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Implementation of Keystroke Dynamics Application for Identifying Emotional State

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Abstract— This paper describes the concept based on using standard input devices, such as keyboard and mouse, as sources of data recognition of user's emotional states. Applications do not adapt to user's context. User context includes information such as their location, emotional states, or situation. There have been various methods for evaluating emotional states that have varying rates of success, but they still exhibit one or both of two main problems preventing wide scale use: they can be intrusive to the user, and can require specialized equipment that is expensive and not found in typical home or office environments. This system using key strokes is more intuitive, unobtrusive and has a wider range of users. In the present paper, the emotional states are investigated via keystroke dynamics.

Keywords— emotion, keystroke dynamics, biometric, net beans, emotion detection

I. INTRODUCTION

A form of emotional intelligent would provide a richer context from which computer could change its behavior accordingly.There are two categories of Biometric: physiological (fingerprints) and behavioural (handwriting) [1]. Keystroke dynamics falls within the category of behavioural biometrics. The idea behind keystroke dynamics is that people have different typing styles and by analysing the timings of keystrokes, a person can be identified. A benefit of this metric is that measuring keystrokes can be done through a keyboard, thus negating the cost of typical physiological biometric systems which require expensive hardware to measure physical attributes.

"Keystroke dynamics is the study of unique timing patterns in the individual's typing and it includes extracting keystroke timing features such as the duration of key press and the time elapsed between key presses"

There have been various methods for evaluating emotional states like facial expression analysis, voice intonation analysis, change in breathing and physiological sensors attached to the skin etc. that have varying rates of success, but they still exhibit one or both of two main problems preventing wide scale use: they can be intrusive to the user, and can require specialized equipment that is expensive and not found in typical home or office environments. This technique is relatively straightforward to apply and is one of the least expensive biometrics. No additional devices need to be purchased, installed, or integrated. User's typing pattern is unique because of the neuro-physiological [2] factors that also make written signatures unique. Keystroke Dynamics as biometrics characteristics is not a new one. Keystroke Dynamics was first formally investigated by Bryan and Harter in 1897 as part of a study on skill gaining in telegraph operators. In 1975 Spillane suggested in an IBM technical bulletin that typing rhythms might be used for identifying the user at a computer keyboard. That bulletin described keystroke dynamics in concept. Forsen et al. in 1977 conducted preliminary tests of whether keystroke dynamics could be used to distinguish typists [3]. Gaines et al. in 1980 produced an extensive report of their investigation with seven typists into keystroke dynamics [4]. After then S. Bleha submitted his PhD thesis on Recognition system based on keystroke dynamics in 1988 [5]. R. Joyce and G. Gupta proposed an identity authentication based on keystroke latencies in 1990 [6]. F. Monrose et al. [7] proposed keystroke dynamic as a biometric for authentication in 2000. Different online and offline applications already have been done by fixed text and free text keystroke dynamics. Keystroke dynamics research has been going on for the more than thirty three years.

A. KEYSTROKE DYNAMICS FEATURES

There are several different features [8] which can be detected when the user presses keys on a Keyboard. Possible features include:

A. Pressing time (the time in which the key is held down)
B. Releasing time (the time in which the key is released).
C. Latency (the time between two consecutive keys 2).

II. RELATED WORK

We have published a research titled "Objective of Keystroke Dynamics for Identifying Emotional State".[9]

The idea behind keystroke dynamics appeared in the 20th century when telegraph operators could recognize each other based on their distinctive patterns when keying messages over telegraph lines. Keystroke dynamics is known with other names such as keyboard dynamics, keystroke analysis, typing biometrics and typing rhythms.

Keystroke dynamics is a behavioral biometrics which is the method of analyzing the way a user types on a keyboard and classify him based on his regular typing rhythm. It is the study of people who can be identified by their typing rhythms; much like handwriting is used to recognize the author of a written text. A research on identifying emotional states using keystroke dynamics in a real-life application has been presented in [10,11]. The authors gathered keystroke data from users during their usual daily computer activities, such as using word processor, mail or messaging applications. The users were interrupted from time to time, depending on their activity, by presenting their recently typed text and asking to fill in an emotional state questionnaire. Then they were also asked to retype a fixed text.

III. PROPOSED WORK

The proposed method is based on to calculate the pressing time, dwell time, mean time, range and standard deviation time of keystrokes. We analyses this work on laptop keyboard. There statistical method is used to measure the mean time and average time. The NetBeans IDE is an open-source integrated development environment. NetBeans IDE supports development of all Java application types. The NetBeans IDE is written in Java and runs everywhere where a JVM is installed, including Windows, Mac OS, Linux, and Solaris.

