A New Multimodal Biometric Identification Approach

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Abstract

Several authors [1] [2] [3] [4] [5] have shown that multimodality was a highly efficient solution for biometric identification and allows to increase performance and reliability. Indeed, the acquisition of multiple biometric features makes it much more difficult for an impostor to spoof the system with artificially developed samples. However, we do not get these benefits for free: multimodal biometric systems are less profitable and have significant effects on their users. Some of them may indeed lead a non acceptance by their users, in particular when it comes to privacy issues that may result when acquiring data at multiple levels.

That is why it is always important to explore the possibility of finding new systems that could be accepted by users and which are fully reliable than the previous ones.

In this paper we present a new approach for speaker biometric identification. This approach is a user friendly platform which adds a new modality, namely a virtual character, which will be easily accepted by users. The virtual character [6] will first put the users in a comfortable position and simultaneously acquire the information necessary for their identification. Then, it will guide them step by step until the end of the process of identification. The users are put in the best conditions which will facilitate their participation and acceptance to be identified.

Keywords: *Speaker recognition, biometric identification, multimodal identification, virtual character.*

1. Introduction

Biometric identification is currently providing practical and effective solutions that enable the design of very powerful and highly efficient security systems. These systems typically use several modalities acquired by different sensors (fingerprint and iris). They are very reliable and very efficient but they are constraining and expensive [7] [8].

In this paper we propose a non constraining biometric identification system which will exploit the visual and voice properties of the user in order to establish his identity. Furthermore, to improve the performance of classification, we propose to use a new modality, namely a virtual character, capable of exchanging information with the user who comes to the system. The virtual character will be in charge of putting the user in the best conditions in order to facilitate the acquisition of information which is necessary for his identification.

2. Architecture of the proposed system

The propsed system is divided in three modules:

- A vocal identification module
- A visual identification module
- A virtual character module

We can also add other modules in order to increase the performances of our system, for example a fingerprint module, based on the degree of the security needed or sought.
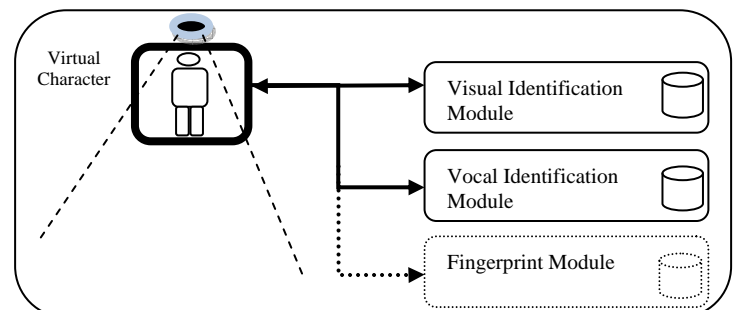

Fig 1. System Architecture

3. Operating mode of the system

In a multimodal biometric system, the acquisition of biometric data is a bit more complex. The role of the

IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 2, No 1, March 2012
ISSN (Online): 1694-0814
www.IJCSI.org

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virtual character is to organize, manage the process of acquisition and post acquisition and ensure the rapidity and fluidity of identification. Figure 2 shows the different steps of the system:
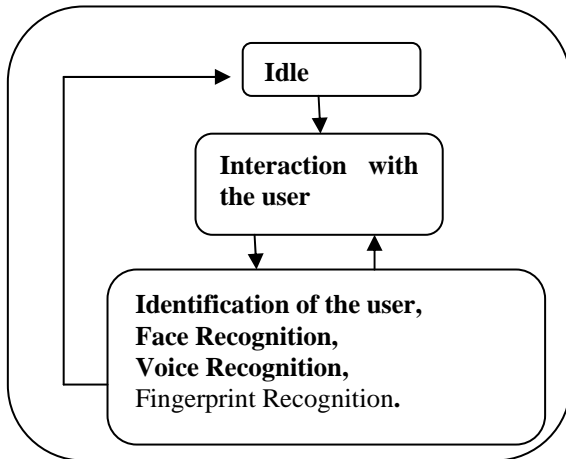

Fig 2. General Scheme of the system

1. **Idle:** Initially, the virtual character is in its default state (idle state), until an incident excites the system (detection of a human from a nearby camera).
2. **Interaction:** Once a human is detected, the virtual character welcomes the user in order to attract his attention and direct his look to the system, this is very important to ensure a better capture of a facial image.
3. **Identification:** we use the following protocol in order to ensure the identification process:

First of all the system is initialized, the sensor is ready for the detection of the person and the virtual character is at idle state. Once a person is detected, the virtual character welcomes it, intiate the process of face detection and begins a dialogue (using a predefined questionnaire) in order to get sufficient vocal information for the speaker identification process. The system fuse the scores of the two processes and if the obtained score is higher than a predefined threshold the person is granted the access, otherwise the virtual character asks him to to introduce his fingerprint. A fusion of the precedent score and the score obtained by the fingerprint identification process is done and compared with another threshold, if it is higher the person is granted the access, otherwise after a predefined number of attempts the person is denied the access.

4. **Main Interface of the platform**

IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 2, No 1, March 2012
ISSN (Online): 1694-0814
www.IJCSI.org

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5. Conclusion

In this paper we have described the overall architecture of a multimodal platform using a new approach for detecting the speaker. The proposed system is user friendly and allows getting better results and is easily accepted by the users. The introduction of the virtual character helps in increasing the performance of the system and guides the user from the beginning until the end of the identification process.

Acknowledgments

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