Chapter 10
Novel Applications of Multimodal Biometrics

ABSTRACT

This chapter presents the original idea of using social networks and context information in multimodal biometric for increased system security. A recently investigated study's outcomes is presented, which showcase this idea as a new step in multi-biometric research. Since this method does not degrade the performance of the system and is not computationally expensive, it can be used in any biometric framework. However, as the amount of improvement depends on how distinctive and predictable people are in terms of their behavioral patterns, the method is most suitable for the predictable environments with some predefined behavioral routines. Fine tuning the system for each environment to find the most suitable parameters based on the behavioral patterns of that specific environment can result in better performance. This research is validated on example of gait recognition.

1. INTRODUCTION

The idea of using social network for multimodal biometric only recently has made its way into state-of-the-art multimodal biometric research. In the previous sections, we proposed to use chaotic neural network for better trait learning, and presented the dimensionality reduction technique for simplifying biometric template to ease the burden on computational resources. We further suggested to combine biometric data with information about people including "soft biometric." This section introduces one more idea—idea of using social connections—to the mix.

Let us consider this idea for a moment. The person identity can be determined not only through passport data (eye color, height, weight, birth date, nationality, etc.), and not solemnly from finger-

DOI: 10.4018/978-1-4666-3646-0.ch010

prints or iris, but also through associations with others. This, to the common questions on identity estimates: "What person knows," "What person possesses," and "Who person is" which correspond to Knowledge, ID Possession and Biometrics, we add a novel component:

"Whom Person Knows"

Abundance of social networks and sites, used for communication, news and information exchange (Facebook, MySpace, Classmates, LinkedID, Twitter, MSNLive, etc.) has created a highly favorable environment for connecting people regardless of their physical appearance, geographical location, age, religion, job etc., based on some commonly shared interests or trends. These are those trends that we are specifically interested in assisting to determine what person identity is.

Let us examine the principles under which Social networks works. Normally, individual users need to create their profiles containing certain bibliographical information about themselves. To protect user privacy, social networks usually have controls that allow users to choose who can view their profile, who may contact them, who can add them to their list of contacts, etc. Users can upload images to their profiles, post blog entries for others to read, search for other users with similar interests, share lists of contacts, follow threads of discussions, celebrate birthdays, give virtual cards or flowers etc. These social connections, friends, groups of interests, contacts, discussion threads or event favorite TV shows can, in combination, identify individual as good if not better than usual password/ID/biometric does. The difficulty in exploiting this type of information as primary cue is, however, abundant. The difficulties are:

- Social data needs to be gathered from social sites, and filtered to render it suitable for subsequent identification processes.
- Variety of social networks and different types of data/connections in networks need to be identified and represented uniformly.
- Certain social traits need to be chosen over others to render better recognition results.
- Social features need to be studies and standards on them developed.
- Social networks and on-line communities are highly volatile phenomena which might be available today but not tomorrow due to server/network connection, administrator/host, maintenance/migration, number of users.
- High computational power is needed for identification.

However, to counteract those negative trends, some features of social networks make them ideal candidates as *supplementary traits for multi-biometrics*.

They include:

- Unique set of interests, which is highly valuable for person identification.
- Unique network of close friends for each individual which can be used for recognition.
- Data is abundant.
- Data is accessible, usually freely shared by network users.
- It can be collected/processed remotely at any moment of time, and does not requires any specialized expensive hardware to collect.

Moreover, secondary uses of such information can shine light not only on security or person identification, but also on other scientific research (ethics, consumer surveys, psychology, learning, collaborative environments, virtual reality, art).

2. GAIT ANALYSIS IN MULTI-BIOMETRIC RESEARCH

Let us now introduce one more biometric—based on Human Gait—and explain how its performance can be augmented using social traits.

Geo-Fence Technique for Prevention of Human Kidnapping
Gabriel Babatunde Iwasokun, Olayinka Oluwaseun Ogunfeitimi, Oluyomi Kolawole Akinyokunand Samuel Oluwatayo Ogunlana (2021). *International Journal of Smart Security Technologies (pp. 21-41).*
www.irma-international.org/article/geo-fence-technique-for-prevention-of-human-kidnapping/284846