A. LOGIN PROCESS

When a user starts the application, a login activity is launched where a registered user submits his user id and password then start application to capture data and an unregistered user can register him by clicking on Sign up button.

B. NEW USER REGISTRATION

New user clicks new user button, then registration activity is displayed where user is asked to enter first name, last name user name, password, and re enter password, date of birth, email id and contact number, address and then save data in data base. See Figure 2.While the user is typing on keyboard for submitting a sample, factors like dwell time (time interval between consecutive key press and key release), flight time (time interval between consecutive key release and key press), total time and pressing time of characters key is calculated and upon clicking the save button, the values are stored in the respective table.

C. FIXED TEXT COLLECTION

User enter the username then select the present state of the user and type text given in paragraph then click on save button. Data save on database table which is known as fixed text table for every user.

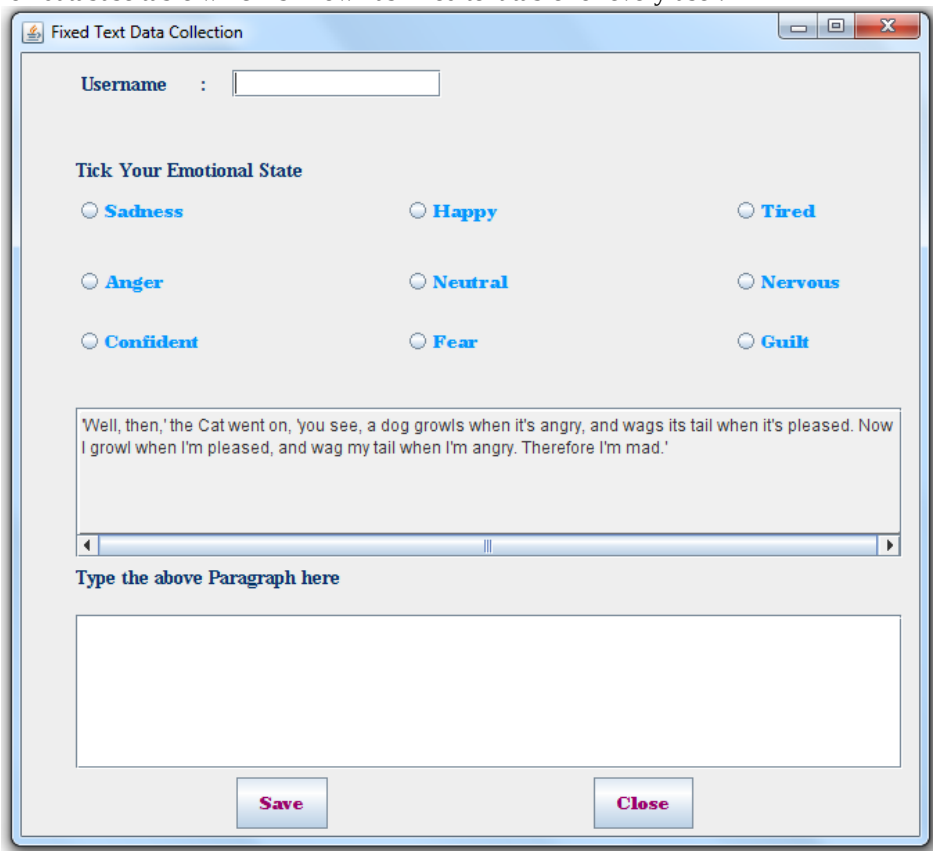

Fig. 3: Fixed Text Data.

D. FREE TEXT COLLECTION

Users enter the username and choose the current mental state of the user. Then click on save button.

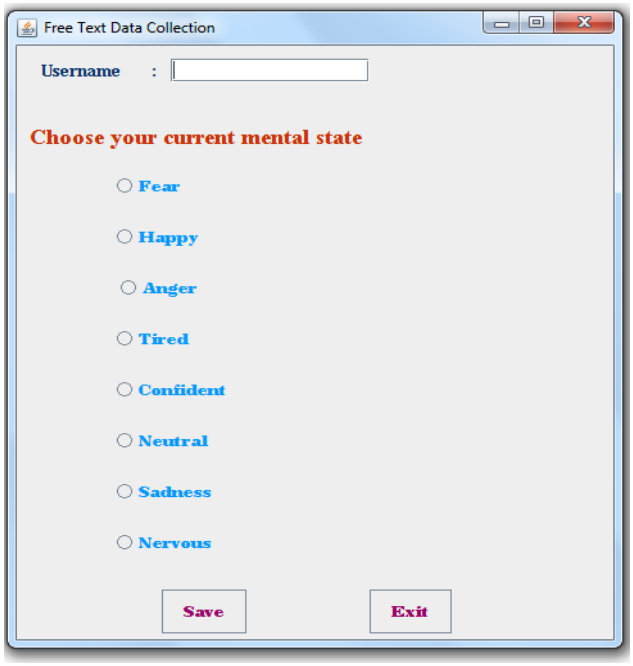

Fig. 2: Free Text Data

E. IDENTIFY EMOTIONAL STATE

Select the user name click on submit button then result display on the screen.

