Fingerprints and faces can be faked, but not brain patterns

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(PhysOrg.com) -- Sensors able to identify individuals' brain patterns and heart rhythms could become part of security systems which also use more traditional forms of biometric recognition, thanks to pioneering work being done by European researchers.

Since 9/11, the need to secure important facilities from terrorist attack has become a top priority around the world. And one of the keys to this is making sure the right people are allowed into sensitive areas and the wrong people are kept out.

A range of technologies and systems have been deployed in the past few years, but the more successful they are the more obtrusive they tend to be, causing disruptions and delays.

For the past three years, a consortium of academic and research institutions and private-sector companies have been looking at developing new technologies that aim at enhancing both security and safety across a wide spectrum of applications.

At the same time, they have been improving existing technologies with the aim of making recognition techniques much more unobtrusive.

Combining biometrics and sensors

At the heart of the EU-funded HUMABIO research project is combining

new types of biometrics - methods used for the unique recognition of humans - with the latest sensor technologies.

As well as developing sensorial and connectivity hardware for specific biometric applications, the researchers had to come up with sophisticated new software to extract the biometric profile of individuals, based on physiology and behaviour characteristics. This is stored in a database and then compared to profiles created when individuals enter the monitored area.

Until now, the most widely used forms of biometric identification have been fingerprints, facial recognition and voice recognition, all of which can be faked. HUMABIO has introduced new forms of biometric recognition which are considerably more difficult to get around.

Headgear scans brainwaves

Uniquely, this includes using electrocardiograms (ECGs), which record heart rhythms, and electroencephalograms (EEGs), which record brain patterns, to identify people. The researchers have come up with prototype headgear which includes two electrodes to take the readings.

Unlike some of the other achievements of the project, this technology is still at pre-commercial, proof-of-concept stage and might take several years before becoming widely used.

“Unobtrusiveness was one of the most important aspects of what we were trying to achieve,” says project coordinator Dimitrios Tzovaras, “but a lot of work will need to be done on the EEG and ECG sensors to make them unobtrusive”.

The project is delighted with the results to date, however, and Tzovaras says: “This is the first time this type of biometrics has been used for

identification, and it solves most of the problems other biometric systems face."

Other new types of biometrics the project has been working on are much closer to commercialisation. These include analysis of gait, or the way people walk and carry themselves, and analysis of seated posture. The project has also been enhancing facial and voice recognition techniques, and putting everything together into a multimodal biometric identification system which is more secure than the unimodal biometrics that comprise it.

Successful pilot projects

The new technologies developed by HUMABIO were tested in three pilot projects. The first was in a truck provided by one of the project's industrial partners, Volvo. It combined facial and voice recognition with posture recognition via a seat cover fitted with a new type of inbuilt sensor for analysing how the driver sits. The system continually updates the driver's biometric information both to warn if there is a change of driver, possibly following a hijack, and to make sure the driver is fit to drive.

A second pilot was at the Euroairport in Basel, with voice, facial recognition and gait recognition being used to provide on-the-go authentication of airport personnel, such as security guards and airline pilots. The third demonstration, in a laboratory at Stuttgart, used biometric authentication to restrict access to a specific, high-value machine which can only be used by trained, authorised personnel.

"In the first pilot, the seat cover was as comfortable as a normal [one], and the facial and voice sensors did not bother the driver at all. In the other two pilots, people at the airport and lab were able to move around freely in the monitored areas while their identities were authenticated.

The goal of unobtrusiveness was attained, while security and safety was considerably enhanced compared to conventional systems," says Tzovaras.

The truck pilot was so successful that Volvo is now planning to install the authentication system on all its trucks, and other parts of the system, such as the enhanced facial recognition camera, are also on the way to being commercialsed.

While work is still needed on some of the technologies, there are working prototypes for all of them including EGC/EEG, which Tzovaras believes will one day be integrated into sophisticated biometric systems that terrorists and criminals will find it next to impossible to fool.

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HUMABIO project: www.humabio-eu.org/

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