Ambient Intelligence and Smart Environments: A Preliminary Overview

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Abstract. Nowadays human activities are incoming at a digitalization stage. The introduction of information technology along with new forms of communication, influence a variety of forms of human action and focus mainly on the integration and the convergence of the digital and physical worlds. The use of more intelligent – electronic solutions, improves the lives of people around the world, according to studies carried out on the ingress of new smart technologies. Artificial and Ambient intelligence nowadays getting more and more attention about the development of smart, digital environments. The Smart Cities designed for All must aim to arrange the disparity in cities through smart technology, making cities both smart and accessible to a range of users regardless of their abilities or disabilities. The birth of "Artificial Intelligence" (AI) has facilitated the complex computations for reality simulation the new communication era of wireless 5G, all combined have given the hope for a new and better future, to reverse disability to empower the humans with more capabilities, to be faster than they can ever be, stronger than they can ever dream. This paper provides an overview of Ambient Intelligence and smart environments, as well as how technological advancements will benefit everyday usage by devices in common spaces such as homes or offices, and how they will interact and serve as a part of an intelligent ecosystem by bringing together resources such as networks, sensors, human-computer interfaces, pervasive computing, and so on.

Keywords. Ambient Intelligence, Smart Environments, Smart Cities, Augmented Reality Accessibility, Disabled.

1. Introduction

Researchers focus on Computational Intelligence (CI), Machine Learning and developing new techniques of intelligent environments. The spread of new technologies and Internet of Things (IoT) provide opportunities creating new web-based smart systems for all levels of education and related educational and learning tasks. [1]
This study aims to explore the prospects of: Section 1) Ambient Intelligence and Smart Environments, Section 2) Smart Cities, Section 3) With Augmented Reality and Internet of Things Improve Accessibility, a Paradigm of a Smart Store (RFID) technology, Section 3) Smart Store and RFID technology, paradigm of a super market, a definition what is smart, intelligent a packaging paradigm. From the conceptual model to the Smart and to the Intelligent. Smart - intelligent designing system a basic for design for All. Section 4) Supporting people with disabilities in their Daily Life in a Smart City. Section 5) Conclusion and Future.

Furthermore, the authors' perspective is extended by a glimpse into the future on how technological advancements such as Augmented Reality and the Internet of Things will be applied in a smart shop using RFID technology. Intelligently designed goods for everybody, as well as the inclusion of persons with disabilities in the city of the future as a smart city, are investigated.

2. Ambient Intelligence and Smart Environments

Computer devices become part of our life. This technology can be networked and used with the coordination of highly intelligent software to understand the events and relevant context of a specific environment and to take sensible decisions in real-time or a posteriori [2].

Appliances with the advancement of science have become smaller in size with more technology included, easy to be used providing to consumers benefits that years ago we had not imagined. Devices have become part of our body movements extending of our hand. Computing devices by minimizing their size to small chips can embodied to our society in all the environments public places and private places. Our inside home machines have been enhanced with the possibility of increased options making autonomous decisions.

Our home our personal in home or outside devices as coffee, laundry machines, refrigerator, cars have so many sensors and activators to anticipate or activate situations. The existing smart systems easily provide us the opportunity to turn on and off lights in our house scheduling the time or using our voice, order shopping from super markets, be moved easily to another place. We can easily realize how computing will affect all environments in the near future [3].

These computing devices will have to be coordinated by intelligent systems that integrate the resources available to provide an "intelligent environment". This confluence of topics has led to the introduction of the area of "Ambient Intelligence" (AmI) [4]: It is AmI which brings together networks, sensors, human-computer interfaces, pervasive computing, artificial intelligence (including robotics and multi-agent systems) and many other areas to provide flexible and intelligent services to users acting in their environments [5]. It is necessary the existence of sensible-intelligent system. Being sensible demands recognizing the user, learning or knowing her/his preferences, and the capability to exhibit empathy with or react to the user's mood and the prevailing situation, i.e, it implicitly requires for the system to be sensitive [6]. With the use of term Smart Environment, we make clear the existence and the necessity to support the post system with (sensors, actuators and networks).

