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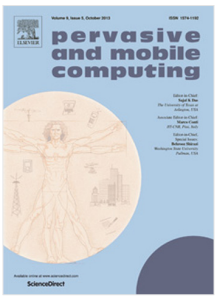

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Advanced Internet of Things for Personalised Healthcare System: A Survey

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***Abstract*—As a new revolution of the Internet, Internet of Things (IoT) is rapidly gaining ground as a new research topic in many academic and industrial disciplines, especially in healthcare. Remarkably, due to the rapid proliferation of wearable devices and smartphone, the Internet of Things enabled technology is evolving healthcare from conventional hub based system to more personalised healthcare system (PHS). However, empowering the utility of advanced IoT technology in PHS is still significantly challenging in the area considering many issues, like shortage of cost-effective and accurate smart medical sensors, unstandardized IoT system architectures, heterogeneity of connected wearable devices, multi-dimensionality of data generated and high demand for interoperability. In an effect to understand advance of IoT technologies in PHS, this paper will give a systematic review on advanced IoT enabled PHS. It will review the current research of IoT enabled PHS, and key enabling technologies, major IoT enabled applications and successful case studies in healthcare, and finally point out future research trends and challenges.**

***Index Terms*— Internet of Things, Personalised, Healthcare system, Survey.**

I. INTRODUCTION

Recently, Internet of Things (IoT) is emerging as a new paradigm in information technology aimed at building up a dynamic global network infrastructure by connecting a variety of physical and virtual 'things' with the growing mobile and sensors. IoT was initially proposed to refer to uniquely identifiable objects (things) and their virtual representations in an internet-like structure, by mean of using radio-frequency identification (RFID) technology. Later on, the concept of IoT has been extended to cover more type of 'things' with a variety of sensors, such as actuators, global positioning system (GPS) devices and mobile devices. The seamless integration and effective harness of these sensors in a platform associated to the Internet have raised up a lot of research issues, from system architecture, data processing to applications. Nowadays, IoT technology has been rapidly gaining ground as a priority multidisciplinary research topic in many academic and industrial disciplines, especially in healthcare.

Traditionally, the motivation of utilizing modern Information and communication technologies (ICT) in healthcare system is
to offer promising solutions for efficiently delivering all kinds of medical healthcare services to patients, named as e-health, such as electronic record systems, telemedicine systems, personalised devices for diagnosis, etc. But, driven by a sustained increase in longevity, many developed countries are now facing the fact that their fast-growing demographics is the over-80s. This trend brings with some key concerns about the economic viability of traditional healthcare systems, and thus it needs to design and develop more coherent and ubiquitous ICT enabled solutions for delivering high quality patient-centred healthcare services. Fortunately, due to the rapid proliferation of wearable devices and smartphone, IoT enabled technology is evolving healthcare from conventional hub based system to more personalised healthcare system. Successful utilisation of IoT enabled technology in PHS will enable faster and safer preventive care, lower overall cost, improved patient-centered practice and enhanced sustainability [1]. Future IoT enabled PHS will be realised by providing highly customized access to rich medical information and efficient clinical decision making to each individual with unobtrusive and successive sensing and monitoring.

But empowering the utility of IoT enabled technology in PHS is still significantly challenging in the area considering shortage of cost-effective and accurate smart medical sensors, unstandardized IoT system architectures, heterogeneity of connected wearable devices, multi-dimensionality and high volume of data generated, and high demand for interoperability. From user-centered perspective, the successful use of IoT in PHS will also need an interoperable IoT environment for care delivery and research, tightly-coupled health data mining applications, adequate data and knowledge standards of self-empowerment and sound clinical decision-making foundation. These above challenges and needs grant a lot of opportunities to explore and investigate new concepts, algorithms and applications in IoT enabled PHS field.

In an effect to understand advance of IoT technologies in PHS, this paper conducts a survey on recent advanced IoT enabled PHS. We undertook an extensive literature review by