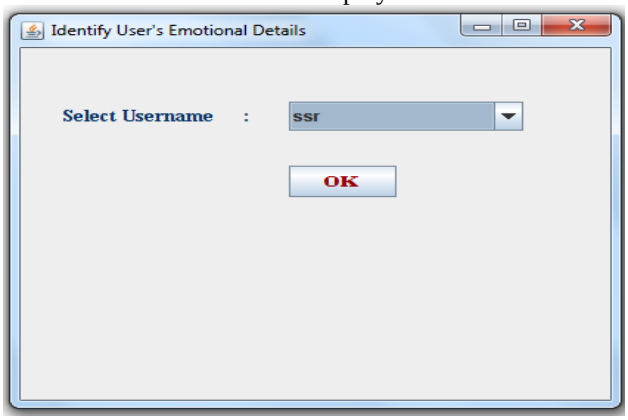

Fig. 3: Identify Emotional State.

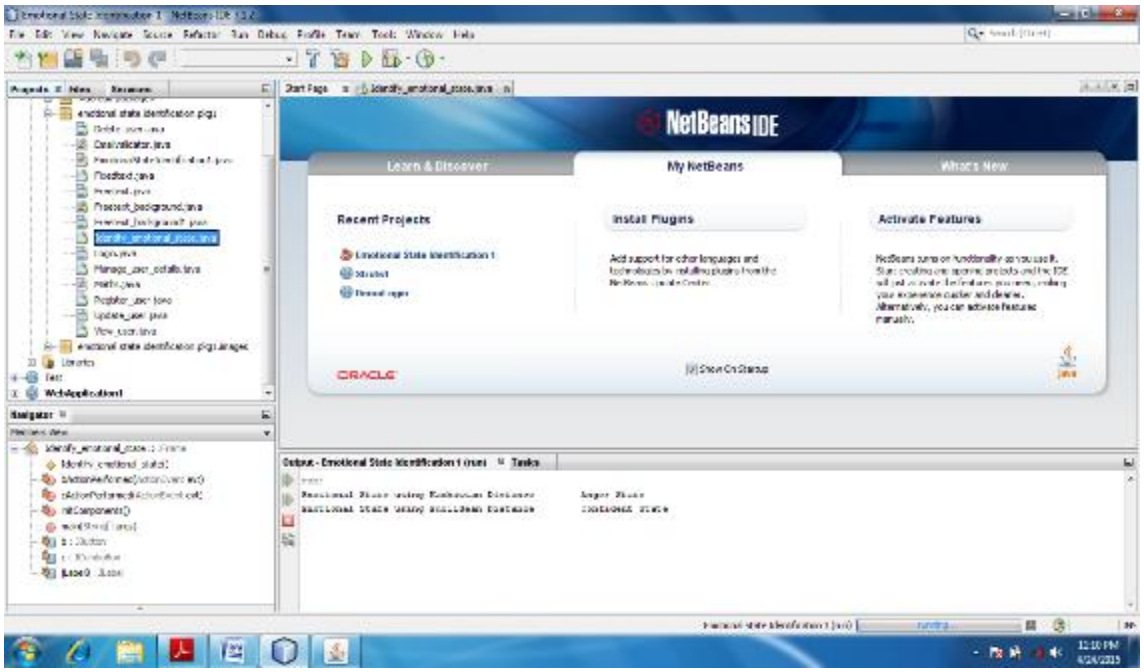

Fig. 4: Emotional State.

F. MANAGE USER

Admin manage the different user. We want to delete, update, create and view user.

IV. KYSTROKE FEATURES

The typing data cannot be used directly. Instead, set of timing features are extracted.

Specially, extracted Key press –key press times, key release – key release times and held times for all key pressed during fixed-text and free-text data collection [12, 13]. For these features show n table below:

List of Features
Minimum
Maximum
Mean
Mode
Median
Standard deviation
Variance

Specially, in the training phase, the mean vector of the set of timing vectors is calculated. In the emotional identification phase, the squared Euclidean distance between the test vector and the mean vector is calculated.