3. Smart Cities

Nowadays, cities are getting bigger and more numerous, with a lot of urban problems like air pollution, traffic congestions, lack of resources [7]. Societies unfold all their problems and citizens all their peculiarities and social values become more sensitive and seeks solutions more than ever. The need for societies to respond to both the changes of nature and the demands of citizens and socio-economic change in general leads cities become Smarter. Several working definitions have been put forward and adopted in both

practical and academic use [8]. The development of eight factors as technology, policy, built a nature environment etc., identify the term Smart; it depends from local governments how will be envisioned the term and which factor will develop firstly in order to become a Smarter City [9]. Giffinger et al. (2007) suggest a smart city framework consisting of six main components (smart economy, smart people, smart governance, smart mobility, smart environment, and smart living) [10]. Local and international accessibility are important aspects of Smart Mobility as well as the availability of information and communication technologies and modern and sustainable transport systems [10].

In a Smart City the implementation of information technology includes all the devices, networks, procedures that are utilized in the information and telecommunication and technology (ICT) fields to promote interaction amongst different stakeholders [11]. ICT infrastructure includes wireless infrastructure (fiber optic channels, Wi-Fi networks, wireless hotspots, kiosks) [12]. Smart object networks play a crucial role in making smart cities a reality [13]. According H. Chourabi etal., (2012) in Initiatives framework all factors have an impact to Smart City, Due to the fact that many smart city initiatives are intensively using technology, it could be seen as a factor that in some way influences all other success factors in this framework [14].

4. Smart Cities Augmented Reality and Internet of Things Improve Accessibility Paradigm of a smart store-RFID technology

In a Smart City the living conditions must serve all citizens equally [15]. Even if there are important accessing problems or insignificant issues, technology enables us to overcome obstacles to solve difficulties and to provide a society of equality and socially acceptable to all [16].

For people as wheelchair users who have limited independence in their everyday life and are not able to do shopping because of a limited ability to reach upper surfaces as the super market shelves Augmented Reality (AR) and Radio Frequency Identification (RFID) technology give the solution. The resulting experience is close to being able to browse a shelf, clicking on it and obtaining information about the items it contains, allowing wheelchair users to shop independently, and providing autonomy in their everyday activities [17]. The Smart Shelf enabled with the RFID into a super market area can easily provide the information to user when the labeled with RFID tags items change location. The RFID system is composed of electronic tags (attached to objects), a reader or interrogator and an Information System (IS) managing the system's operations [18]. It is a low cost, item level identification for products, being the best for IoT technology. On the shelf of a store every item can attached with RFID tags. In that way the interactive interface gives all the necessary information for the location of products into the market area, firstly indicating the products into the shop and secondly with another indicating the products on the selves.

According Z. Rashid. et al. (2017) paradigm a database within the IS stores information about each item including EPC (i.e. ID code), an image (i.e. cover) and all available information on the package. An inventory list, consisting of all objects' EPCs, together with their approximate locations is periodically uploaded to the database from the RFID system [19]. With the help of a mobile device, a touch screen which is connected with the IS and the real conditions of shelfs and their products all the groups of users disabled or not can easily find the required product inside the store. Web interfaces present

information about location and existence of the products into the shop and on the shelves thanks to RFID update. A system including Augmented Reality using touch screen interfaces and with on time realization of Internet of Things (IoT) technology can give solutions [20]. Technology helps to avoid stigma between able-bodied and wheelchair users. The combination of both AR and RFID is a unique step towards a practical solution to wheelchair users to shop independently and autonomously in the context of Smart Cities [21]. Shopping independence help not only people with disabilities but all shoppers.

In Smart Cities people with disabilities as motor disabled people have solutions to their problems through the Internet of Things (IoT) which connects the physical objects with the people, the Internet, information systems and among themselves [22]. There are researchers showing the assisting technology providing solutions to everyday life of disabled people as people with motor disability that help them to escape of their problem. There are a big variety of people who interact only with head or mouth, with robotic arms, with smart-phone [23].

5. Smart - intelligent designing system a basic for design for All

The Internet-based Systems aid to design applications that could easily help designers to design for All. At the level of design and modelling, recent advances in areas, such as adaptive user interfaces and software agents, provide solutions to conceptual and engineering issues related to design-for-all [24]. The need to redesign products is because of the rapidly change of our society, the increasing changes of population needs the diversity of activities, the required needs of the planet and the expansion of technological platforms [25]. Designing products using technology in a way to make the life easier for people with a disability we succeed to have applications widely accessible and to incorporate people requirements. For that reason, we have to evaluate the existing design environment use the modelling theories and methods include all the required recommendations for disabled users and develop the areas of electronic virtual use and the redesign of the existing practical everyday issues.

