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

Diego Reforgiato Recupero, Aldo Gangemi, Misael Mongiovi, Stefano Nolfi, Andrea
G. Nuzzolese, Valentina Presutti, Massimiliano Raciti, Dympna Casey, Vincent
Dupourque, Geoff Pegman, Alexandros Gkiokas, Andy Bleaden, Antonio Greco,
Christos Kouroupetroglou, Siegfried Handschuh

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
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] 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 seman-
tic interpretation. Extracted knowledge includes named entities, entity typing,
sense disambiguation, concept taxonomies, events with their participants, arbi-
trary relations, negation, modality, tense.

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 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, Universitàt Passau.

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**References**


\(^3\) [http://standards.ieee.org/develop/project/1872.html](http://standards.ieee.org/develop/project/1872.html)

\(^4\) [http://mario-project.eu/](http://mario-project.eu/)