

Real-Time School Violence Reporting Process Using Smart Bands

Won-Cheol Park¹, Koo-Rack Park^{2*}, Young-Suk Chung³, Jin-Young Jeong⁴

¹Dept. of Computer Engineering Kongju National University / 31080 Rep. of Korea

^{2,3}Dept. of Computer Science & Engineering, Kongju National University / 31080 Rep. of Korea

⁴Dept. of Bio Information, Daejeon Health Science College / 34504 Rep. of Korea

*Corresponding author E-mail: ecgrrack@kongju.ac.kr

Abstract

Background/Objectives: The number of school violence victims has not gone down in the country. Moreover, there are no adequate measures against violence committed in a blind spot that the CCTV coverage has, unnoticed by the public eye. Therefore, there is a need to devise an alternative system for preventing school violence committed in the blind spot.

Methods/Statistical analysis: With default settings, an application that transmits location information based on the Bluetooth communication of smart bands and smartphones is installed. In the application, the number of people to whom a user wants to transmit location information is stored. If the user click the button of the smart band, the location information transmission application of the smartphone receives the signal with the Bluetooth communication. The real-time location information of the user is transmitted to the list stored in the location information transmission application by SMS text message. The transmitted location information is stored in the database in the form of X and Y coordinates.

Findings: This paper proposes a real-time location information transmission process that can prepare for violence by transmitting real-time location information and calling for help in the case of violence committed in a blind spot outside the CCTV coverage range. The location information notification application has been widely used. However, since it requires manual operation, it is difficult to efficiently transmit location information in actual situations. In this regard, it is expected that the proposed process can help to escape from the violence situation effectively by transmitting the location information in real-time situations.

Improvements/Applications: For future work, there is a need for continuous research to collect information on blind spots as big data for collecting information on places where school violence occurs frequently, and thus to prevent violent crimes that occur in areas other than the school.

Keywords: Smart Band, GPS(Global Positioning System), CCTV(closed circuit television), School Violence, crime.

1. Introduction

School violence among students is one of the serious social problems to be prevented and resolved. As the damage caused by school violence increases and gets serious every year, national interest is on the rise. According to the Youth Violence Prevention Foundation (2012), the rate of school violence decreased slightly in 2008 compared to that in 2007, but has increased again since 2009. The damage rate of school violence also decreased slightly from 2006 to 2009, but has significantly increased since 2011¹. Some of the victims who were exposed to school violence have made extreme choices such as suicide. Even if various violence prevention measures and policies have been implemented to prevent school violence, their effects are relatively small.

In particular, although CCTVs are installed to prevent crimes, it is difficult to prevent school violence that occurs outside its surveillance range.

This paper proposes a real-time school violence reporting process using smart bands to allows students who are victimized by school

violence to ask for help and escape from school violence. The proposed process is expected to be a countermeasure for self-protection and against violence that will occur in the future if it can enable students to call for help in real time in a situation where violence takes place. The composition of this paper is as follows: Chapter 2 discusses related studies. Chapter 3 proposes a real-time school violence reporting process using smart bands. Chapter 4 describes the experimental results of the proposed process. Lastly, conclusions and future research topics are discussed.

2. Related Work

2.1 A Study on the Prevention of School Violence

Many studies have been conducted regarding the prevention of school violence, which include a study on the measures for students who commit school violence², a study on the verification of physical education effects for preventing school violence and suicide³, and a qualitative study on the role experience as a defender in response to school violence⁴. Students victimized by school violence are less likely to ask for help after school

violence, and most of them do not tell anyone about their violence experiences after they were subjected to school violence. Once the violence starts, it is likely to occur continuously and irregularly to victimized students in unspecified places, and it is difficult for them to ask for help due to the fear of retaliatory violence if they inform people around them of school violence. In addition, there is a vicious cycle that the victims of school violence become perpetrators, and harms and damages are circulated throughout the cycle⁵.

