

Information and Communications Technologies for Ubiquitous-Healthcare

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In most developed and rapidly developing countries, there has been a continual increase in life expectancy primarily due to improvements in public health, nutrition and medicine. However, this is now coupled with aging population demographics and falling birth rates, which when combined, are expected to significantly burden the socio-economic well-being of many of these countries. In fact, never before in human history have we been confronted with such a large aging population, nor have we developed solid, cost-effective solutions for

the healthcare and social needs and well-being of the elderly.

Here, we will describe an ongoing project in Ubiquitous (U)-Healthcare as a contribution of the application of science and technology for the benefit of humanity, especially the elderly. This project is focused on a smart medical home as a convergence of ubiquitous-health (U - Health) and ubiquitous-environment (U-Environment). The focus of our

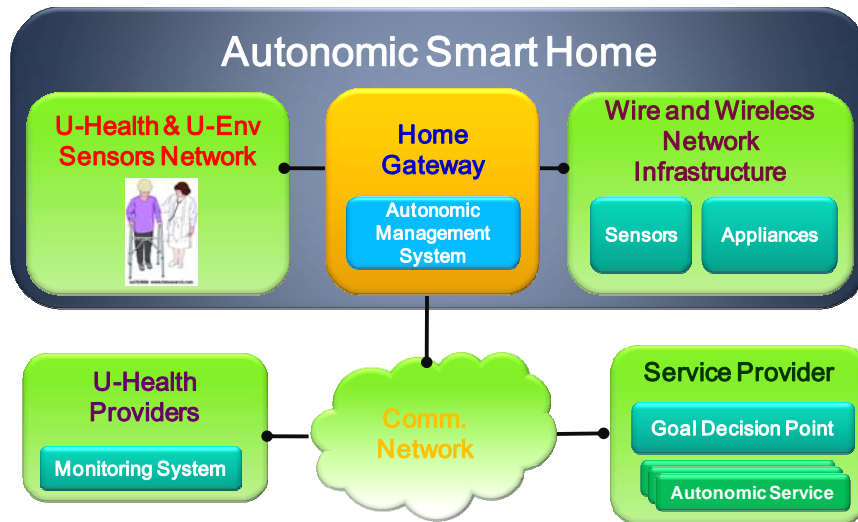


Figure 1. Proposed U-health and U-Environment system

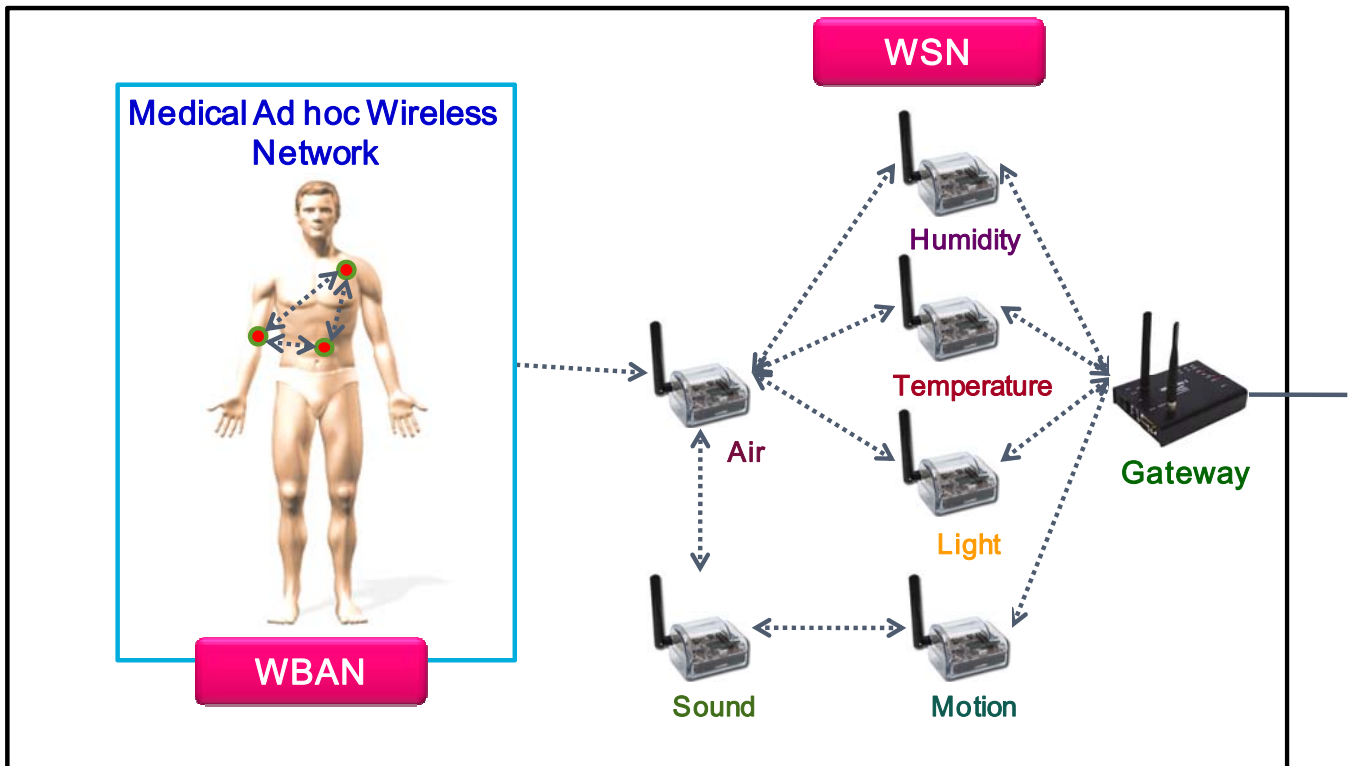


Figure 2. An example of such a deployment in a wireless sensor network format

research is on helping elderly people live a more independent and healthy life as long as possible, in their own home, while being remotely monitored and assisted in an unobtrusive and seamless manner. A schematic overview of the proposed U-health and U-Environment system is shown in Figure 1.

In the recent past, smart home has attracted much attention. However, because of some limitations in specific areas - cost, performance or reliability that include ultra-low power sensors and actuators; ultra-low-power integrated circuits for signal conditioning and processing, transceivers and memory; energy efficient and agile network systems; data fusion and “intelligent” decision making, its penetration has not been as high as envisaged. But now, two factors are pushing towards the development of more complete and cost-effective solutions. First is the significant increase in the world’s aging population. And second is the health providers’ willingness to reduce costs by treating elderly patients at home rather than within costly specialized hospitals or institutions, on the other side.

In our work, we are using advances in information and communications technologies, wireless communication, web-based technologies and autonomies, to develop new, smart and cost-effective solutions for the health wellness of the elderly. Such a solution would enable elderly to lead independent lifestyles in their own homes while being continuously monitored for the early detection of symptoms, so diseases can be treated earlier than in later stages as is currently done; to promote health wellness; as well as to treat chronic illnesses. An example of such a deployment in a wireless sensor network format is shown in Figure 2.

In this plenary presentation, through a few examples, we will discuss our ongoing work and the challenges we have uncovered, plus some of the research issues we are pursuing. **In particular, we will focus on the critical role of information and communications technologies (ICT) in developing innovative, low-cost and high impacting solutions to the pending elderly demographic crisis.** Several examples will be described to highlight ICT in U-Health.