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통합 무선 기술 기반의 도시 교통 관리 시스템 설계

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Design of Urban Transport Management System Based on Integrated Wireless LAN Technologies

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Abstract

Rapid developments of industry and economics have made a metropolis which demands an effective urban transport management system (UTMS). Specially, this paper considers a subway surveillance system based on integrated wireless LAN technologies for public safety. Since a current subway platform security entirely relies on conventional closed circuit television camera (CCTV) or human operators, subway train drivers cannot detect platform states and cope with abnormal situations or accidents immediately. However, through the IP cameras and some wireless routers, high quality images of the platform conditions can be directly delivered to the train drivers and other station employees in advance of train entering the platform. In this paper, several design issues and problems are discussed when building up the subway management system. Further, we illustrate a system model with the system requirements in real parametric values in order to draw concrete system designs and to realize a practical implementation of the future UTMS.

I. Introduction

With increments of public transportation usages, efficient and thorough urban transport management systems (UTMS) are highly demanded nowadays. Especially, public safety problem has become a great concerned issue in UTMS designs.

For example, a great portion of subway accidents which are involving people crossing the railroad without warning and hit by the train, is 35.4% from 1995 to 2004 in Korea [1]. Since a current subway platform security completely relies on conventional closed circuit television camera (CCTV) monitoring or human operators, there are limits to prevent all abnormal situations or accidents. Recently, some stations adopt a screen door system which protects passengers from falling into the platform, but it requires lots of installation and maintenance costs.

This paper proposes a new UTMS model based on integrated wireless LAN technologies for subway platform safety management. Firstly, our UTMS model with concrete descriptions are presented. Next, several system requirements and issues of the proposed model are discussed.

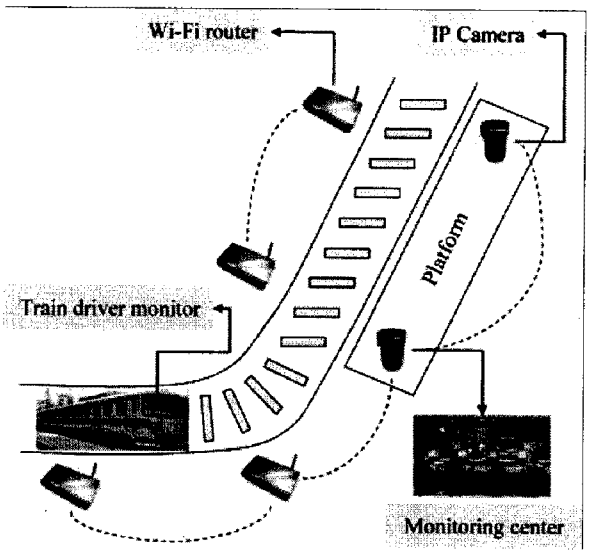

Figure 1. Subway safety management system configuration based on wireless LAN technologies

II. UTMS Model

Figure 1 shows the proposed subway safety management system configuration based on wireless LAN technologies. At the both sides of the platform end, IP cameras are placed which periodically take high quality images of the platform states, and directly deliver to the next hop Wi-Fi router until they reach to the train driver monitors. Then, the train driver can take proper action according to the platform conditions in advance of train entering the platform. At the same time, images are transferred to other station employees and subway monitoring center for immediate managements to emergency situation. All image data transmissions are secured and performed by wireless LAN communications.

III. UTMS Requirements and Issues

There are lots of system requirements and issues to build up the proposed UMTS model. In a sense of image processing, one important issue is a change detection to derive a right decision of accident occurrences. Previously, lots of researches have done in compute vision systems [2], but it still requires correct detection under the various illuminations of subway environments. Another issue is a proper selection of image resolution and compression codec. These selections should satisfy two conditions, such as exact image interpretations by the train driver, and a limited capacity of the constructed surveillance network.

The proposed management model utilize a wireless LAN which is specifically designed for distributed networks. From the IEEE 802.11 standards [3], it has limited radio range (ex. 802.11b has ~35 meters indoor and ~110meters outdoor) which is much stringent in subway circumstances. Thus, router should be carefully deployed considering network connectivity after deep experiments of subway radio propagation characteristics. For the fast and reliable data transmissions in one-dimensional multi-hop network, robust routing techniques and suitable medium access control (MAC) designs are required. A strong security policy against attackers is also essential requirement for the proposed UMTS model.

IV. Conclusions

This paper has proposed an urban transportation management system specifically designed for subway safety monitoring system. We expect that the proposed system has advantages on low installation costs, and convenient maintenances with better monitoring performances. Further, we continue to work on implementation of the proposed system in parallel with study on subway system designs.

Acknowledgment

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