6. What is smart, intelligent a package paradigm. From the conceptual model to the smart and to the intelligent

New technologies familiar from the Smart City and Home as intelligent products and packaging, radiofrequency identification (RFID), we find them in Smart Products and in their packaging replacing the traditional packaging. The new intelligent packaging incorporates microchips, antennas and new materials such as thermochromic inks and various indicators that track changes and provide real-time responses and wireless communication capabilities [26]. From the literature packaging is defined as the mean to protect the product from environmental changes and distribution, with some graphical information in a way to communicate with the consumer and provide product information. The conventional packaging is the packaging that can contain material product, to protect it, to communicate with the consumer, but also to have compatibility capabilities of the construction material (container), with the content.

Smart packaging has simple changes; offers better graphics, bar code, better protection. Smart packaging monitors changes in a product or its environment (smart), but also acts after these changes in active behavior. It uses chemical sensors or biosensors to monitor the quality and safety of products (food-drugs, etc.) from the producer to users-customers-consumers. But along with smart packaging, it uses a variety of sensors to monitor the quality and safety of sensitive products. This is done through the detection of chemicals, such as pathogens, leaks, carbon dioxide, oxygen, pH level, time or temperature, which means freshness in a food products e.tc. Intelligent packaging has a communicative character with printed electronics and the existence of microchips, antennas and batteries. RFID tags provide a product description and allow content identification [26].

Intelligent packaging allows a product to be located (tracked) and detected throughout its life cycle (time) and the analysis and control of the environment inside or outside the package, to inform the manufacturer, retailer or the condition of the product at all times. It also gives information about the place and time consumed, mainly for the smooth operation of the supply chain. We have capabilities for managing metadata, but also in recording any counterfeit products (smuggled).

7. Supporting people with disabilities in their Daily Life in a Smart City

With the evolution of technology smart cities is the future of urban development. To define what smart city is becomes difficult because the ideal city has to be perfect in all the aspects and that is difficult. From the citizen point of view the smart city has to be accessible and friendly to users in a natural way without feeling like technology is actual. Innovations technology became the tool for independence [27]. It would be very promising and comforting for this technology to promote growth and development. A completely hands-free city with stores, schools, hospitals accessible through mobile applications, automatic doors and voice control [28].

Imagine a city where a person in a wheelchair or pushing a stroller can chart a route to the local park using curb cuts and avoiding barriers; wirelessly log onto the park itself and receive notifications of upcoming park events, and perhaps even participate in an interactive lesson on the trees and flowers currently in bloom; where refrigerators will provide alerts of any diminishing essentials so that caregivers can adjust their grocery list before they visit their parents' home [29].

Toronto is slated to be the first smart city in Canada thanks to Alphabet's (Google's owner) Sidewalk Labs; The project's mission is to "blend people-centered urban design with cutting-edge technology to achieve new standards of sustainability, affordability, mobility, and economic opportunity [30]." When the U.S. Department of Transportation held its Smart City Challenge in 2016, one of the application requirements was to increase inclusivity, including for people with disabilities [31].

Kansas City has launched a network of interactive digital kiosks that can collect and share information. According (Bowman E. 2017) the kiosks have an audio jack so that visually impaired users won't feel self-conscious about listening to information available in the text-to-voice feature. They simply plug in their own headphones and listen privately [31]. Microsoft has created the Smart Cities for All proposal with G3ict and World Enabled and try to affect investors to become reality defining accessibility.

8. Conclusions

Several task-based scenarios for people with mild cognitive disabilities have been developed like for example preparing a meal, medication or handling daily activities like morning routines. Our longterm vision and our main purpose must be focused on promoting an accessible intelligent environment based on design for All, using architecture and innovative solutions, positioning citizens play the leading role in the intelligent society. Very significant is the role of Smart technology in many sciences. Artificial Intelligence and Bionics can offer to the disabled humans to experience things that they would have not otherwise been able to if surrender to the disability state [32]. By evaluating present technologies and needs, the author tackles themes that will convert modern living into the life of the future, simplifying the daily lives of individuals with different requirements and impairments.

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