2.2. Smart-Band

Smart band refers to a product that is worn on the user's wrist as one of the wearable devices. There have been continuous researches on the application of individual health care services using the smart band⁶. Another study shows that sudden death of infants occurs continuously due to parents' busy economic activities and their lack of experience in child care. In order to solve this problem, a study on the health care systems for infants and toddlers using the smart band is underway⁷. There is also a smart band study for divers and haenyeos (female divers) working in the water during winter seasons. In addition, many researches have been conducted regarding prevention of safety accidents at the workplace, which include a study on the waterproof smart band equipped with body temperature sensor to prevent accidents and unpredictable situations such as hypothermia and cardiac arrest during work in water⁸ and a study on the Bluetooth communication of bands and smartphones that can be used to allow workers to ask for help in cases where they cannot move their body parts smoothly due to accidents at the workplace⁹.

2.3GPS (Global Positioning System)

GPS was developed by the US Department of Defense. It is managed by the 50th Space Wing of the US Air Force and has been used for military and civil purposes such as navigation, measurement, cartography and geodetic survey, visual synchronization and weapon induction¹⁰. A variety of studies using the location information of GPS have been underway. They include a study on the indoor location recognition system using Zigbee and GPS that informs a user of his or her location and the location where he or she wants to go in real time in places such as exhibitions and fairs¹¹, and a study on the route analysis and route path recommendation system that recommends the route path and provides the location information by utilizing the route path data of the user accumulated using the GPS of the mobile device¹². Even in the field of prevention of natural disasters using GPS, researches are actively being conducted. One of them aims to prevent major damages by predicting earthquakes that occur frequently in advance¹³. In terms of education, various studies and educations using GPS are being carried out. Through the change from the terrain and geography education, which was learned only from the exiting plane view, to the study of three-dimensional geographic learning model using GPS, the effects to acquire information on stereoscopic and realistic geography in real time and achieve a better understanding can be expected¹⁴.

3. Proposed Work

3.1. System Configuration Map

The following (Figure 1) shown below shows the overall configuration map of the system proposed in this study.



Figure 1.: System Configuration Map

As shown in Figure 1, the configuration of the proposed system can be divided into three parts.

The first is a smart band equipped with the Bluetooth communication function. The second is a user's smartphone application that receives a signal transmitted from the band. The last component is the smartphone to receive location information.

In this paper, an Android-based application was used to receive signals transmitted from the smart band and transmit location information to recipients.

3.2. System Process

The process can be divided into three stages, such as the stage of transmitting signals from the smart band, the stage of receiving signals in the user's smartphone and the stage of transmitting location information via SMS from the smartphone application.

Figure 2 shows the overall process of the proposed system.

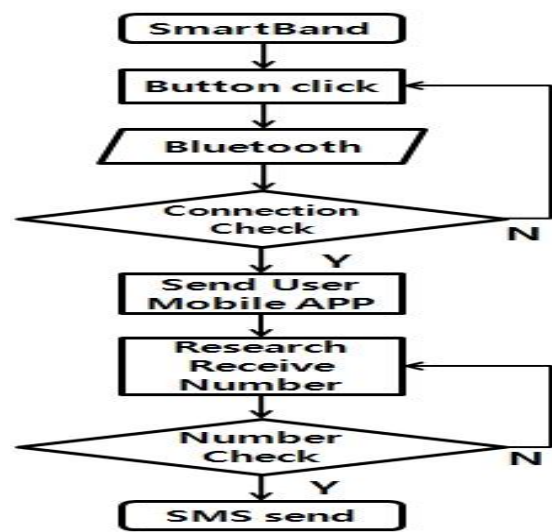


Figure 2.: System Process

First, the location transmission application needs to be installed on the user's smartphone. The application should store the numbers to which the location information is transmitted and have the GPS function enabled.

Figure 3 shows the phone number saving screen of the location transmission application.



Figure 3.: User registration screen of location information transmission application

In the stage where the number of people to whom the location information of the user is to be transmitted in case of an emergency, there is a text input field for entering name, contact details and group, and the group can be set or not be set. The user can manage the numbers in a list or a group by storing the telephone numbers of people to which the location of the user is transmitted when a violent situation occurs.

