

An affordable contactless security system access for restricted area

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We present in this paper a security system based on identity verification process and a low-cost smart camera, intended to avoid unauthorized access to restricted area. The Le2i laboratory has a longstanding experience in smart cameras implementation and design [1], for example in the case of real-time classical face detection [2] or human fall detection [3].

The principle of the system, fully thought and designed in our laboratory, is as follows: the allowed user presents a RFID card to the reader based on Odalid system [4]. The card ID, time and date of authorized access are checked using connection to an online server. In the same time, multi-modality identity verification is performed using the camera.

There are many ways to perform face recognition and face verification. As a first approach, we implemented a standard face localization using Haar cascade [5] and verification process based on Eigenfaces (feature extraction), with the ORL face data base (or AT&T) [6], and SVM (verification) [7].

On the one hand, the training step has been performed with 10-folds cross validation using the 3000 first faces from LFW face database [8] as unauthorized class and 20 known faces were used for the authorized class. On the other hand, the testing step has been performed using the rest of the LFW data base and 40 other faces from the same known person. The false positive and false negative rates are respectively 0,004% and 1,39% with a standard deviation of respectively 0,006% and 2,08%, considering a precision of 98,9% and a recall of 98,6%.

The current PC based implementation has been designed to be easily deployed on a Raspberry Pi3 or similar based target. A combination of Eigenfaces [9], Fisherfaces [9], Local Binary Patterns [9] and Generalized Fourier Descriptors [10] will be also studied.

However, it is known that the use of single modality such as standard face luminosity for identity control leads often to ergonomics problems due to the high intra-variability of human faces [11]. Recent work published in the literature and developed in our laboratory showed that it is possible to extract precise multispectral body information from standard camera.

The next step and originality of our system will resides in the fact that we will consider Near Infrared or multi-spectral approach in order to improve the security level (decrease false positive rate) as well as ergonomics (decrease false negative rate).

The proposed platform enables security access to be improved and original solutions based on specific illumination to be investigated.

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