World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:11, No:10, 2017

A Smart Sensor Network Approach Using Affordable River Water Level Sensors

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Abstract : Recent developments in sensors, wireless data communication and the cloud computing have brought the sensor web to a whole new generation. The introduction of the concept of 'Internet of Thing (IoT)' has brought the sensor research into a new level, which involves the developing of long lasting, low cost, environment friendly and smart sensors; new wireless data communication technologies; big data analytics algorithms and cloud based solutions that are tailored to large scale smart sensor network. The next generation of smart sensor network consists of several layers: physical layer, where all the smart sensors resident and data pre-processes occur, either on the sensor itself or field gateway; data transmission layer, where data and instructions exchanges happen; the data process layer, where meaningful information is extracted and organized from the pre-process data stream. There are many definitions of smart sensor, however, to summarize all these definitions, a smart sensor must be Intelligent and Adaptable. In future large scale sensor network, collected data are far too large for traditional applications to send, store or process. The sensor unit must be intelligent that pre-processes collected data locally on board (this process may occur on field gateway depends on the sensor network structure). In this case study, three smart sensing methods, corresponding to simple thresholding, statistical model and machine learning based MoPBAS method, are introduced and their strength and weakness are discussed as an introduction to the smart sensing concept. Data fusion, the integration of data and knowledge from multiple sources, are key components of the next generation smart sensor network. For example, in the water level monitoring system, weather forecast can be extracted from external sources and if a heavy rainfall is expected, the server can send instructions to the sensor notes to, for instance, increase the sampling rate or switch on the sleeping mode vice versa. In this paper, we describe the deployment of 11 affordable water level sensors in the Dublin catchment. The objective of this paper is to use the deployed river level sensor network at the Dodder catchment in Dublin, Ireland as a case study to give a vision of the next generation of a smart sensor network for flood monitoring to assist agencies in making decisions about deploying resources in the case of a severe flood event. Some of the deployed sensors are located alongside traditional water level sensors for validation purposes. Using the 11 deployed river level sensors in a network as a case study, a vision of the next generation of smart sensor network is proposed. Each key component of the smart sensor network is discussed, which hopefully inspires the researchers who are working in the sensor research domain.

Keywords : smart sensing, internet of things, water level sensor, flooding
Conference Title : ICSAM 2017 : International Conference on Sensors, Actuators and Microsystems
Conference Location : Barcelona, Spain
Conference Dates : October 30-31, 2017