Poster: Korean Vowel Based Passwords

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Abstract—**This poster presents a novel password scheme that uses lines and points of Korean vowel letters for password entry. Users may choose any Korean words or phrases and enter it parts through a simple interface, so that usability problems on password memorability and entry could be alleviated. The proposed method may be particularly fit for smartphones and be resistant to shoulder surfing. While the scheme is based on Korean, it may be applied to other languages, including English, Japanese, and Chinese.**

Keywords—usable security; password scheme; textual passwords; graphical passwords; authentication

I. INTRODUCTION

Although alphanumeric passwords have been part of the authentication process for a very long time, they have usability problems, such as password memorability [1]; users are forced to recall weird passwords (a.k.a. strong passwords). Also, entering such weird passwords through virtual keyboards on small touchscreens of smartphones has resulted in another usability problem on password entry, as well as shoulder surfing susceptibility [2]. Although graphical passwords and smartphones seem a natural fit, so far not many graphical password schemes are in actual use on smartphones for many reasons [3].

In this paper, we propose a Korean vowel based password (KVBP) scheme, which may be particularly useful to password entry in smartphones. The proposed scheme is based on three elements of the Korean vowel letters. In the scheme, a user chooses an everyday Korean word or phrase and then enter its vowel elements as a password through a very simple interface, so that usability problems on password memorability and entry could be considerably alleviated. Also, characteristics, such as stroke directions and orders, of each user could be reflected in a password, which may improve password security. The paper also briefly presents some interface designs for KVBP entry and results from preliminary evaluations carried out on our prototype implementations.

Although our idea is based on the Korean alphabet, Hangul, it may be applied to other languages having vowel letters (e.g., the English alphabet, the Japanese alphabet, and so on). Moreover, it might be extended to tonal languages, such as Mandarin Chinese.

II. OUR SCHEME

The Korean vowel letters shown in Fig. 1(a) are based on three elements: a horizontal line, a point (a short horizontal or vertical stroke), and a vertical line. Thus, each vowel letter can be further decomposed into a sequence of such elements. For example, a vowel in the dotted circle (the 'wi' sound) can be decomposed into: (b) a sequence of horizontal and vertical lines (points are also represented as lines), or (c) that of the lines and points. Then, vowel letters of a Korean word or phrase can be also represented as a sequence of the elements. For example, (d) vowel letters of a 4-character-long Korean word (meaning 'Seoul Women's Univ.') can be represented as: (e) a sequence of 5 horizontal lines and 5 vertical ones, or (f) that of 1 horizontal line, 4 vertical ones, and 5 points.
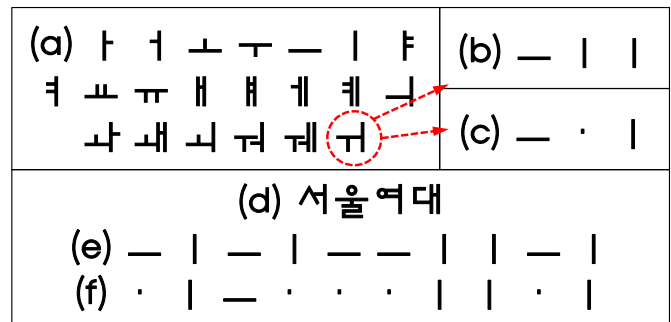

Fig. 1. Korean vowel letters and strokes

The proposed scheme uses a sequence of these elements as a password. That is, a user chooses any word, phrase, or sentence and then enters a sequence of its *vowel elements* as the user's password. The scheme includes two types of KVBPs: as shown in Fig. 1, (e) *line-based* passwords (LBPs) and (f) *line-and-point-based* passwords (LPBPs).

The proposed scheme may have the following merits.

- Problems on password memorability could be alleviated considerably. A user does not need to memorize a weird password. A user may choose an everyday word, phrase, or sentence and then use its vowel elements as a password.

- Characteristics of each user can be reflected, which may enhance password security. While everyone writes vertical lines from top to bottom, some people

habitually write horizontal line from right to left. Also, in LBPs, some peoples may use *different stroke orders*.

- It is virtually impossible to guess users' words. For, example, we may not guess a word in Fig. 1(d) from an LBP in Fig. 1(e). This is similar to guessing an English phrase 'security and privacy' from a sequence of English vowel letters 'euiaia.'