Figure 4 show the latest list screen that can identify the recent history or the latest list to which the location information is transmitted from the user's smartphone.

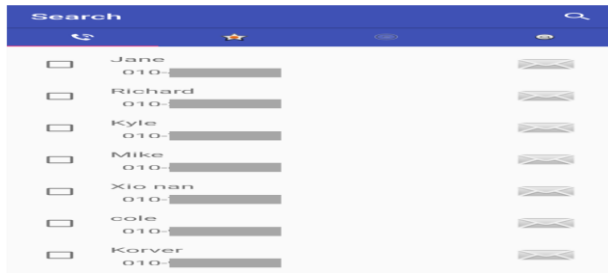


Figure 4. Recent history of SMS sent

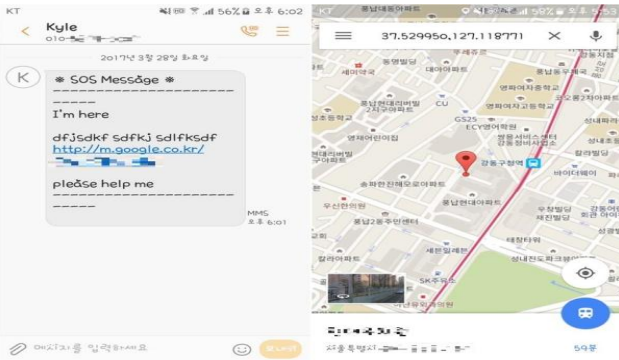


Figure 5: Location information SMS received

As shown in Figure 5, it can be confirmed that the user's location information is received in the smartphone of the user waiting in C region, along with the message asking for help. If the location information is clicked, the user's location can be identified in real time through mobile web connections.

In the latest list screen, it is possible to check the contact details to which the location information was recently transmitted and perform history management.

Secondly, the user clicks the button of the smart band when an emergency situation occurs. The smart band transmits a signal to the user's smartphone through Bluetooth communication. When the signal is transmitted, the communication status is checked to see if the communication between the smart band and the smartphone is normally connected, and the signal is continuously explored until the communication is normally connected.

Thirdly, if the communication is successfully connected, the signal is received in the user's smartphone application, and the number to which the location information is transmitted is searched. The search is performed automatically, and the information is transmitted to the recently registered group. The number to which the location information is transmitted can be edited according to the user's convenience, and the location information is transmitted to the recently transmitted list even if the priority is not set, or to the recently stored number list if there is not recently transmitted number.

Lastly, the overall flow of the proposed process is completed when the location information is transmitted to the number of the recipient stored in the application via SMS.

3.3. DB table Configuration

The following (Table 1) shows the DB table structure of the proposed process.

It is based on the location information of Google, a location information service of the smartphone. In the collected location information, the X and Y coordinates of the GPS are stored as data.

Table 1: DB Table Information

Field	Data Type	Description
Idx_no	Int(11)	Index Number
gps_x	Varchar(20)	gps x coordinate
gps_y	Varchar(20)	gps y coordinate
reg_date	DateTime	Create Date

4. Results and Discussion

In order to test the system proposed in this paper, a test was conducted with the following scenario. The assumption was that school violence occurred in A region. The smart button is clicked in A region where the violence occurred. The location information received from the smartphones waiting in other regions such as B and C.

Figure 5 shows the location information in an SMS message received by the smartphone of the user who is waiting in C region when the button of the smart band is clicked in A region.

5. Conclusion

The process proposed in this paper was suggested as an alternative to violence prevention through which students who are exposed to violence that occurs in the blind spot of CCTV ask for help. The utilization of this process can allow students who are vulnerable to violence committed in the CCTV blind spots to seek immediate help in the event of violence, and thus can reduce damages. In addition, it is expected that the information on the location where violence occurs most often can be obtained, and the use of this information will help to prevent crimes. In the future, we will proceed with a research on the system capable of obtaining important information for identification of perpetrators and movements of the criminals by allowing CCTVs around a user to observe the location of the user when the user transmits his or her location information.

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