Virtual Coaching Activities for Rehabilitation in Elderly

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D4.4 Technical SW components (controller, reasoned learner, pattern matcher, monitor, recommender) first release

Extended summary

This document describes the first release of the technical components Controller, Reasoned learner, pattern matcher, Monitor and recommender. The mentioned components are the main modules around the compiled information in the Knowledge Layer and are located in the **Smart Agent and Reasoner components**. The components implement and extend the conceptual draft on rule-based and reinforcement learning-based agents and exploits ontological concepts the vCare ontology.

These components are strongly interwoven to serve the overall objective of tailoring a generic clinical pathway to an individual patient. In a first step, components such as pattern recognition and deviation monitoring are used to observe and understand the progress of the patient represented in *time series*. In parallel, the Reasoner processes observations based on expert rules and initiates the vCare System to react in a way defined by physicians. On another level, the Reasoner works with our Smart Agent. Again, based on rules defined by our medical experts, it defines an action space where the agent can suggest rehabilitation measures. **The set of presented rules were developed in close cooperation with vCare medical partners**. The **rule generation process is gradual** and will therefore be essential throughout the subsequent project phases in order to ensure patient safety for all rehabilitation measures and every disease case. We have expanded existing machine learning approaches and implemented an overall concept in the field of *safety reinforcement learning*.

In this document, we examine the individual technical components, present their concepts and show examples on how the system works using various data sets. In addition, we provide **the components as software artefacts** so that their functioning can be observed in the form of a demonstration. Furthermore, we provide first **demonstrations of these artefacts in the form of a vCare dashboard**, which visualized the used information and generated decisions from our rule-based and safety reinforcement agents.

The technical components presented here are of central importance to serve the overall objective of personalization. We were able to **use public data and simulated data to illustrate how the system works** and, as a subsequent step, target processing real world data in the next project phase, i.e. the Living Labs.