Bulletin of Networking, Computing, Systems, and Software – www.bncss.org, ISSN 2186-5140
Volume 7, Number 1, pages 9–11, January 2018

Development of a system alerting unsafe actions of texting while walking using a tail lamp

Amato Tsuji, Keita Ushida, Qiu Chen
Kogakuin University
Shinjuku Tokyo, Japan

***Abstract*—Texting while walking has a risk of accidents. There are various activities against it. The authors propose a system alerting people around the user to the fact that s/he is texting while walking. The authors assume three unsafe actions in texting while walking; 1) texting, 2) slow down, 3) stopping. The system senses the user's behavior and lights a red lamp on the waist when his/her action is regarded as dangerous one described above. The lighting alerts the people in the back.**

I. Introduction

Now that the number of smartphone users has increased, the danger of "texting while walking (TWW)" is regarded as an issue to consider.

In the simulation in [1], 1000 of 1500 people in TWW across a scramble crossing fail because of accidents such as collision.

According to a questionnaire in [2], 46.3% of respondents had done TWW though 98.3% of them thought that TWW was risky. This result indicates some people cannot stop TWW in spite of its risk.

Therefore a system which reduces the risk of TWW without stopping it should be proposed for them.

In this paper, the authors report development of a system alerting people around the user to his/her dangerous action.

II. Related Works

In most of works and products about TWW, users are urged to stop it due to its dangerousness. For instance, a software which cautions the user and locks the smartphone when it detects TWW is provided [3]. A system which alerts the user concerning his/her immersion level to TWW is proposed [4]. On the other hand, systems which do not intend to stop TWW are also proposed. The system proposed in [5] aims to support "safe" TWW by telling the user the distances of obstacles around him/her through the smartphone. In these works, the target to which the systems inform is the user in TWW. In contrast, the authors' system tells the dangerousness to people around the user in TWW.

III. Proposed System Overview

A user in TWW does not tend to pay attention to his/her surroundings. Therefore his/her action will sometimes be dangerous such as turning and stopping suddenly, which may cause accidents like collision. Whereat the authors propose that the targets to which the system informs are people around the user in TWW. By receiving the alert they will able to act to avoid accidents. This idea will make the dangerousness of TWW reduce comprehensively.

In this paper the authors assume that the main targets the system alerts are people behind the user. When a user is seen from behind, it is difficult to know whether s/he is doing TWW. Thus the authors think that it is effective to alert people behind the user.

The proposed system utilizes light to alert people behind. For this purpose light is preferable to sound since the sound may be lost in the noises of a crowd. The user wears a light module on the back of the waist. It will be seen easily by people behind.

In the system a red lamp is employed as the light. Since red lamps are used as tail lamps and traffic signals, we know they indicate alerts. Similarly, the authors think a red lamp is suitable for an alerting sign.

The system issues alerts on the three conditions as following.

- The user operates the smartphone
- The user slows down
- The user stops walking

When the user operates the smartphone, s/he will be absorbed in it. So s/he may turn or stop suddenly without caring about his/her surroundings. These may cause collision with others.

Slowing down and stopping should also be taken into account. Such actions in traffic will increase a risk of accidents.

IV. The Implemented System

The implemented system consists of a smartphone (iPhone) and a light module. The smartphone monitors the user's activity with its front camera and its accelerometer. The light module consists of a Raspberry Pi computer and a color LED panel. The smartphone controls the light module via Bluetooth.

Fig. 1 shows the flowchart of the system. According to the chart, The system examines the user's state. The system turns on its LED light when it detects dangerous actions of the user (shown as "Alert!!" in Fig. 1).

First, the system examines whether the user is operating the smartphone with the front camera ("Face Detection" in Fig. 1). When the user's face is detected, the system judges that s/he is operating the smartphone and alerts people behind.

