PAPER

Sensors and Monitoring

S. NUNZIATA, G. MATRELLA, N. MORA, M. GIROLAMI, D. RUSSO, P. BARSOCCHI, A. CARBONI, S. WOERNER, B. JANSEN, E. MONTANARI, F. COCCHI, N. CAMPANINI, M.R. SPADA, P. CIAMPOLINI. IoT for active and healthy ageing: The ACTIVAGE DS-RER project. Gerontechnology 2018;17(Suppl):115s-116s; https://doi.org/10.4017/gt.2018.17.s.112.00 **Purpose** The Internet of Things (IoT) paradigm[1] is permeating real-life: with technology becoming more and more mature, research is focusing on assessing the potential impact of IoT on many application scenarios. Within the framework of Horizon 2020 programme, the European Union invested more than 100M€ in Large Scale Pilot initiatives, "to foster the deployment of IoT solutions in Europe through integration of advanced IoT technologies across the value chain": seven projects were launched in 2017. Among them, the ACTIVAGE project[2] deals with "the deployment and operation at large scale of Active & Healthy Ageing IoT-based solutions and services, supporting the independent living of older adults in their living environments, and responding to real needs of caregivers, service providers and public authorities." The ACTIVAGE project is currently exploring heterogeneous IoT solutions for AHA over 9 different European Deployment Sites (DS), in an interoperable network. In this work, we present main features of the DS-RER experimentation, being implemented in the Emilia-Romagna Region (RER, Italy) and mostly aimed at effectively embedding IoT-enabled solutions within the actual organization and practices of the regional social- and health-care services, to support users over 65 suffering post stroke conditions. **Method** Continuous monitoring of home activity is exploited to support independent living at home. Health-related information comes from mixing direct and indirect sources: direct information includes bodyweight and drugs assumption monitoring, assessed through smart, networked devices. Indirect information comes from tracking daily living activities by means of wireless sensors deployed into the home environment (sensing room presence, bed occupancy, toilet usage, etc.). An artificial-reasoning layer, based on machine-learning techniques is implemented to provide interpretation of behavioural data. The overall system architecture is sketched in *Figure 1*. At user's home, a set of sensors that exploit Wi-Fi WLAN protocol is deployed, and straightforwardly connected to the cloud environment[3]. The ACTIVAGE platform is embedded into the general service platform which provides the regional healthcare system with the management of electronic health records and booking of medical examinations. Data security therefore follows the strict regulations coming from such sectors. Privacy and ethical concerns are accounted for, in compliance with European and National regulations. The local platform then feeds anonymized data to the data analytics engine, based on IBM Bluemix cloud services and on the Watson AI platform, which converts raw sensor data into meaningful knowledge, e.g., information such as activity trends and anomaly detection are automatically worked out. Such knowledge is eventually fed back to the end-users (the older adult, caregivers, care- and case-managers), by means of differentiated interaction strategies. **Results & Discussion** Pilot tests (starting in early 2018, following a technical assessment phase) target mildly frail 65+ older adults still able to live almost independently. Although the scope is much wider, the current pilot will focus on persons suffering from post-stroke conditions to provide a homogeneous and well-characterized sample. A randomized controlled trial is being conducted, aimed at evaluating the impact of continuous monitoring in improving treatment (e.g., by reducing the re-hospitalization rate). A total population of 200 patients is going to be recruited and split into two equiponderant (active and control) sets. Besides his own caregiver(s), each patient is associated to a care-manager, who according to the hierarchical architecture of the regional healthcare system, connects patients to GP and specialists, if needed. The behavioural knowledge coming from data analytics is exploited to make caregiving more effective (e.g., by prioritizing care intervention) and for early assessment of symptoms requiring medical attention (e.g., alteration in circadian rhythms).

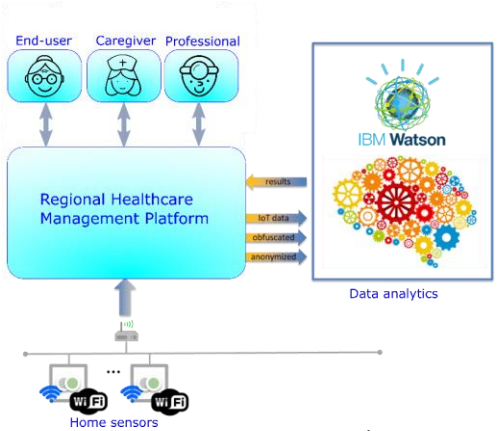

Figure 1. ACTIVAGE DS-RER architecture

References

1. Friedemann M, Floerkemeier C. From the Internet of Computers to the Internet of Things. Springer, Heidelberg. 2010:242-259

2. www.activageproject.eu, retrieved 2018/01/30. The ACTIVAGE project is funded by European Union's Horizon 2020 research and innovation programme, under grant agreement No 732679

3. Bassoli M, Bianchi V, De Munari I, Ciampolini P. An IoT Approach for an AAL Wi-Fi-Based Monitoring System. in IEEE Trans. Instrum. Meas 2017;66(12), 3200-3209, 2017, https://doi.org/10.1109/TIM.2017.2753458

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