A Multi-Modal Human-Machine-Interface for Accelerator Operation and Maintenance Applications

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Supported Modalities

1D / 2D Flat Gestures
- Single-finger actions (mouse)
- Single- and multi-finger gestures (touch-sensitive display)

2D / 3D Spatial Gestures
- Hand-gestures (Leap Motion controller)
- Hand- and arm-gestures (Myo gesture control armband)

Spoken Commands
- English (Sphinx speech recognition)

Table: OS (most recent version) VS. Mouse, Touch, Leap, Myo, Speech

<table>
<thead>
<tr>
<th>OS</th>
<th>Mouse</th>
<th>Touch</th>
<th>Leap</th>
<th>Myo</th>
<th>Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Linux</td>
<td>Yes</td>
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<td>MacOS</td>
<td>Yes</td>
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<tr>
<td>Android</td>
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<td>iOS</td>
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</tbody>
</table>

Applies to
- Desktop / Notebook computers with passive or touch-sensitive display
- Tablet computers / Smartphones with touch-sensitive display
- See-Through Augmented Reality glasses

Web2cToGo / Explorer View HMI

Web2cToGo Web service
- Implements Web Client / Server architecture
- Capable of running simultaneously up to 15 multi-page Web2cToolkit-compliant user applications (e.g. Web2cViewer application)
- Supports Web2cHMI: multi-modal HMI (primitive and enriched gestures, spoken commands)

- Primitive gestures:
  - Mouse: Click, Move
  - Touch: Tap, Move / Swipe, Pinch (2 fingers)
  - Leap: Key-Tap, Swipe, Open-Hand, Closed-Hand, Circle
  - Myo: Double-Tap, Wave-Out / Wave-In, Fingers-Spread, Fist

- Enriched gestures: primitive gestures followed by moves, rotations etc.

Explorer View
- Launching / Displaying of user applications
- Indicates the currently supported modalities and corresponding status (armed / disarmed)

Web2cHMI Example

Navigation View
- Switching between user applications
- Closing user applications
- Browsing between pages of user applications
- Zooming, resizing and scrolling pages of user applications
- Switching to Explorer View or Operation View

Web2cViewer / Operation View HMI

Operation View
- Interacting with interactive widgets
- Supported types (1 widget instance of each type per user application page)
  - “On” - action (On-Button)
  - “Off” - action (Off-Button)
  - “Set Value” - action (Slider)
  - “Zoom Data” - action (Chart)
- Switching to Navigation View

Web2cHMI Example

Web2cHMI Example

Web2cHMI Example

Web2cHMI Example