strong>Frequency (ETSI)</strong></td>
<td>865.6 bis 867.6 MHz</td>
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<td><strong>RFID Standards</strong></td>
<td>ISO 18000-6C</td>
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<td></td>
<td>EPCClass1Gen2</td>
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<td><strong>Power Output</strong></td>
<td>0-15 dBm</td>
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<td><strong>Read Range</strong></td>
<td>up to 40 cm</td>
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<tr>
<td><strong>Battery Capacity</strong></td>
<td>up to 2200 reads</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>116 g</td>
</tr>
</tbody>
</table>
Wearable Assistance using the RFID Wristband

Overview

1. RFID Transponder
   - in a picking area
   - on a box
   - on a part
   - on a tool
   - ...

2. Scanning of RFID transponder in manual process

3. Wireless transmission of read RFID data

4. Verification of process and read RFID data + feedback to user
Wearable Assistance using the RFID Wristband

Typical Use Cases

- **Verification of material supply deliveries**
  - Application for C-Parts-Management (verification of container and storage position)
  - Verification and feedback within handling process

- **Automated confirmation of pickings**
  - Applications for KANBAN racks, order picking and assembly workplaces
  - More efficient and more reliable compared to classic barcode verification

- **Verification of sorting processes**
  - Application for order picking trolleys
  - Verification and feedback within handling process
Wearable Assistance using Smart Glasses

Overview

- Smart Glasses are used to enrich the process context with **Augmented Reality** information
- Smart Glasses like Google Glass or Vuzix provide **Assisted Reality** contents
  - Concepts for Assisted Reality are ergonomically feasible
- Ubimax is project partner of Fraunhofer IFF for the development of integrated Wearable Solutions
  - Ubimax is the European market leader for Smart Glass based solution development
Wearable Assistance using Smart Glasses

Overview

- Smart Glasses can be used in various manual operations providing assistance along the value chain

- The Assisted Reality application provide online or offline context information and are synchronized with IT systems like ERP

- The Smart Glasses operate as integrating device with other wearables or sensing devices connected via Bluetooth or Wifi
Wearable Assistance using Smart Glasses

Applications

- The Warehousing solution XPick of Ubimax proved the efficiency potential of Head-Mounted-Displays as it was scientifically evaluated (Guo et al., 2015; Baumann, 2013)
  - +25% Speed at DHL
  - +22% Speed and +10% Accuracy at Samsung
  - +20% Speed at Daimler
  - +29% Speed at Intel (using Smart Glasses together with barcode ring scanner)
Wearable Assistance in Logistics and Manufacturing

Benefits

- The use of Wearables like Smart Glasses or the RFID-Wristband offers various benefits for industrial applications in logistics and manufacturing processes.

- Higher Speed
  - Both hands free for main task
  - Seamless Integration of digital and real world
  - Data and interaction always available

- Fewer Errors
  - Innovative graphical User Interfaces
  - Step-by-Step Workflow Confirmations
  - Context Awareness and Integrated Sensors

- Greater Flexibility
  - No fixed installations required
  - User and task specific user interface
Integrated Wearable Solution
Project AR-LEAN

Smart Glasses
✓ Compute job orders and information of RFID Wristband
✓ Visualize current job orders (e.g. picking) and feedback information
✓ Trigger RFID reading

RFID-Wristband
✓ Automatically identifies picked objects or picking locations
✓ Gives verification feedback at Wrist
✓ Can be used as input trigger for Smart Glass operation
Integrated Wearable Solution
Project AR-LEAN

- Within the project AR-LEAN following main goals are focused
  - Development of RFID-Wristband with BLE interface for direct communication with Smart Glasses
  - Development of an integrated application for logistics operation like picking + placing
  - Evaluation of the integrated solution in productive logistics use cases
  - Evaluation of interaction of wearables with smart containers
- The project is funded by the BMWi on German national level (reference 16KN045445)
- On international level AR-LEAN is ranked as EUREKA project
Relevance of Wearables for the Physical Internet
Interacting with Smart PI Containers

Even with the Physical Internet in place manual handling of containers will remain crucial!

Wearable assistance solutions can be helpful in various scenarios:

- **RFID-based identification of PI containers** – Standardized PI containers can be identified by the RFID Wristband in manual handling processes where automation is not feasible but process reliability needs to be secured.

- **AR context information about PI containers** – PI containers with a higher smartness level can directly communicate with HMD applications via wireless communication to provide process related context information.

- **Interaction of other wearables with PI containers** – as PI containers will provide wireless interfaces, also other wearables like smart watches can come into focus for process control interaction. Wearables can be used as control and decision support devices – e.g. to assign single PI containers to follow-up processes.
Thank you for your attention!

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