

Counter measures to 2D facial spoofing attacks

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PROPOSED ALGORITHM

In this work, we propose a novel approach to a challenging problem of detecting 2D facial spoofing attacks. Generally, it is not possible to depend completely on liveness detection (facial movement and eye blinking) because there are many problems of attacks which are performed by displaying a video recording of the real user or placing a printed photo of a real user in front of the camera and complex outdoor lighting with wide range of viewpoints. Therefore, the proposed method consists of performing both Texture and Motion analysis on video to provide a secure biometric system.

The proposed method analyzes and combines the following 3 intuitive visual features- the texture of the facial images using local binary patterns (LBP), motion based algorithm (Face-Background Consistency) and texture with motion based background modeling followed by the 2D Discrete Fourier Transform. We used a dynamic SVM-HMM hybrid model for the learning.

1. Face print have printing quality defects which can be detected by using the texture features [1]. These features can also be used in face recognition. LBP operator is applied on the input frame and then histogram is computed of each frame.
2. Face Background consistency feature [2] is used as a complementary to non-rigid motion approach. We used the Gaussian Mixture Model (GMM) [4] based background modeling method to describe the motion in the scene.
3. Some Transforms like Wavelet decomposition is effective only in case of banding effect in fake video but banding effect is not necessarily present in High Definition fake Video. Similarly, simple noise based Fourier spectrum [3] of videos, sole texture features and motion features are ineffective in case of High Definition fake videos. To deal with HD fake videos, we combined the Motion with texture analysis i.e. 2-D discrete Fourier transform is applied on Background Modeled [4] video to distinguish between valid and fake users for video based spoofing. Then average is taken of a complete FFT transformed video and the histogram is computed of the average frame. This histogram is used as a feature to train the SVM-HMM model.

The HTER measured from the proposed algorithm for available test dataset equaled 0.0.

REFERENCES

- [1] J. Maatta, A. Hadid and M. Pietikainen. Face Spoofing Detection From Single Images Using Micro-Texture Analysis. In Biometrics (IJCB), 2011 International Joint Conference on, pages 1–7. IEEE, 2011.
- [2] J. Yan, Z. Zhang, Z. Lei, D. Yi, SZ. Li. Face Liveness Detection by Exploring Multiple Scenic Clues. 12th International Conference on Control, Automation, Robotics and Vision, ICARCV 2012
- [3] Allan da Silva Pinto, Helio Pedrini, William Robson Schwartz, Anderson Rocha. Video-Based Face Spoofing Detection through Visual Rhythm Analysis. 25th SIBGRAPI Conference on Graphics, Patterns and Images
- [4] Stauffer and W. Grimson. Adaptive background mixture models for real-time tracking. In CVPR. IEEE, 1999.