

Chapter 12

Security Framework for Smart Visual Sensor Networks

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ABSTRACT

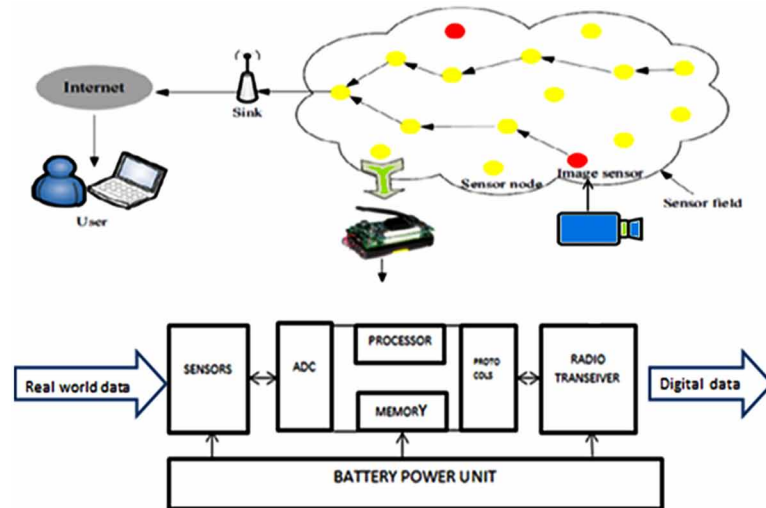
Due to the significance of image data over the scalar data, the camera-integrated wireless sensor networks have attained the focus of researchers in the field of smart visual sensor networks. These networks are inexpensive and found wide application in surveillance and monitoring systems. The challenge is that these systems are resource deprived systems. The visual sensor node is typically an embedded system made up of a light weight processor, low memory, low bandwidth transceiver, and low-cost image sensor unit. As these networks carry sensitive information of the surveillance region, security and privacy protection are critical needs of the VSN. Due to resource limited nature of the VSN, the image encryption is crooked into an optimally lower issue, and many findings of image security in VSN are based on selective or partial encryption systems. The secure transmission of images is more trivial. Thus, in this chapter, a security frame work of smart visual sensor network built using energy-efficient image encryption and coding systems designed for VSN is presented.

INTRODUCTION

The contemporary advancements in CMOS technology, multimedia systems together with communication technologies empowered image communication over resource constrained Visual Sensor Network (VSN). The image communication is more significant than scalar data communication, hence it has attained wide applications like critical infrastructure monitoring, habitat monitoring, surveillance, traffic monitoring, industrial control systems, smart home systems and many more. Recently (Paek, Hicks, Coe, & Govindan, 2014) has reported the bird nest monitoring system at the James San Jacinto Mountain Reserve and the system assisted the biologists to study the life of birds during the nesting spell to unbox

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Figure 1. VSN architecture and sensor mote architecture



the biological interrogations connected to the laying, incubation and hatching of eggs and way of life of the new born nestlings in the nests. Yet quite a lot of new commercial applications which require visual support are emerging out embedded VSN.

In Visual Sensor Network the VS nodes are deployed in places where they can be used to monitor and sense environmental conditions by collaborating and communicating with each other over the wireless communication channels. Smart cameras which are capable of processing the sensed images onboard can be connected to Visual Sensor Networks. Typically, Visual Sensor Networks are built with resource-limited devices. These networks are resource restricted systems with limited memory, processing speed, computational power and bandwidth. Visual Sensor Networks are autonomous systems capable of capturing, processing and communicating the image in difficult-to-access regions without exclusive network infrastructure in adhoc fashion. The typical VSN architecture and Sensor Mote architecture are shown in Figure 1 (Suseela & Phamila, 2016). Generally, wireless networks prefer energy efficient computation and communication for better lifetime of the network. As images contain more redundancies, processing and communicating the image data will consume more energy. Hence for the increased active lifetime of the network image processing algorithms exclusively developed for energy efficiency and low resource utilization must be adopted in VSN. The inherent nature of visual data in the form of images is self-descriptive. Therefore, the secrecy and privacy protection are more essential in wireless communication networks, as wireless links are more prone to security threats by nature (Gonalves & Costa, 2015).

VISUAL SENSOR NETWORK SECURITY REQUIREMENT

In these modern days, VSNs are gaining more attention by both private and public communities and security becomes a prominent issue to address. The visual data are more sensitive than scalar data when an image data is meddled the information content of the transmitted image will be revealed abruptly;

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