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Raspberry Pi as a Sensor Web node for home automation ☆

Vladimir Vujović *, Mirjana Maksimović

Faculty of Electrical Engineering, Vuka Karadžića 30, 71123 East Sarajevo, Bosnia and Herzegovina

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ABSTRACT

The world of home automation is an exciting field that has exploded with new technologies and today is known as an area where "The internet of things" (IoT) vision becomes reality. The primary advantages that stem from this concept include how each device forms a small part of the Internet, by which the advanced system is able to interact and communicate, maximizes safety, security, comfort, convenience and energy-savings. This paper proposes an implementation of Sensor Web node as a part of IoT using a Raspberry Pi – inexpensive, fully customizable and programmable small computer with support for a large number of peripherals and network communication. Using this technology, in an example of monitoring and determining the confidence of fire in building, a full system, based on Sensor Web elements, is created and developed starting from a scratch. The given example confirms the advantage of Raspberry Pi – flexibility and extensive possibility of its usage.

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1. Introduction

The "Internet of Things" – IoT, can be viewed as a highly dynamic and widely distributed network system. In other words, it is a system comprising many identifiable components that are able to communicate and to interact, either among themselves or with end-users or other entities in the network [1]. Home-automation, by way of smart devices that sense physical occurrences and translate them into a stream of information data, maximizes safety, security, comfort, convenience and energy-savings (Fig. 1) [1,2]. The building elements of home automation are sensor networks and Building Management System (BMS). Using Sensor Web elements, as a part of IoT, in opposition to the standard sensor elements, the communication infrastructure rapidly changes from local to global, moving a BMS to global level too. Moreover, home automation system in a whole becomes ubiquitous – appears everywhere and anywhere.

Thus, home automation can be defined as a mechanism removing as much human interaction as technically possible and desirable in various domestic processes and replacing them with programmed electronic systems. Ultimately it is a system that aims to heighten quality of life with the automation of household activity that may be controlled over the Internet or telephone.

Originally, this system was used to control HVAC (Heating, Ventilation and Air-Conditioning) as well as fire safety and security, controlled by a central computer [3]. With the development of modern technologies home automation includes various features for security, surveillance, lighting, energy management, access control, entertainment-appliances, interfaces and software. The home automation system should be easy to understand and operate, as well as providing for easy

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* Corresponding author. Tel./fax: +387 57 342 788.
E-mail addresses: vladimir.vujovic@etf.unssa.rs.ba (V. Vujović), mirjana@etf.unssa.rs.ba (M. Maksimović).

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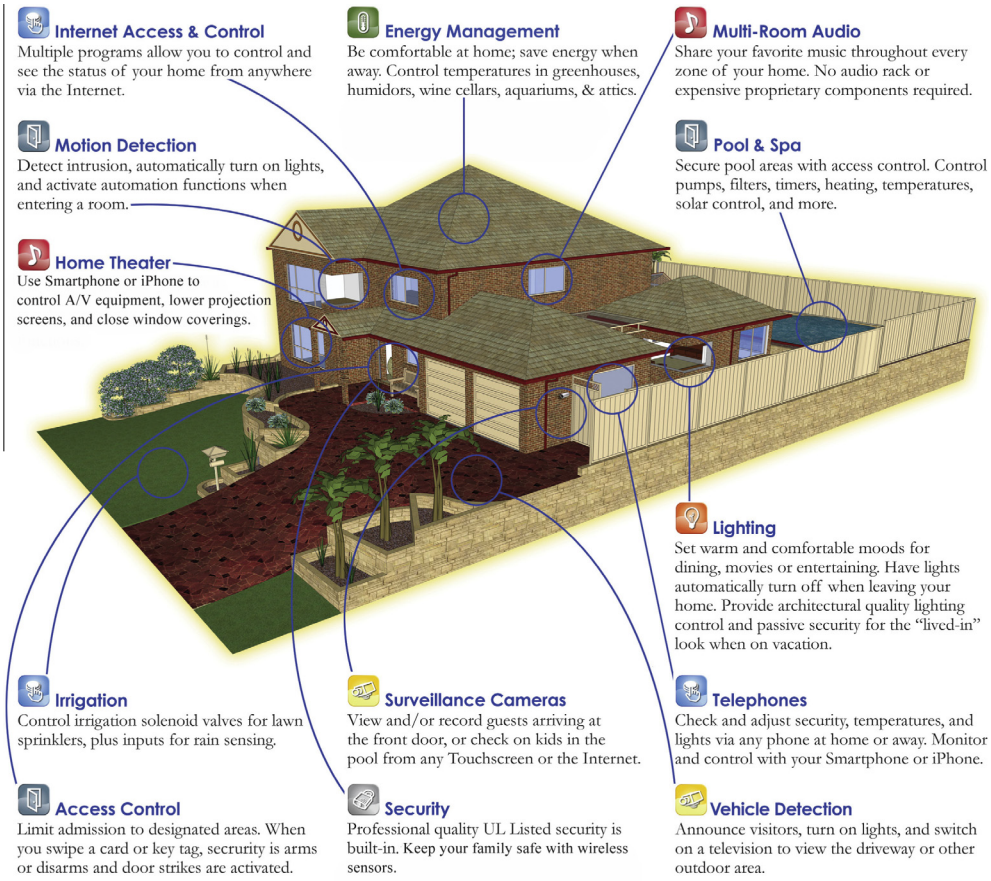

Fig. 1. Integrated home automation system and its benefits [3].

expansion according to users' needs and individual budget. More importantly, home automation provides for an alternative solution to the reduction of energy consumption, cost expenditure as well as increased convenience [3].

Research performed by Berg Insight [4] states that at the end of 2012, in the countries EU27 + 2, there were a total of 1.06 million smart home systems in use. This demonstrates that the European market for smart home systems is approximately three years behind North America in terms of penetration and market maturity. Berg Insight forecasts that the installed smart home systems in EU27 + 2 will grow and reach 17.4 million systems by 2017 (Fig. 2).

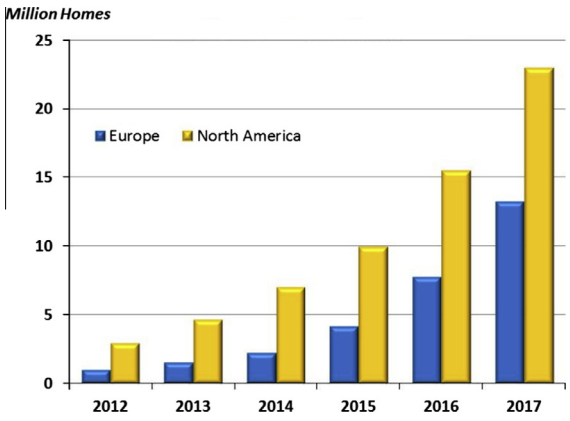

Fig. 2. Total number of smart homes (Europe and North America 2012–2017) [4].

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