- KVBPs can be entered through a simple interface, which would be particularly useful to smartphones. This may also reduce typos and be resistant to shoulder surfing.
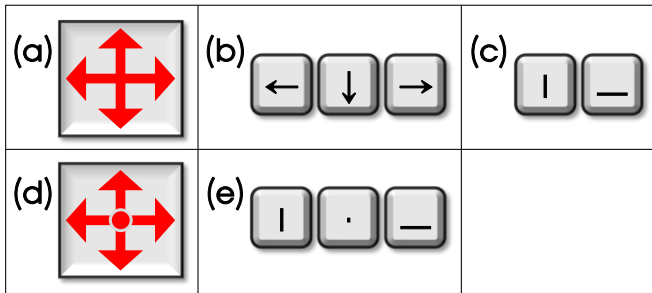

Fig. 2. Input interface designs for Korean vowel based passwords (KVBPs)

Fig. 2 shows some interface designs for entering KVBPs. In design (a), LBPs can be entered by sliding, as in handwriting. It could reflect some more characteristics (e.g., starting points of strokes) of each user. LBPs can be entered with (b) 3 arrow keys or (c) just 2 keys, which would be particularly useful to *low-end* devices or embedded systems. LPBPs can be entered (d) by sliding and tapping so that more characteristics of users could be reflected. Most Korean people would be familiar with design (e) since it is used to enter vowel letters in 'Cheon-ji-in' keyboards. Thus, it may minimize typos.

While the scheme is based on Hangul, it may be applied or extended to other languages. For example, we may use the English *vowel letters* as passwords. Also, the English or Japanese *vowel sounds* may be used as passwords. Moreover, in Chinese, a tonal language, *tones of syllables* may be entered for authentication.

III. IMPLEMENTATION AND EVALUATION

Based on the proposed scheme, we have implemented two types of prototypes shown in Fig. 3. In prototype (a), LBPs can be entered by dragging buttons. LPBPs can be done (b) with 3 keys, which are used for entering vowel letters in Cheon-ji-in keyboard. We have conducted preliminary surveys and evaluations on the prototypes. According to the evaluation results shown in Fig. 4, KVBPs were easier to recall than alphanumeric passwords since the users did not need to memorize complex passwords containing numbers or special letters. Especially, the users were familiar with interface (b), so that they could enter LPBPs, with ease, without a typo.
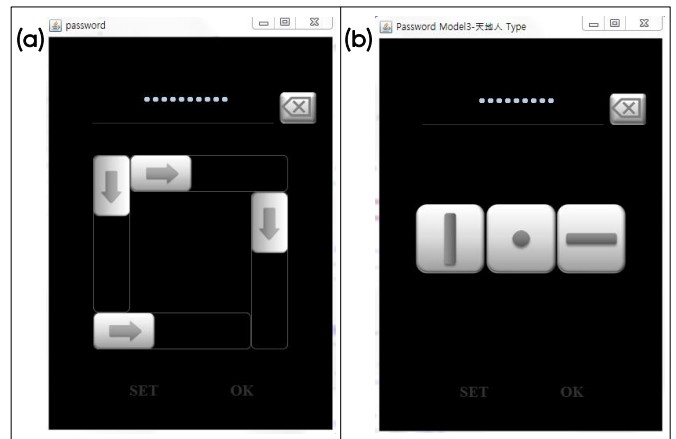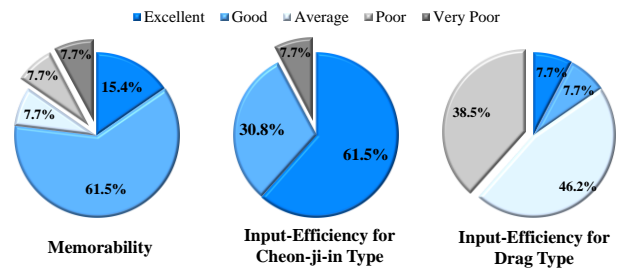

Fig. 3. Screenshots of our prototypes

Fig. 4. Preliminary evaulation results

IV. CONCLUSIONS AND FUTURE WORK

This paper presented KVBP scheme in which the vowel elements of an easy-to-recall Korean word or phrase are used as a password. Some interface designs for KVBP entry were also presented, which would be useful to password entry on smartphones and be resistant to shoulder surfing. The proposed scheme may be applied or extended to other languages, such as English, Japanese, and Chinese. As future work, we will conduct security analysis and usability surveys on the scheme. Based on the results, we will attempt to improve the scheme. Also, we will study applications and extensions of the scheme to other languages.

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