

An innovative telemonitoring system for older adults based on low power wide area network

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Abstract

This poster describes an innovative system to support the care network of older adults that live autonomously at home, as well as monitoring daily activities in their living environments. The architecture of the system is based on two ICT infrastructures: a new open access regional LowPower Wide Area Network (LPWAN) based on LoRaWAN® technology, and an open regional big-data platform for sensor network, called SensorNET. The system has been co-developed by Lepida Scpa (a local public owned tech-company) and AIAS WeCareMore Centre (an Innovation Centre belonging to a non profit organization of people with disabilities). The first prototype of the system is currently being tested involving residents of sheltered apartments (the Novi Care Residence). The ultimate goal for the system is to foster the integration of the local care and social networks with a new view of connected care, allowing older adults to stay longer, independently and safe in their homes.

Activity Description, Materials and Method

The Contatto (internal code name) project main goal is to develop and test a system that can be effective in supporting the caregivers network of older people that live alone in their homes, making it possible to remain continuously "in contact" with them in a non invasive way. To realize it, a co-design approach involving final users, has been implemented since the earliest stages of project development, in order to realize inclusive tools based on real user needs. The System (Fig.1) is composed by a dashboard (developed by AIAS), the network infrastructure (provided by Lepida Scpa) made up of RetePA-IoT, a LoRaWAN network, and SensorNET, a big-data platform for sensor networking. LoRaWAN has been chosen because, despite a very low data transfer rates, it allows the coverage of large areas with a very low power consumption. Concerning sensors specification, priority was assigned to a very easy installation, minimal invasiveness in home environment, low maintenance needs and extremely long battery life. Combining these requirements with caregivers needs, sensors that measures movement/intrusion, temperature, brightness and humidity have been chosen. All data collected by this sensors are shown in a simple dashboard (Fig.2) that has been created to provide an overview of the night activities of the various apartments. The added value of this new application consists exactly in providing an accessible interface tailored to the user needs. This interface allows the caregiver to understand at a glance whether the apartment is in a potentially "risky" situation or not. To help the caregiver in the interpretation of data, a simple colour based interface has been implemented, in which each colour corresponds with a certain degree of risk. The data shown by the Dashboard makes sense only when they are contextualized with the environment from which they are extracted. Once a movement is detected, the first thing the caregiver needs to check is whether the person is actually aware of his movements during the night. Based on the analysis carried out together with the person, the caregiver will be able to establish whether it will be necessary to make some in-depth visits or not.

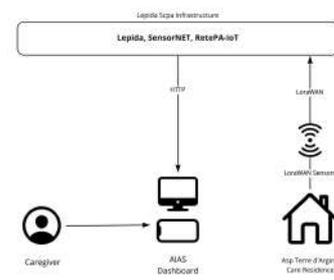


Figure 1
System Architecture



Figure 3
Screenshot of the monitoring system user interface

Findings / Impact

As regards the specific context of Novi, the data considered most important by the operators of the care residence are those detected by the sensors from 00:00 am to 5:59 am. Evening and night correspond to the period of time in which operators are away from the care residence. Among all the data detected by the sensors during this time slot, particular attention was paid to the calculation of the movements made by the user during the night, to detect any strange situation. The key factor for the interpretation and analysis of the data is the user's awareness of these movements. About this, during a co-design phase we defined together with the caregivers a process to be followed for the interpretation of the data, shown by the flowchart in Fig 3. The key-point of this process of giving a meaning to data is represented by the user's awareness. Based on these aspects, sensors were installed in four apartments suggested by caregivers, favouring those in which caregivers had some suspicions relating to the nocturnal movements of some users of the residence. Installing the sensors allowed to test the hypothesis. Thanks to the tool it was possible to monitor any night movements daily, and after a week of monitoring, the hypothesis in which one of the users moved at night without being aware of it was actually confirmed. What happened during this phase was very important in order to demonstrate the potential of the system and the impact on the residence care activities.

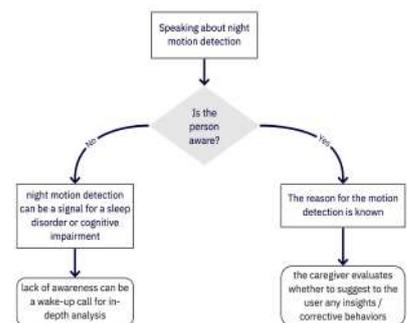


Figure 2
This flowchart represents the process that a caregiver should follow in order to give proper meaning to the data shown by the dashboard.