



AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Computer and System Engineering

Automatic Liveness Detection from Facial Images

A Thesis submitted in partial fulfillment of the requirements for the degree
of

Master of Science in computer and system Engineering

By

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Bachelor of Science in computer and system Engineering

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Statement

This thesis is submitted as a partial fulfillment of Master of Science in Electrical Engineering (computer and system department), Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis summary

Liveness detection is a vital research field when using biometric systems in securing our data. As with technology increasing the usage of the face is preferred in protecting mobile and laptops data. But most devices use biometric systems that are easily attacked by using images of the user, 3D masks, HD videos or some makeup. Thus, the need for liveness detection is increasingly required. As it can detect if the live person in front of the camera in the capture time or it's spoofed one.

Liveness Detection can be implemented using several ways; as using special cameras, detecting some user liveness by asking the user some questions, asking the user to make some movements by head or hand, or by detecting face features as we perform in our thesis.

We enhanced the OULU approach that detects the texture feature and local shape analysis of the face by replacing HOG with customized SIFT to detect the local feature and as for texture, we used LBP and Gabor wavelet.

We perform our tests first in replay attack dataset then get the best parameters that are applied to another 2 publicity datasets NUAA and CASIA. The results in the three datasets are better than

OULU approach. As We use EER and ROC curves to show the experiment results and comparison between datasets.

By applying the proposed approach AUC increases from 0.9741 to 0.9764 NUAA, and on CASIA the area under the curve (AUC) increases from 0.9925 to 0.9974 and on Replay Attack the AUC increased from 0.9452 to 0.9603 And EER from 7% to 6.25% .

Keywords: Images, Liveness, Faces, Detection,
Data-set, and spoofing

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List of Abbreviation

3D	Three Dimension
HD	High Definition
OULU	OULU University
HOG	Histogram of Oriented Gradient
SIFT	Scale Invariance Feature Transform
LBP	Local Binary Pattern
NUAA	Nanjing University of Aeronautics and Astronautics Photograph Imposter Database
CASIA	Chinese Academy of Sciences Institute of Automation Photograph Imposter Database
EER	Error Equivalent Rate
ROC	Receiver Operating Characteristic
NIST	National Institute of Standards and Technology
IJCB2011	International Joint Conference on Biometrics 2011
PLS	Partial Least Squares
SVM	Support Vector Machine
RGB	Red Green Blue
ICA	Independent Component Analysis
tLBP	Transition LBP
dLBP,	Direction coded LBP