ICT-Robotic Architecture for Cognitive Assessment

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1. Introduction

Cognitive computing, sensors and robotic technology for the cognitive assessment of people with cognitive impairment and Dementia's. This system has the potential to:

- Facilitate continuous assessment [3]
- Provide monitoring and guidance
- Lighten carers' burden [5]
- Reduce economic and personal costs.

2. Annual Costs of Dementia Worldwide and in Britain

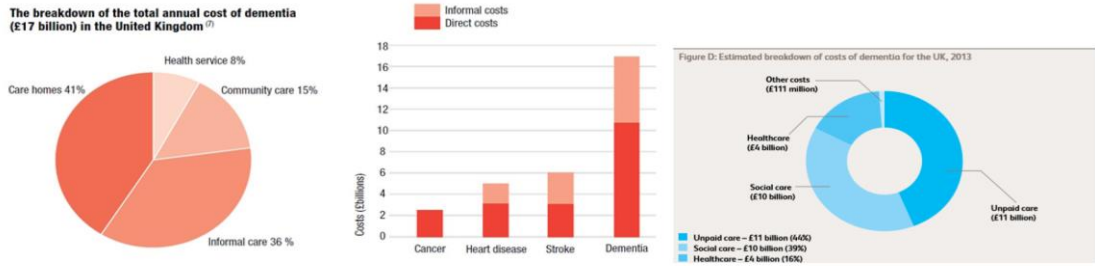

Figure: (left) Worldwide [1] and (right) UK [2]

3. Background

Current pen and paper methods are often inaccurate and vary with culture, education and none can take into account variability with time.

- The use of activities of daily living (ADL) for assessment better reflect real world performance [3]
- Cognitive therapy based on virtual reality (VR) allows to create situations which resemble real life, but with experimental control.
- However VR technologies have also been found to poorly reflect real world performance.

4. VR Kitchen

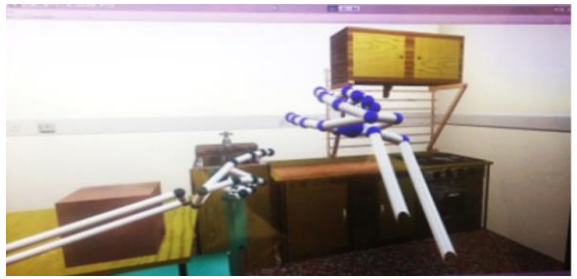

Figure: VR Implementation of the assessment protocol [4]

5. System Architecture

The system links a variety of sensors using the openHAB smart home middle ware [6] bridging to a Robotic Operating System program. [8] This program combines the data, using ontology's, into a Context representation which can be used in addition to user models and schema to conduct activity recognition and cognitive assessment. The system also tests intervention methods, currently using Pepper platform from Softbank robotics [7], and developing a conversational agent to give hints and guide the user towards the successful completion of the ADL.

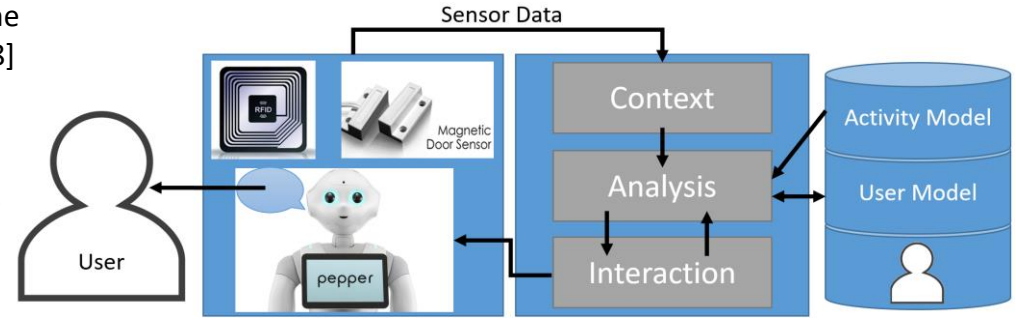

Figure: System Architecture

6. System Implementation

Figure: An initial prototype using the smart kitchen and the humanoid robot Pepper in the testbed

7. Future Work

1. Integrate Multiple sensors into the system
2. Build the Knowledge Base that contains the multitudes of uses of the items in the kitchen and the scripts for the activities
3. To record a dataset to enable further development of the context awareness and analysis components.
4. User study idea with a user group testing the assistive assessing system

8. References

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[6]openhab, empowering the smart home. https://www.openhab.org/. (accessed May 5, 2019).
[7]Softbank Robotics Pepper https://www.softbankrobotics.com/us/pepper (accessed May 5, 2019).
[8]The Robot Operating System (ROS). http://www.ros.org/about-ros/. (accessed May 5, 2019)