MARIO: Managing active and healthy Aging with use of caRing servIce rObots

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1 Introduction

The MARIO project addresses the difficult challenges of loneliness, isolation and dementia in older persons through innovative and multi-faceted inventions delivered by service robots. Mario builds upon the Kompai R&D Robot[1]. This platform features a telecamera, wifi, a series of sensors for indoor navigation and obstacle avoidance, speech recognition with natural voice interaction, daily life applications, a tablet PC, controller and interface technologies that support software easy plug and play development. The project aims to integrate in a single platform a series of capabilities (behavioral skills, gestures and emotion recognition) that represent the state of the art in robotics but that so far have been demonstrated in isolation. Although robotic domain ontologies have started entering the core technology, as witnessed by the recently created IEEE standard committee for Ontologies for Robotics and Automation [1], there is no standard ontology yet that can be used as a base for robot semantics in MARIO.

Mario offers the unique opportunity to radically progress beyond the current state of the art not in in five clear areas of innovation:

1) Integration of robot semantics with existing structured and unstructured data, leveraging on current data integration practices such as the Linked Data principles, W3C semantic web standards RDF, SPARQL, and RIF, semantic-web-oriented machine reading, ontologies, etc.

2) "Entity-centric" knowledge management: each entity and its relations have a public identity that provides a first "grounding" to the knowledge used by robots. Such identity is given by resolvable URIs that use simple Web and Internet protocols to provide useful knowledge as a representative of real world entities.

3) Introduction of semantic-web-oriented machine reading/listening in robots. An existing machine reading component, FRED [2][2] will be extended and improved to that aim. FRED is a tool that extracts knowledge from text ("reads") and represents it into well-connected RDF graphs with a formal semantic interpretation. Extracted knowledge includes named entities, entity typing, sense disambiguation, concept taxonomies, events with their participants, arbitrary relations, negation, modality, tense.

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[1] http://robosoft.com/robotic-solutions/healthcare/kompai/kompai-rd.html
[2] http://wit.istc.cnr.it/stlab-tools/fred

4) Development of a Mario Ontology Network (MON) using the Ontologies for Robotics and Automation[3]. MON will be evolvable by integrating ontologies emerging from interaction with assisted human, sensors or with other robots. MON will also be interconnected with the sentiment analysis framework, which will deal with moods and expression recognition and will provide a semantic structure of the extracted opinions.

5) Ability to advance robot knowledge by learning new ontology patterns from its experience with users and the robot network eventually in place. E.g., the patterns and expressions generated and produced by the described components will be fed back to the cognitive system in order to address emotional needs of the targeted end users in compliance with the sociology and behavior objectives of MARIO.

2   MARIO Project Fact Sheet

About: The MARIO[4] project is a 3 years project that started in February 2015 and responded to the call H2020-PHC-2014-single-stage topic PHC-19-2014. The total cost is € 3.994.857. It is coordinated by Dr. Dympna Casey of the School of Nursing and Midwifery, a research intensive School with an international reputation and high quality researcher within the National University of Ireland. Project partners are specialized in advance robotics solutions, integration and automatic control, social media analytics, software development, semantic web, artificial life, exploitation, dissemination and communication activities, analysis of comprehensive geriatric assessment, telecommunication domain of the robots.

Partners: National University of Ireland, Robosoft Service Robots, R.U.Robots Limited, Ortelio Ltd, Stockport Metropolitan Borough Council, Consiglio Nazionale delle Ricerche, R2M Solution Srl, Fondazione Casa Sollievo della Sofferenza, Caretta-net Innovative IT Services and Systems, Universität Passau.

Acknowledgements

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2. Presutti, V., Draicchio, F., Gangemi, A. (2012). Knowledge extraction based on discourse representation theory and linguistic frames. In Knowledge Engineering and Knowledge Management, pages 114-129. Springer Berlin Heidelberg

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[3] http://standards.ieee.org/develop/project/1872.html
[4] http://mario-project.eu/