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Recent Advances in User Authentication Using Keystroke Dynamics Biometrics

Edited by Yu Zhong and Yunbin Deng

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Preface

These days, computers are involved with many activities in the day-to-day life of human beings. The widespread use of computers and mobile devices to store personal, sensitive and critical information makes security issues, and in particular user authentication, an important field of research. It is a tedious and challenging task to memorize over a dozen passwords for different accounts needed for our daily life. Furthermore, password based one-time user authentication is inadequate for many applications.

Behavioral biometrics for user authentication constitutes an emerging trend in research on security issues. Keystroke dynamics is currently the most popular behavioral biometrics for user authentication on computers as it is non-intrusive and cost-effective. Research on this topic is growing rapidly due to increasing demand for secured access to computers and other resources. By editing this book of cutting edge keystroke dynamics research work, we promote future research to advance the state of the art.

This book is designed for professionals with any level of interest and expertise in keystroke dynamics biometrics. It is useful to graduate students who want a glimpse of the field, PhD candidates who are developing topics for their dissertation, and researchers who are in need of a quick reference on the latest advances. We hope the ideas and concepts in the book, which address many of the challenges on the horizon, will stimulate further research and promote synergy in this rapidly growing field.

The first chapter, titled *"A Survey on Keystroke Dynamics Biometrics: Approaches, Advances, and Evaluations,"* reviews existing approaches, surveys publicly available datasets, and describes recent advances and trends in the field of keystroke dynamics.

Keystroke dynamics analysis can benefit greatly from the latest advances in machine learning. The second chapter, titled *"Keystroke Dynamics User Authentication Using Advanced Machine Learning Methods,"* adopts three popular voice biometric approaches for keystroke dynamics based user authentication. Cutting edge performances are achieved using these methods on the CMU keystroke dynamics dataset.

One key benefit of keystroke biometrics is that it allows for continuous user authentication to ensure a genuine user during the entire login session. This continuous system presents challenges for both authentication algorithms and performance

evaluations. The third chapter, titl*ed "Continuous Authentication with Keystroke Dynamics,"* presents a continuous authentication system where a user is monitored and evaluated at each key stroke. A trust model to assess the authenticity of the user is also described.

Ubiquitous mobile devices are becoming an increasingly indispensable and important part of our everyday lives. It is essential to ensure secure access of these devices as they store not only personal, but oftentimes sensitive and even critical information. The fourth chapter, titled *"Keystroke Dynamics Advances for Mobile Devices Using Deep Neural Network,"* applies the state of the art deep learning classification method to multi-modality keystroke relevant sensory data collected from mobile devices for enhanced mobile keystroke biometrics.

Keystroke dynamics is a behavioral biometrics that is influenced by the physical and mental states of the user. Consequently, it is also possible to infer emotions using keystroke dynamics. The fifth chapter, titled *"Will User Authentication Using Keystroke Dynamics Biometrics Be Interfered by Emotions? – NCTU-15 Affective Keyboard Typing Dataset for Hypothesis Testing,"* examines the emerging field of affective computing using keystroke dynamics. A new affective keyboard typing dataset is presented for studying the effects of human emotion on keystroke dynamics biometrics, and reversely for emotion recognition using keystroke dynamics.

This book would not be possible without the hard work of the authors of each chapter. We would like to thank all of the contributing authors for sharing an exceptionally high quality body of work that addresses many of the new fronts of keystroke dynamics research. We also thank Peter Yi for editing the final manuscript and Maria Katefidou at *Science Gate Publishing* for her suggestions and assistance in the production of this book.

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