

System of Ambient Assisted Living

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Abstract— using a system that is a combination of “Ambient Intelligence” and “Assisted Living”, we can use information and communication technologies (ICT) in an assisted person’s daily living and working environment, we can enable them to stay active for a longer period of time, remain socially connected and thus, live independently. Along with this we can use a variety of sensors for activity recognition and behavior understanding, these sensors will sense either directly (via wearable sensors) or indirectly (through environmental sensors mounted in the rooms or homes) and analyze the data they capture for predicting the physical or cognitive status of the person under observation. All these factors along with active human participation can reduce the drawbacks of traditional Assisted Living Systems.

Key words: Ambient Intelligence, Assisted Living, Domotics, Ambient Assisted Living

I. INTRODUCTION

“System of Ambient Assisted Living” or SAAL is a combination of a relatively new technology, namely Ambient Intelligence along with Assisted Living. A system that is formed by combining these two with a few traits of Domotics can be termed as a SAAL. Research in this field includes human activity recognition and behaviour understanding with the objectives of detection & recognition of actions, activities and situations in an environment. Traditional sensor based systems that are used nowadays often are simple “panic buttons”, others use smart sensors and, the most advanced ones, focus on “context aware” interfaces for older people or “smart-homes” for simplifying their day-to-day needs[1]. Usually ambient assisted living is used for elderly people who have limited movements, thus, helping them in their day-to-day life. Here is a brief introduction about some of the topics that are used in such systems.

A. Ambient Intelligence

Ambient Intelligence (AmI) is a relatively new paradigm in Information Technology (IT), in which assisted people are empowered through a digital environment that is not only aware of their presence, but sensitive, adaptive, and responsive to their needs, habits, gestures and passions [2]. The ambient intelligence paradigm builds upon pervasive computing, ubiquitous computing, profiling, context awareness, and human-centric computer interaction design and is characterized by systems and technologies that can be embedded, context aware, personalized, adaptive or anticipatory.

B. Assisted Living

Assisted Living (AL) is a technological approach that is very promising for addressing the needs of elderly people. AmI and AL combine to form Ambient Assisted Living (AAL). AL technologies are widely developed in the above mentioned domain. These technologies aim to construct safe environments around assisted peoples and helping them in maintaining an independent lifestyle.

C. Domotics

Domotics, also known as Home Automation, involves controlling the devices and the overall environment of the house via switches and sensors connected to a central hub known as a “gateway” from which the system is controlled with a user interface that can either be a wall-mounted terminal, mobile phone software, tablet computer or by using a web interface, often via Internet cloud services or using Wi-Fi.

AAL systems are based on pervasive devices that are usually used in Domotics, and also on AmI technologies to integrate devices and build a safe environment for the assisted person. The main goal of AmI is to help people in their daily activities, building around them an unobtrusive, interconnected, adaptable, dynamic, embedded, and intelligent environment [7]. Humans can interact with AmI-based systems using natural user interfaces like speech and gestures. One of the goals of AmI is to allow the user to interact with an AmI system as s/he would do with any other human [8]; anyway, assistive technologies can supplement human care giving but cannot substitute it [9].

II. LITERATURE SURVEY

In [1] the authors have proposed an intelligent multi-agent system that is able to monitor, interact and serve the users, which are in need of care services, based in open standards, expecting to overcome the problems induced by the use of new technologies and formalisms.

In [2] the author has proposed a system that uses a scenario-based approach and outlines the possible role of AmI in health care by focusing on both its technological and relational nature. In this sense, clinicians and health care providers that want to exploit AmI potential need a significant attention to technology, ergonomics, project management, human factors and organizational changes in the structure of the relevant health service.

In [3] the authors introduced the basic architecture of an expert system for AAL: the Virtual Carer (VC) which is an IT system that is a distributed, reliable and modular sensor network composed of biometric and ambient sensors, that is able to communicate with an assisted user, for monitoring the user’s health conditions and to control the environment around the user. The main goal of such a system is to help an elderly user with his/her daily activities ensuring his/her security.

In [4] the authors review the current status of researches on AAL, discuss the promises and possible advantages of AAL, and also indicate the challenges developers must meet in order to develop practical and efficient AAL systems for elderly people.

III. EXISTING SYSTEMS

A typical AAL system consists of the following components:

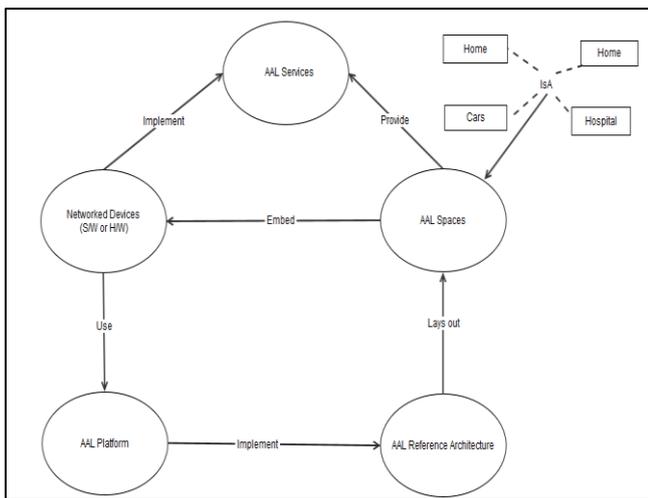


Fig. 1: Existing System

Here, as it is evident, there is almost no explicit input from the user as the system is “smart” enough to estimate the user’s input and start performing the necessary required action beforehand. However, as it is visible, being an almost completely automated system, an elder user may become over dependent on the system and this may cause the user to become a passive consumer of services provided by the system rather than being an active asset for the society. When this happens, the user may lose his/her self-esteem. Almost all AAL systems consider their users to be people that are extremely weak and need to be assisted by others around them, which is not true most of the time. Such a system almost always neglects the fact that these elderlies can still make their contributions to our society through their valuable experiences. Other challenges that a traditional fully automated AAL system has to face are:

- 1) Availability of services changes dynamically.
- 2) Training the computers/devices to automatically map the available/requested services.
- 3) People’s willingness to participate in AAL systems.
- 4) Psychological frustration in the user due to continuously being dependent on a machine.
- 5) Technological frustration in elderly people as they are usually scared by new technologies.

