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Dynamic signature recognition

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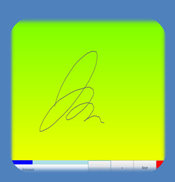
Abstract

Nowadays, we need more security to protect our information. If we want to increase the complexity of our password, we could add some special characters such as @, #, _, and % or increase its length. However, this in turn would increase the time to log in for a user. In this project, authentication will be faster and more secured against shoulder surfing using signature recognition technique on time series data. Our algorithm used dynamic time warping distance measure to analyze and recognize an input signature represented by a series of x, y-coordinates. We devised a special user interface that a user can provide the signature input, whose data are sampled every 10 ms. The input data were then analyzed in the authentication process to verify the user. Our experiment demonstrated that our shoulder-surfing protector program added more security and increased the recognition rate compared to the previously proposed image processing method.

Objective

Create software for efficient identity verification to protect against shoulder surfing problem by incorporating signature rhythm into consideration using Dynamic Time Warping algorithm

Method



Create program for input signature in binary

Create signature template form binary file

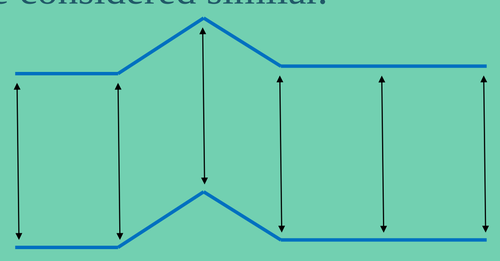
Create verification program by Windows Application in C#

Create Shoulder surfing protector program

Test in 10 people for results

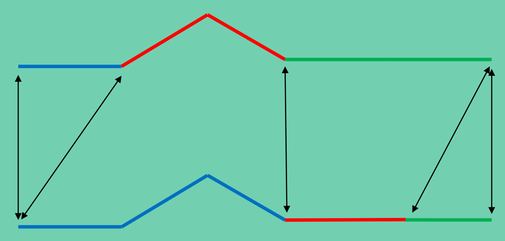
Algorithm

For each input coordinate, our algorithm matched it with the coordinate from the template signature so that the distance is minimized. If these two signatures are indeed similar, the distance of each coordinates pair will be small. The algorithm will consider all these distances and determine whether they are within an acceptable threshold for the two signatures to be considered similar.



Off-line algorithm

This algorithm only analyzed the shape of the signature by breaking the signature into equal segments and comparing their coordinates.



Dynamic Time Warping

This algorithm analyzed coordinates from on-line input by comparing with the signature template in 10 ms time interval. If the signature rhythms differ, even though the shapes are the same, the authentication will not succeed.

Result

User	1	2	3	4	5	6	7	8	9	10	
Real dtw	7	6	8	6	7	5	8	6	6	7	66 %
Real offline	10	10	10	10	10	10	10	10	10	10	100 %
Fake dtw	0	0	0	0	0	0	0	0	1	0	1 %
Fake offline	8	8	10	8	8	9	8	6	6	8	79 %

The table shows the number of times user pass login of 10 times in various conditions.

Main window

Signup window

Conclusion

Incorporating signature rhythm into consideration, Dynamic time warping algorithm increases login security by protecting against shoulder surfing problem. For real users, percent of login successful remains 66%; however, fake users can log in successfully almost only 0% (from 79% to 1%).

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Reference

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