

Title Facial Liveness Testing for the Web - what are the most suitable and effective methods?

Project Type Computer Vision, Image Processing and Security

Description In order to avoid spoofing in facial recognition systems, liveness tests are needed. While various liveness tests exist, some require specialized hardware and are therefore not suitable. This project aims to select the most suitable methods for a web facial authentication system, and analyze their effectiveness in terms of security. A liveness test is suitable if it uses only one built-in camera (found within laptops in the webcam, or in mobile devices as the front camera), and potentially the device screen (which varies in size depending on the device used), and can be done in near real time.

Minimum Objectives

- Build the test framework, to test using several different datasets and liveness tests.
- Implement the image quality based liveness test.
- Train the classifier used within the image quality based liveness test.
- Evaluate the image quality liveness test.

Intermediate Objectives

- Implement the eye tracking liveness test.
- Train the eye tracking liveness test classifier.
- Evaluate the eye tracking liveness test.
- Implement the CNN based liveness method (involving texture and temporal metrics).
- Train the CNN based liveness method classifier.
- Evaluate the CNN based liveness method.
- Compare CNN, eye tracking, and image quality based liveness methods together.

Advanced Objectives

- Implement a consolidation layer, combining the metrics above through a classifier.
- Train the consolidation layer classifier
- Evaluate the performance of the consolidation layer (i.e. all methods when integrated together) compared to each individual method on it's own.
- Implement the facial flashing liveness test ¹

References

- Keras (<https://keras.io>) for Machine Learning
- OpenCV (<https://opencv.org/>) for Image Processing
- Image quality based liveness test (<https://ieeexplore.ieee.org/document/6671991>)
- Eye tracking liveness test (<https://waset.org/publications/5308/liveness-detection-for-embedded-face-recognition-system>)
- CNN based liveness test (<https://arxiv.org/pdf/1408.5601.pdf>)
- Facial Flashing liveness test (<https://arxiv.org/pdf/1801.01949.pdf>)

¹An optional objective. Not shown in the Gantt chart as it's not an essential component of our research.

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