

Synthesize Facial Expressions for Authentication Based on Spatiotemporal Information and Actions

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1. Introduction

Recently, to enhance the security of confidential information, various authentication methods have been proposed for users who enter important places in which such information is stored. For example, a study [1] has introduced an authentication method based on spatiotemporal information and actions. The method assumes that mobile device and network can be used for authentication. Using this method, users repeatedly perform predetermined actions, such as tapping a smartphone at predetermined places (e.g., station) on the way to their destination (e.g., data center) several times, so that they can be authenticated. One of its advantages is that attackers face greater difficulty in observing authentication behaviors (e.g., tapping users' smartphones at a station). The method can be classified into shoulder-surfing resilient authentication such as [2].

2. Proposed Method

The goal of this study is to enhance the security of the method, by increasing the number of predetermined actions. When the number is large, it is difficult for attackers to identify which actions are used for the authentication. In our proposed method, we use facial expressions and websites that are displayed on users' smartphones as follows:

- (a) Displayed websites are used as predetermined locations, and facial expressions are used as predetermined actions.
- (b) Combinations of displayed websites and facial expressions are used as predetermined actions.

Fig. 1 and 2 illustrates the proposed method. For instance, at a station, a user smiles to the camera on his/her smartphone, while browsing a microblogging website. It is natural for the users' facial expressions to change according to the websites shown on their smartphones. Consequently, it is expected to be difficult for attackers to get clues about the authentication process. Note that we assume that proposed method is applied while using public transportation.

Although previous study [3] have proposed authentication methods that utilize the facial expressions of users to enter important places, they did not combined the

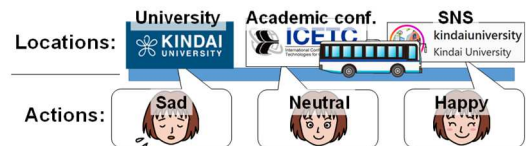


Fig. 1 Example of proposed method (a)

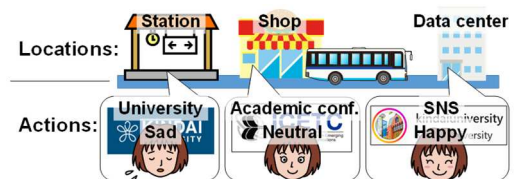


Fig. 2 Example of proposed method (b)

expressions with spatiotemporal information. Hence, the method is not shoulder-surfing resilient.

3. Preliminary Analysis

To evaluate the feasibility of our method, we analyzed whether the system properly recognized the users' facial expressions. Additionally, we assessed whether the users maintained the predefined facial expressions for a while. In the experiment, nine subjects were asked to smile for two seconds five times. The results showed that average of the false rejection rate (FRR) of our method was 0% for seven subjects, while over 60% for two subjects. In other words, the system recognized the subjects' facial expressions, and subjects properly smiled in most cases.

As future work, we will evaluate FRR on actual situation as shown in Fig. 1 and 2. Also, we will evaluate whether other people can identify predefined actions or not.

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References

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