Chapter 14

A Low Cost, Power Efficient, Social Distancing Notification Embedded System Based on Intelligent Wireless Sensor Network

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ABSTRACT

The World Health Organization (WHO) has been closely monitoring and keeping track of the latest COVID-19 outbreak and has issued advisory guidance on safe social distancing of at least one meter between people to prevent human-to-human transmission. In many countries, there are long queues seen prominently at popular wet markets, supermarkets, and the entrance of popular shopping malls. However, due to high manpower cost, it is not practical to deploy security personnel at every queue line to monitor the one-meter distance constantly and accurately between people throughout the entire day. This chapter will introduce a low-cost wireless embedded solution that would not only address this problem but helps streamline the manpower resources more efficiently.

INTRODUCTION

The current COVID-19 pandemic has created a huge and lasting paradigm shift in almost all facets of society globally. In March 2020, when there was a major outbreak in China city Wuhan, scientists and medical doctors were still trying to figure out the characteristics of the unknown virus and hence finding a suitable vaccine to mitigate its deadly effects. However, according to the World Health Organization (WHO), after closely monitoring and keeping track of the latest COVID-19 outbreak ("Additional Precautionary Measures to Prevent Further Importation and Spread of COVID-19 Cases," 2020), had identified that one possible solution could be implemented very quickly to prevent widespread virus

transmission. They immediately issued advisory guidance on safe social distancing of at least one meter between people to prevent human to human droplets transmission through the air.

Social distancing is required in all walks of life example from queuing to enter a shopping mall to buy food and boarding bus and train ("Advice for the Public: Coronavirus Disease (COVID-19)," 2020). The current way of ensuring social distancing in the public is only by manual observation of the safe distancing between people which is no doubt tedious and labor intensive. Hence, it is evident that there are no easier available solutions or technologies which can constantly and accurately keep track of the safe distancing between people in public.

In this paper, we will present a proposed solution that employs the next unit of computing (NUC) server ("Intel NUC Mini PCs," 2003) together with a network of wireless sensor embedded system in the proximity to constantly and accurately monitor the distance between two people in the queue. The entire proposed integrated system solution is shown in Figure 1. The sensors, placed at one meter apart in the queue, can detect and measure the distance between two people by using ultrasonic detection technology. If a safe distancing of one meter is breached, the sensor will emit a verbal warning in 4 different languages (English, Chinese, Malay and Tamil) to alert and warn the person. After which, the sensor will transmit the data wirelessly to the NUC which acts as the server to collect and analyze them. If the safe social distancing of one meter is constantly being breached, the application on the mobile device or smartphone of the stakeholder or safety officer when checking with the NUC/server will be notified to allow further human intervention.

As seen in Figure 1, the solution contains 3 major sub-systems: the wireless sensor embedded system, a small Next Unit of Computing (NUC) or a Single Board Computer (SBC) running a Linux operating system as a server and lastly, a mobile device or smartphone.

Figure 1. Proposed Integrated System Solution
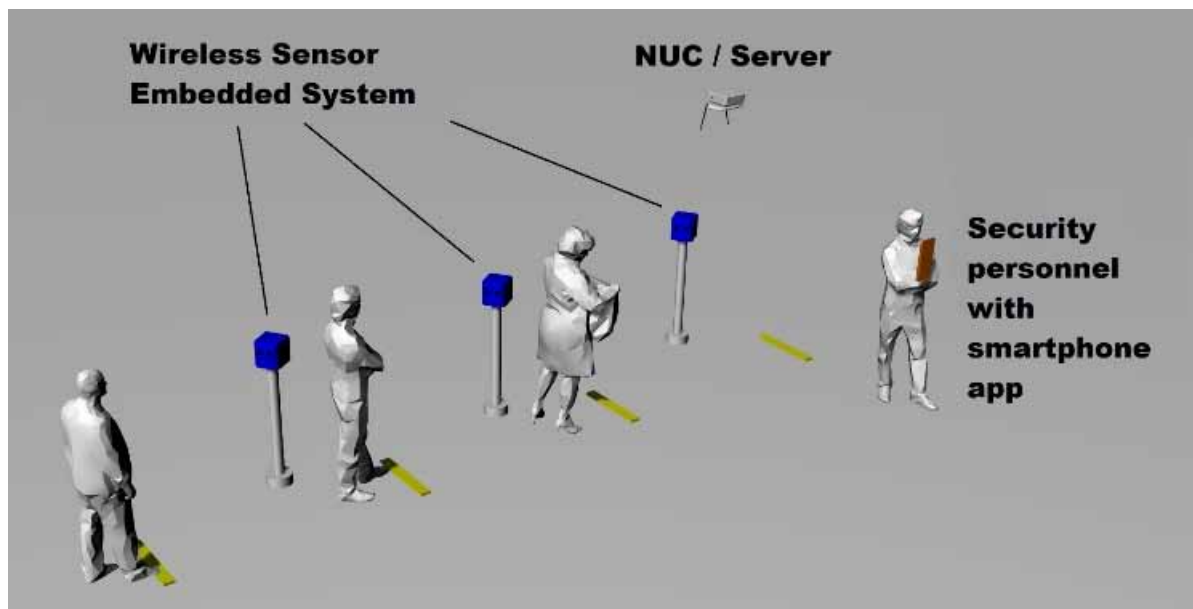
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