Development of a Multidisciplinary and Telemedicine Focused System Database

Richard Paštěka
Home-based Rehabilitation

- Complex processes of rehabilitation often cannot be limited to the sessions conducted in a specialized facility

- Home-based rehabilitation programs supports reintegration into everyday life

- Exercises are currently explained to the patient within the healthcare institution and in most cases documented by a paper based explanatory description. At this state the patient has no further possibility to inform him or herself about the exercises than asking the therapist.
REHABitation Database

- Available databases are:
  - mostly based on the principle of memberships
  - provide information about specific exercises. Usually without combinational option of available systems and exercises

- REHABitation project combines novel developments (mobile devices, sensors, etc.) and applies them to clinical and home based rehabilitation processes
Requirements for Database Development

- Allow insertion of new entries (exercises, assessment, equipment) by authenticated users
- Capture internal connections between entries
- Store entries so they are accessible worldwide
- Provide easy usage and user-friendly interface on web
- Present entered data in concise and intuitive way
- Minimize costs
- Consider further expandability and usability
Used Technology – Open Source

- LAMP stack – open source development platform
  - Linux – operating system
  - Apache – web server
  - MySQL – relational database management system
  - PHP – object-oriented scripting language

- Bootstrap - HTML, CSS and JS development framework for dynamic and responsive projects on web

- DataTables - table plug-in for jQuery
  - advanced interaction control for HTML tables
Architecture of the REHABitation Database

- **Data Access Layer (back end)**
  - Provides access to the database
  - Validates, stores or deletes entered data
  - Informs user about result of performed actions

- **Data Presentation Layer (front end)**
  - Web based application, user interacts directly with it
  - Responsive web design – tablet, desktop, smart phone
  - Presents data from REHABitation database
  - Allows searching, sorting, paging and filtering of entries
Roles of the User – Authentication

User can in general:

- **Search for Entry**
  - No restrictions
  - Web address: https://rehadb.healthy-interoperability.at/
  - No registration is required

- **Adds/Modifies/Deletes Entry**
  - Registration and authentication required
  - Designed for physical therapists, technicians or other professional personnel
Overview of Presentation Layer

User represents patient, physical therapist or technician looking for an information.

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Adding a New Entry

Add new Equipment Entry

**Equipment**
- Name of Equipment

**Description**
- Description of Equipment

**Information**
- Equipment Information

**Mobility**
- Stationary

**State**
- Product

**Type**
- Device
- Click to Establish connection with Exercises
- Timed Up and Go
- Click to Establish Equipment Connectivity Opt
- Bluetooth, Wi-Fi
- Click to Enlist equipment as a part of System
- Select system

Hover over the field label in order to obtain detailed information

Close  Save changes
Use Case Developed for Testing

- Use cases represent **three major areas** of interest in rehabilitation: **neurological** defects, **trauma** focused rehabilitation and **preventive** measures.

- The **testers**, representing **medical** professionals, had the task to **search** for available **exercises**, **assessments** and the connected **tools** for the therapy of the given patient.

- **Testing** group, representing a **patient** as user, had the task to **search** for their **tasks** defined by the therapists and the **equipment** needed for that purpose.
Use Cases Definition Example

Use Case: **Stroke Patient**

Appropriate rehabilitation exercises for:

- Female patient, 67 years old
- Stroke diagnosis, suffering from a rightward hemiparesis
- Exercise focus - improving the posture and mobility
- Exercise performable at home
- Previous knowledge - patient’s family owns a Kinect system
Result – Stroke Patient

<table>
<thead>
<tr>
<th>Name Of Exercise</th>
<th>Description</th>
<th>Diagnosis</th>
<th>Area Of Assessment</th>
<th>Home</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book Shelf</td>
<td>Pushing falling books back into a bookshelf</td>
<td>Lower Back Pain, Movement Disorders, Stroke, Geriatrics</td>
<td>Range of Motion, Movement, Balance, Posture, Coordination</td>
<td>Yes</td>
<td>Kinect 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>posture</td>
<td>YES</td>
<td>Kinect</td>
</tr>
</tbody>
</table>

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Notable Features

- Establishing internal links between entries
- Distinguishes between exercises and assessments
- Search in Live-time
- Responsive and dynamically adjusted web page content in accordance to the device used (desktop, tablet, mobile phone)
- Advanced filtering options (all entries, individual columns, etc.)
- Build on open source software
- Free to use
Conclusion – REHABitation database

- Connecting novel and available devices and tools for rehabilitative home and clinical exercises
- Tested using real-life inspired patient use cases
- Display exactly the information the individual user is looking for in minimal time and effort

Future development:
- Expanding the database with new entries also outside of rehabilitation field
- Interactive collaboration platform to allow device manufacturers, as well as medical professionals to publish their available devices
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