KEYSTROKE DYNAMIC ALGORITHMS:

Many classification methods have been applied in keystroke dynamics study over the last three decades, where statistical methods, features learning methods and neural network are popular. But in our experiment, following are the distance based algorithms were used to evaluate the system. Down Up key latency of two consecutive keys may be negative for key overlapping [14]. So we have to take absolute values of the samples. Our top result for confident state is accuracy between 76% to 90% and sadness, anger state is accuracies between 78% t0 85%.

V. RESEARCH METHODOLOGY

A. Euclidean Distance

Euclidean distance is the most commonly used it calculates the root of square differences between coordinates of two Objects[15].

$$D_{XY} = \sqrt{\sum_{k=1}^{m}(xik - xjk)^2)}$$

B. Manhattan Distance

Manhattan distance or city block distance represents distance between two points in a city road grid. It computes the absolute differences between coordinates of two objects.

$$D_{XY} = \sum |x_{ik} - x_{jk}|$$

TABLE 1

Experiment result of, overall accuracy, number of iteration, mean absolute error in Euclidean distance function, Manhattan and distance function

For Data Size 5

	Euclidean	**Manhattan**
Overall accuracy	80%	70%
No. Of Iteration	50	25
Mean Absolute Error	0.8	0.3

TABLE 2

Experiment result of overall accuracy, number of iteration, mean absolute error in Euclidean distance function , Manhattan and distance function

For Data Size 10

	Euclidean	Manhattan
Overall accuracy	84%	70%
No. Of Iteration	20	10
Mean Absolute Error	0.4	0.5

VI. CONCLUSION

The current methods of measuring emotional states of computer users are very expensive and invasive technologies. Keyboard is essential for a computer device, which can recognize our typing style and very much unique as per our experiment.

In this paper we have proposed a keystroke dynamics based application for recognizing emotional states of computer user. This method is inexpensive and non-intrusive to user. For keystroke dynamics method, timing features of fixed texts has been analysed because fixed text showed better results than free text.

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REFERENCES

[1] B. Miller, Vital sings of identity, IEEE Spectrum, 1994, pp. 22-30.

[2] R. Gaines, W. Lisowski, S. Press, and N. Shapiro, "Authentication by keystroke timing: some preliminary results," Rand Corporation, Tech. Rep., 1980.

[3] Forsen G., Nelson M., and Staron R., Jr. "Personal attributes authentication techniques", *Technical Report RADC-TR-77-333*, Rome Air Development Center, October 1977.

[4] Gaines R., Lisowski W., Press S., Shapiro N., "Authentication by keystroke timing: some preliminary results", *Rand Rep. R-2560-NSF*, Rand Corporation, 1980.

[5] Bleha S., Slivinsky C. and Hussien B., "Computer-access security systems using keystroke dynamics", *IEEE Transactions on Pattern Analysis and Machine Intelligence* 12 (1990) 1217–1222

[6] Picard, R.W. *Affective Computing*. MIT Press, Cambridge, 2007.

[7] P. Ekman. An argument for basic emotions. Cognition and Emotion, 6:169–200, 1992.

[8] Clayton Epp, Michael Lippold, and Regan L. Mandryk, Identifying Emotional States using Keystroke Dynamics , CHI 2011

[9] "Objective of Keystroke Dynamics for Identify motional state"', *Publishing in C*SIT Vol. 6, issue 1, pp. 632–636

[10] Emotion in human-computer interaction, *Scott Brave and Clifford Nass, Stanford University*

[11] F. Monrose and A. Rubin. Authentication via keystroke dynamics. In Proceedings of the 4th ACM Conference on Computer and Communications Security. ACM, 1997.

[12] F. Monrose and A. D. Rubin. Keystroke dynamics as a biometric for authentication. Future Generation Computer Systems, 16(4), 2000.

[13] Brown, M. and Rogers, S.J. User identification via keystroke characteristics of typed names using neural networks. *Int. J. Man-Mach. Stud. 39*, 6 (1993), 999-1014.

[14] Joyce, R. and Gupta, G. Identity authentication basedon keystroke latencies. *Commun. ACM 33*, 2 (1990), 168-176.

[15] Sheng, Y., Phoha, V., and Rovnyak, S. A parallel decision tree-based method for user authentication based on keystroke patterns. *IEEE Transactions on Systems, Man, and Cybernetics 35*, 4 (2005), 826-833.

[16] L. M. Vizer, L. Zhou, and A. Sears. Automated stress detection using keystroke and linguistic features: An exploratory study. International Journal of Human-Computer Studies, 67(10), 2009.

