

6th International Carers Conference

Care and caring: future proofing the new demographics

3-6th September September 2015, Gothia Towers, Gothenburg, Sweden

Theme: Technology-enabled care and support: How can new technologies support the delivery of care, transform the lives of individuals and families and drive economic growth?

ABSTRACT

With an ageing population, the issue of care provision is becoming increasingly important. The simple aspiration of the majority of older people is to live safely and well at home. Housing will be part of health & care integration in the following years and decades. A higher proportion of people will have to rely on informal care through family, friends, neighbors and others who provide care to an older person in need of assistance (around 80% of care across the EU). They do not usually have a formal status and are usually unpaid. We need to ensure that all disabled or chronically ill people can get the help they need without overburdening their families.

The physical and emotional stress of carers is one of the dangers that this dependency can bring. **To prevent carers burnout it is necessary to provide new solutions that are affordable and user friendly for the families and caregivers.**

Objectives/Outcomes:

The challenge is to offer useful and reliable tools, to the professionals/familiars to perform a better supervision, reducing their stress, and improving the autonomy and wellness of the elderly people. Current solutions to support these tasks are invasive (wearable sensors) or require pro-activity from the elder (call or press the button), which cannot avoid some critical situations (e.g. falling or fainting situations where the elder is not able to give any response).

Care Respite is related to the remote monitoring of senior citizens at their homes by exploiting computer vision techniques for automatic behaviour analysis. Recent advances in the field of human computer interaction have allowed intelligent systems to incorporate new capabilities related to human action detection. This potential has been found highly suitable for detecting events in real time, which could be of interest to monitor dependant elderly, especially in indoor scenarios.

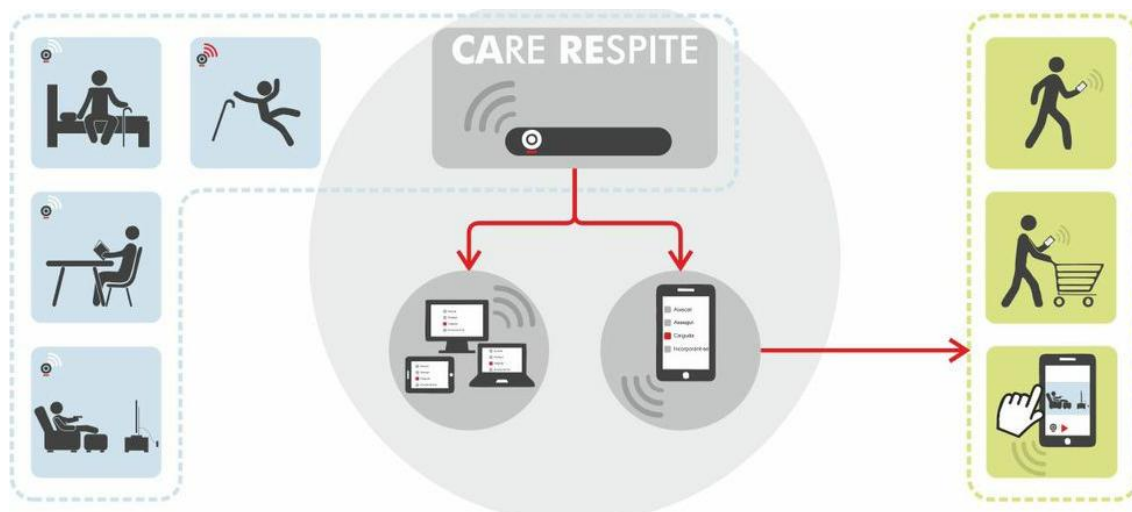
The CARE RESPITE technology is composed by an ambient intelligent device (AID) and a remote receiver (RR). The AID device includes a Microsoft Kinect™ multi-modal device and a computer unit. The objective of the Microsoft Kinect™ multi-modal device is to capture audio, RGB, and depth maps (thanks to its infrared structured light technology) from the environment where the AID device is located. The sensor is able to capture the information around 25m² to be processed by the computer unit. The computer unit will contain a new

generation of Computer Vision, Pattern Recognition, and Machine Learning software, able to recognize the events present in the environment related to the elder. In addition all of these events can be recognized even in dark environments thanks to the infrared sensor technology.

Examples of events that will recognize the system include: the elder leaves the environment, the elder falls, the elder shows a high agitation degree, etc. These events will be automatically computed by the computer unit without the need to include more sensors in the scene or invasive technologies wore by the elder.

All the critic events that are automatically detected by the AID device will be transmitted to the receiver RR. In this case the receiver is just a smartphone (or a computer). Any smartphone with internet connexion will be able to use the system software independently of its operating system thanks to a multi-platform web application. Once a risk event is produced, the professional or familiar will receive an alert song to be advised of a possible risk.

How does it work?.



Care Respite addresses the automatic detection of actions like falling down, not moving during a period of time, receiving a visit or being absent from a room. The foreseen intelligent system, to be deployed at the homes of dependant elders, will send the recognized actions to the mobile device of relative or professional caretakers.

The innovative aspect of Care Respite relies on the benefits of the incorporation and exploitation of the new technologies arisen recently thanks to the use of low-cost depth cameras. As a result, no other monitoring system in the market is comparable in terms of safety, relief, autonomy, satisfaction, intimacy and cost reduction.

In addition, the system does not require a fixed installation point, so the monitoring camera can be placed anywhere inside a home or a retirement house; also, the set of actions to be detected can be arbitrarily decided by the relatives or professional caregivers, depending on each elder person and her/his degree of dependency. Moreover, since those detected actions-of-interest will be sent to a mobile device by displaying the images of the action that had just occurred, an early response will be assured, also being possible to communicate by voice with the dependant person using the smartphone, thus asking or checking whether the detected

action has a real potential danger to the elder person. So an immediate response and feedback will be guaranteed with Care Respite.

