Title:

Pattern recognition based authentication in mobile and wireless system

Introduction

Nowaday, the mobile communication devices such as smart phone, lap-top, PDA, and etc. are widely used in our daily life. It brought convinience in our life, but meanwhile there is also some flaws exist because of the design shortages. Today, the wireless communication's security problem has become a very important issue for most wireless service operators and users.

To improve the security in wireless communication, system usually requires long and complex password to ensure the security of personal acount. But sometimes these password is hard to memorized. The approach of using hand writing and drawing pattern recognition to improve the reliable of client's authentication by using simple signature or simple hand drawing figures .

The complex process of pattern recognition generates data string and matrix which can be used to acheive the authentication task . The data strings are different because of the signature's uniqueness. This can be used to against the attack like dictionary attack or any other way which is target on the user's password.

Hidden Markov model and pattern recognition

The hidden markov model has been widely used in handwriting and voice pattern recognition field. A hidden markov model, as it defined by rabiner, *"is a doubly embedded stochastic process with an underlying process that is not observable (it is hidden), but can only be observed through another set of stochastic processes that produce the sequence of observations."* We can see the following figure is showing a general idea of a hidden markov model.
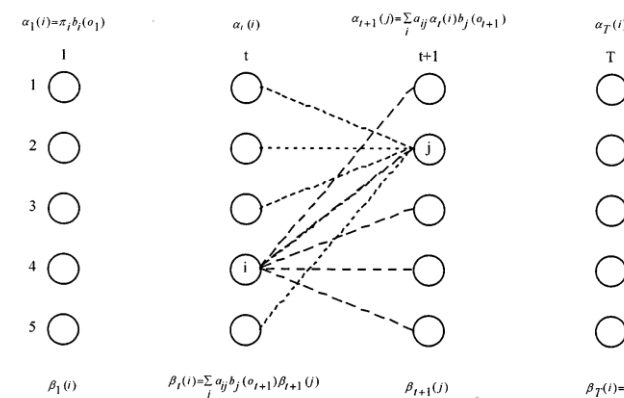

Figure 1 Hidden Markov Model

And for application in the handwriting pattern recognition, the figure 2 shows the general process of it.

We can see in this process the features extraction { $O_1, O_2, \cdots O_T$ } is very important for recognition. And in the post-processing, generated data can be used for the anthentication which is complex enogh to ensure the security requirement.

Besides handwriting pattern recognition, the hand drawing pattern recognition can also be a new way to replace the tradition password which type on the keyboard.

The drawing recognition process is almost the same as writing recognition process. But for the hand drawing figure, it will requires the figure elements recognition and elements relationship recognition.
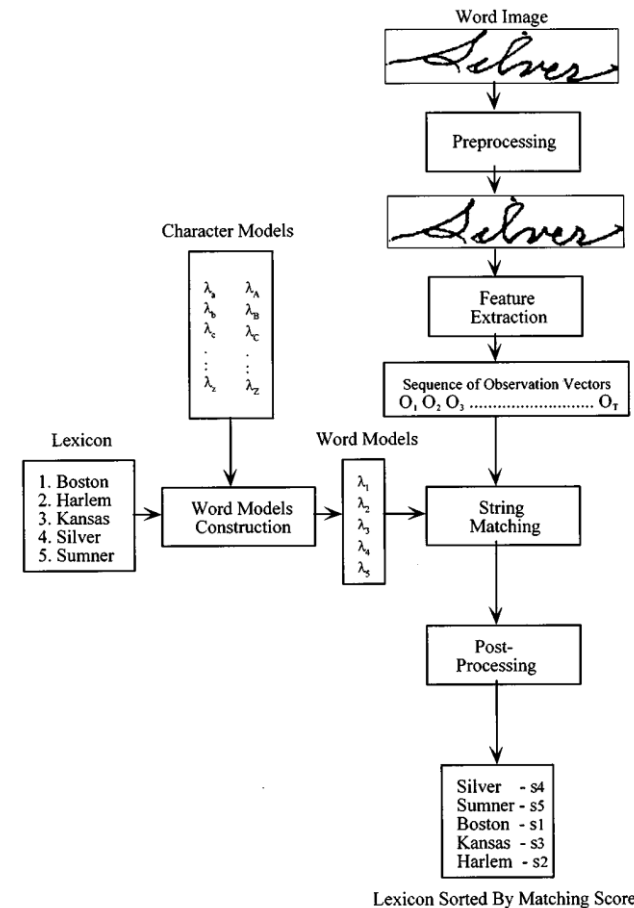

Figure 2 the process of handwriting pattern recognition

The elements recognition and element relationship recognition can be used to generate the matrix which is used for the access control matrix. We assume that in a simple hand drawing figure consisted by four elements: a big circle contain two small circle and an arc to form a face.

We can see in tabel 1 & 2, showing us the matrixes which can be use for the access contol in wireless system generated from a simple hand drawing figure.

	circle	triangle	ellipse	square	arc	line
Circle 1	1	0	0	0	0	0
Circle 2	1	0	0	0	0	0
Circle 3	1	0	0	0	0	0
Arc 4	0	0	0	0	1	0

Table 1 the elements recognition matrix

	Circle 1	Circle 2	Circle 3	Arc 4
Circle 1	0	1	1	1
Circle 2	0	0	0	0
Circle 3	0	0	0	0
Arc 4	0	0	0	0

Table 2 the elements relationship matrix

Therefore, if a figure contains more elements, it will contribute more elements in its matrix. And this can generate long data string for the system authentication.

Conclusion

Hidden Markov Model has aimed a good performance in the handwriting and drawing pattern recognition. when its applicated with other filters it can perfor much more stable than other pattern recognition algorithms.

Hand writing and drawing pattern recognition for the wireless system's authentication can be a new way to improve the security. And also can reduce the user's burden of remember long and complex password to ensure the system's security requirement.