

## Neural Networks for identifying drunk persons using thermal infrared imagery

Neural networks were tested on infrared images of faces for discriminating intoxicated persons. Two different experimental approaches were thoroughly investigated. In the first one, each face was examined, location by location, in order to find out those regions that can be used for discriminating a drunk from a sober person by means of neural structure convergence. It was found that it was mainly the face forehead that changed thermal behaviour with alcohol consumption. In the second procedure a single neural structure was trained on the whole face. The discrimination performance of this neural structure was tested on the same face, as well as on unknown faces. The neural networks presented high discrimination performance even on unknown persons, when trained on the forehead of the sober and the drunk person respectively.

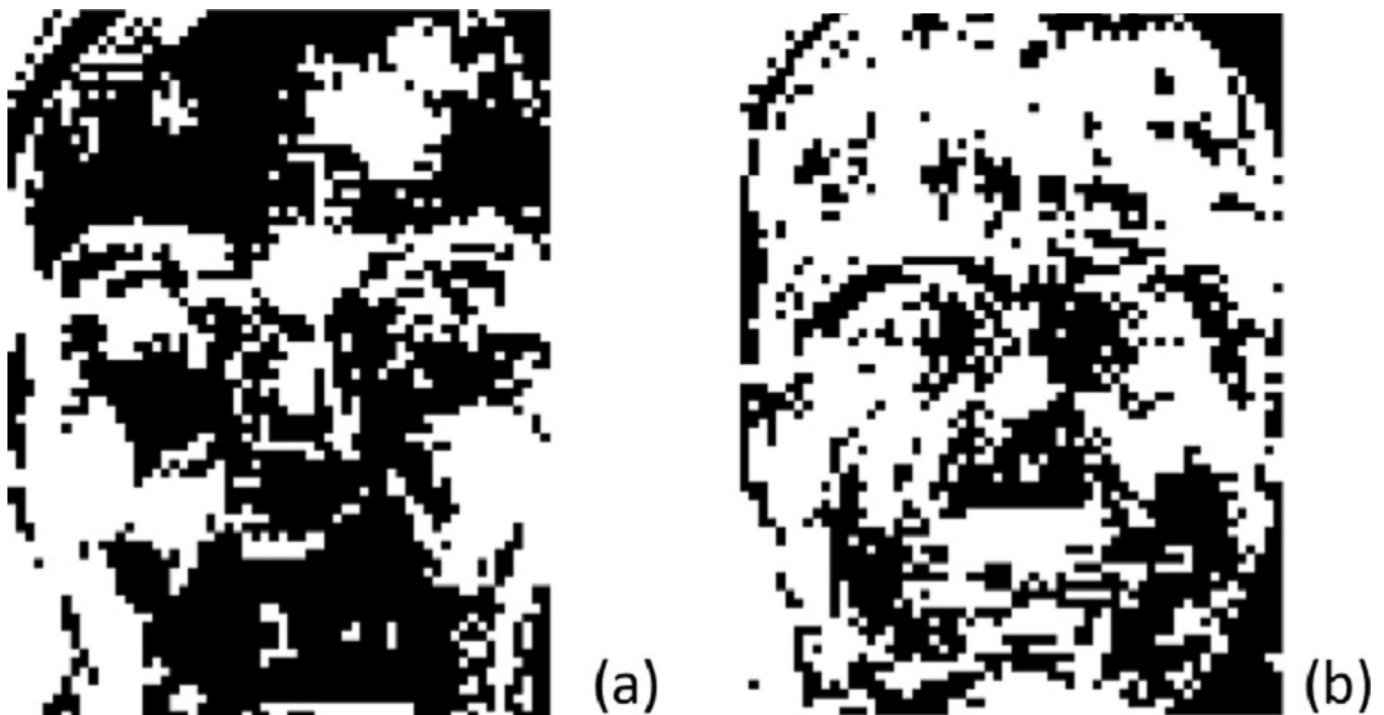


Fig. 1. Results taken when a neural network trained with the data from a specific person, it is tested on the face of another person, when he is sober (a) and when he is drunk (b). For 100% identification success, the image of the sober person should be black while that of the drunk person should be white.

Actually, in this work the utility of the thermal images in identifying drunk persons is assessed by means of a "blind approach", i.e. the neural networks, where simple pixels from the face of the persons are used as input to the networks. In the experimental procedure, forty-one persons were

involved. They were initially sober and then drank a specific amount of alcohol in a systematic way. The participants were aware about the experimental procedure. Thermal images were obtained from calm and sober persons, as well as from drunk persons having consumed the same quantity of alcohol, while the acquisitions were taken on specific time instances. In this sense, the database created can be considered adequate, since it is the only one found in the literature providing all this information [[www.physics.upatras.gr/sober/](http://www.physics.upatras.gr/sober/)].

Only intoxicated situation is tested in the experiments, assuming that no other scenario happens; i.e. the people employed were calm and in normal physical and psychological condition, healthy, without psychological stress or any kind of body exercise before the experiment.

The significant contribution of this work is that it shows that person intoxication can be detected using the thermal images of the drunk persons only. This is very important, since in real intoxicated person identification procedures, the corresponding sober images are not available. The thermal images of the intoxicated person due to the increased activity of the dense vessel network around the nose and the forehead provide the necessary information for detecting intoxication. The infrared images of the intoxicated person contain personal information and simultaneously give clear evidence to the authorities to proceed to further investigation with other evidence supporting intoxicated situation. Based on this method smart devices could be manufactured which will make alert the people close to an intoxicated person, or inactivate important infrastructures. Accordingly, a clever vehicle will not start its engine; intoxicated persons won't be allowed to enter crucial infrastructures or to be involved into activities that require increased attention, thus improving the security of the citizens.

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