Other innovative aspects of care Respite is that it does not work with images but with depth maps (and even in complete darkness), thus becoming a privacy and non-invasive monitoring and that the system can be mounted whenever the caretaker considers most critical inside a home.

The foreseen system of Care Resite is a non-invasive and proactive: the smart device could be located elsewhere without any other required invasive devices as current commercial solutions offer. Other innovative aspects of it is that the depth cameras do not work with images but with depth maps (and even in complete darkness), thus becoming a privacy and non-invasive monitoring and that the system can be mounted whenever t and wherever the caretaker considers.

So this project aims at ensuring that all disabled or chronically ill people can get the help they need without overburdening their families. To prevent carers burnout it is necessary to provide new solutions that are affordable and user friendly for the families and caregivers.

Low cost RGB-D cameras are completely changing the computer vision world, as they are being successfully used in several applications and research areas. Depth data are particularly attractive and suitable for multiple human-computer applications, Care Respite exploits the depth data (not RGB) recorded at the senior citizen's homes to send alarms and information to their respective carers who are connected using smartphone.

Indeed, some critical events to be reported to the carers can be recognized in dark environments thanks to the infrared sensor technology. Examples of events that will recognize the system include: an elder leaving the environment, falling, and showing a high agitation degree, etc. These events will be automatically computed without the need to include more sensors in the scene or make use of invasive technologies wore at home by the senior citizen.

A very important aspect of Care Respite is its personalization aspect. Each elder requires particular monitoring events to be recognized. In this sense, the remote application at the smartphone will allow the professional or the familiar carer to mark which risk events they want to monitor, so that they can be alerted only if such events are observed. In addition to this intelligent architecture, the technology also allow standard remote visualization and communication via image and audio, being an essential and supporting tool for a better supervision of the professional/familiar for tranquillity, fast response in case of risk, and to improve autonomy and life quality of the elder and its caregiver.

CARE RESPITE is a suitable solution, because it allows to:

- share the responsibility among different familiar carers due to the possibility that mobile phone surveying bring
- not depending on other care providers, such as paid help
- moving the service to where when the family have to bile performance
- facilitating the caring option by enhancing the “social environment” of informal carers to give them better conditions

- help informal carers to perform their caring tasks
- addressing informal carers' specific needs

As a result of using respite technology, such as CARE RESPITE, caregivers will be able to bring a better attention and care while improving their own quality of life

Other impacts or specific outputs that can be reached by using CARE RESPITE:

- Provide better and personalized care.
- Suitable solutions for difficult transitions in the life of elderly people and their carers, such as:
 - o Transition from institutional to home care
 - o Transition from acute hospital to home care
 - o Transition from nursing home to home care
- Improve opportunities to balance care and work/life
- Decreasing anxiety and burnout. (The impact of caring on the physical and emotional well-being).
- Flexibility to organize their daily activities (such as shopping, health visits, etc.) and have free time for other daily duties or leisure (respite). Person-centred
- Control over periods of time when the older adults is not needing the caregiver support, such as mid morning, afternoon and during the night, but has to be controlled to prevent accidents
- Lower presential care and foster reconciliation of work and family life
- Create opportunities for participation and empowering of the elderly in need of care, due to its active involvement in solving the planning of daily activities
- Better communication between older person and carers
- Improve the quality of long-term care systems by reaching a good balance between efficiency and cost.
- Affordability of caring: less dependency on external help.
- It is a friendly use device; “plug and play”; there is no need of fixed installation and can be moved between rooms and buildings.

CARE RESPITE this product could be considered as part of the “silver market” solutions, but it has an impact that can be traced to a wider market. It is addressed to the general public since all can be carers or become unexpectedly one of them.

Outline plan for the session plus timings (not included in word count):

20 minutes

List of key references/resources (not included in word count):

- [1] M. Dantone, J. Gall, C. Leistner, and L. Van Gool. *Human pose estimation using body parts dependent joint regressors*. In *CVPR*, pages 3041–3048, 2013.
- [2] P. F. Felzenszwalb and D. P. Huttenlocher. *Pictorial structures for object recognition*. *Int. J. Comput. Vision*, 61(1):55–79, Jan. 2005.
- [3] *ChLearn challenges in Machine Learning and labeled data sets for human pose recovery and behavior analysis* <http://gesture.chlearn.org/>

[4] Antonio Hernández-Vela, Miguel Reyes, Víctor Ponce, and Sergio Escalera, *GrabCut-Based Human Segmentation in Video Sequences, Sensors, Volume 12, Issue 11, 15376-15393; doi:10.3390/s121115376, 2012.*

[5] Antonio Hernandez-Vela, Miguel Angel Bautista, Xavier Perez-Sala, Victor Ponce, Sergio Escalera, Xavier Baro, Oriol Pujol, and Cecilio Angulo, *Probability-based Dynamic Time Warping and Bag-of-Visual-and-Depth-Words for Human Gesture Recognition in RGB-D, Pattern Recognition Letters, PATREC5825, DOI: 10.1016/j.patrec.2013.09.009, 2013.*

[6] *ChaLearn challenges in Machine Learning and labeled data sets for human pose recovery and behavior analysis* <http://gesture.chalearn.org/>

[7] Antonio Hernández-Vela, Miguel Reyes, Víctor Ponce, and Sergio Escalera, *GrabCut-Based Human Segmentation in Video Sequences, Sensors, Volume 12, Issue 11, 15376-15393; doi:10.3390/s121115376, 2012.*