Of these, the last two are a severe hindrance that any AAL system has to face throughout its estimated lifetime. In this paper, I will try to reduce these shortcomings of AAL systems and try to improve upon them.

IV. PROPOSED SYSTEM

It can be concluded that most of the above mentioned drawbacks occur due to a lack of human interaction and intervention in traditional AAL systems. Most of these drawbacks can be either reduced or completely eradicated by simply adding more human-machine interaction. The other drawbacks can easily be overcome by using simple substitutes for the currently used technologies. Thus, a better and improved system can be created which can easily put the elderlies and other assisted users to ease and eradicate the drawbacks by substituting the required technologies. In this paper, I will focus only on the human-machine interaction and not on the technological substitutes.

A proposed system can be:

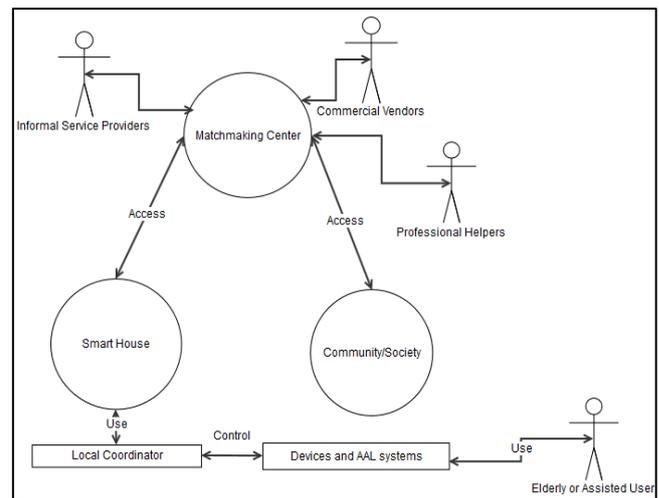


Fig. 2: Proposed System

Here, the system integrates services from human beings with the applications provided by the AAL and Domotics devices, and utilizes the available resources to provide services to the people in need in an effective way.

Assistive devices will be used to construct a smart house environment managed by a local coordinator which can be a smart device for building a safe environment around the assisted people.

Those who are able to give services to these systems and in this way assist the requesting people i.e. the end users are called informal service providers.

Professional care givers (such as doctors, therapists etc.) are included in the community to provide emergency and professional medical service.

Commercial vendors are the people that bring convenience to the user and diversify the service type, at the same time laying the foundation for economic exploitation and self-sustainability.

The community/society can also actively participate by matching the needed help with available informal caregiver services through web service publication, matching and binding, etc. This match-making process is provided by the match-making centres. These centres bring all the actors together. The elderly people can use this for initializing and joining group activities for themselves and for the younger generations as well.

During these intergenerational activities, the younger generation can act as the informal caregivers and help the elderlies by performing tasks that demand physical strength. Even though elderlies and assisted users are physically weak, their accumulated valuable experience and knowledge can be absorbed by the younger generation and they can use it for solving their problems in works and studies. During this process, not only the younger generation gets the much needed experience and knowledge, the elder generation also finds a way to make their valuable contribution to the society. Thus the elderlies and the assisted users may find themselves still useful, with more active living attitude, thus avoiding both the psychological and technological frustrations that they face in traditional AAL Systems.

V. PROJECTED ADVANTAGES & FUTURE SCOPES

Assistive devices, end users, and human services can work together in an interactive manner for exploring future potentials and thus providing high quality services to the end users and assisted people as and when they are needed.

Both assistive devices and human services can provide their availability through a framework that is service oriented. Requested and available services can be reasoned in a framework, and then the matched available services can be invoked.

End users can interact with the framework through a dedicated human-computer interface.

In the proposed system, a user can possibly be registered as a consumer and a provider at the same time, based on the type of services they provide. For example, an elderly can request services that are physically challenging, while providing knowledge and experience-based consulting services and advices.

Simulation results demonstrate that the presence of informal caregivers helps reduce the social resources and provide daily assistance timely [9]; and when the elderlies are participating actively in group activities and intergenerational activities, the dependency on social resources is further reduced, and by doing these activities their social connections are kept and even strengthened.

VI. CONCLUSIONS

As discussed earlier, human participation can help in reducing the challenges of building an AAL system and thus create a system that is even more effective. Human participation can reduce the sense of intrusion, diversify the service categories, explore the full potentials of the assistive devices and AAL systems, and also provide elderlies and assisted users with many chances to serve the society thus, keeping them as active as possible. The above proposed system can be a possible approach for bringing human services into AAL systems. Smart devices can still be used in the system for guaranteeing the safety of elderlies and other assisted users. End users can also actively maintain their social networks, and regain their self-esteem. Thus, it can be said that bringing the people in such a modified home-care environment is effective in saving the social resources, providing timely services and helping the elderly people live in an active way.

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