Next, the system measures the user's walking speed with the accelerometer ("Step Activity Status" in Fig. 1). When

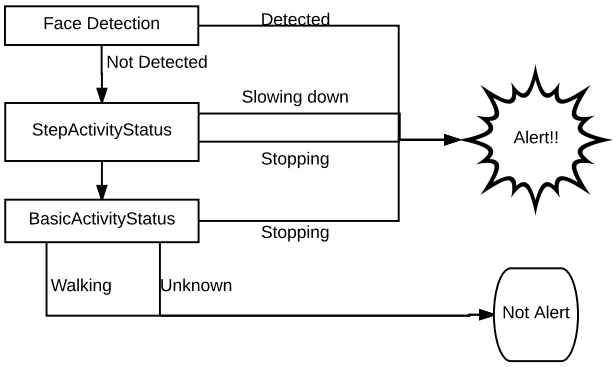

Fig. 1. The flowchart of the system.

the user slows down or is stopping, the system regards it as dangerous action to alert people behind.

Finally, the system examines the user's walking state again using an API of iOS ("Basic Activity Status" in Fig. 1). When the API responds the user is stopping, the system also alerts people behind.

V. Results

Fig. 2. A user wears the implemented system

Fig. 2 shows the implemented system worn by a user. The user wears an LED panel on the back of the waist seen in Fig. 2. The system successfully behaved as described in section III.

The user is texting while walking (TWW)
: TWW is the action to be detected by the system above all. When the system detects the user operating the smartphone by the front camera, the LED panel glows red to alert people behind (Fig. 3).

The user stops walking
: To stop walking is regarded as one of dangerous actions by the system, since stopping suddenly may cause collision. While the user is stopping, the LED panel glows.

The user slows down
: Sudden slowing down is also dangerous for people around the user. The walking speed of the user is measured by the accelerometer, and the system turn on the LED panel when slowing down is detected.

The user is walking not in TWW
: When the user is walking and is not operating the smartphone, the system judges that the user is walking with attention and does not turn on the LED panel.

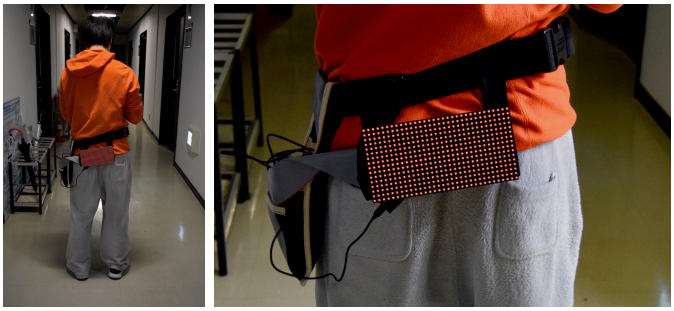

Fig. 3. The system makes the LED panel glow red to alert people behind

VI. Discussion

As described in section V, the implemented system satisfied the concepts in section III. And the authors have found that there are some points to be improved through the implemented system.

The LED panel on the waist is sometimes difficult to see in a crowd. Attaching smaller LED devices on the clothes will be better instead.

The LED panel only glows red in the implemented system. Displaying characters and icons on the panel (such as "in TWW", "stopping") will be more informative and effective to people around. They will be able to act better with the detailed message from the user.

VII. Conclusion

In this paper, an approach to reduction of dangerousness of texting while walking was proposed. It does not aim either to stop TWW or to inform the user about the surroundings, but informs people around the user that s/he may act dangerously owing to TWW. The implemented system equips an LED panel compared to a tail lamp of a car, and alerts people behind by making the LED panel glow red when the user acts dangerously. The implemented system successfully achieved the concept.

Improvement of the system described in section VI is one of the future works. And the authors are planning a substantiative experiment to confirm the effectiveness of the proposed concept.

References

[1] What to happen if all of people crossing the crossing is texting while walking, https://youtu.be/3NDuWV9UAvs, Read on 2017-03-03 (in Japanese).

[2] MMD Laboratory: Survey about texting while walking in 2016 https://mmdlabo.jp/investigation/detail_1615.html, Read on 2017-03-03 (in Japanese).

[3] Safe mode https://play.google.com/store/apps/details?id=jp.co.nttdocomo.anshinmode, Read on 2017-03-03 (in Japanese).

[4] Y. Iwami, T. Miyoshi and M. Eguchi: An Alert System to Texting While Walking Considering Immersion Level, IEICE general conference, B-15-6, p. 588, 2016 (in Japanese).
[5] S. Kodama, Y. Enokibori and K. Mase: Examination of safe-walking support system for “texting while walking” using time-of-flight range image sensors, UbiComp ’16, pp. 129–132, 2016.