

Making a match at first glance

Developments in facial recognition systems aim for improved accuracy

While many facial recognition systems are entering the airport market, these invariably require co-operation from either passengers or staff. However, software developed by Dresden-based Cognitec uses a proprietary algorithm that is able to identify people from video streams.

"Airports already have a lot of video cameras in place and these can be used to pick out individual faces of interest and thereby track the movement of certain passengers," notes Dr Jürgen Pampus, vice-president for sales and marketing. "The system can also be automated to look out for particular people in the crowd and compare them to a database containing several million images." Pampus adds that once a positive identification has been achieved an alarm would be triggered at the airport's security centre.

In principle, the software can be used with any commercially available video cameras, although a certain image quality is needed to ensure that a match can be made. Clearly, if the image of the face captured is too small, that person will not be recognised. Essentially, the system requires a minimum of 50 pixels between the centre of the eyes to enable a comparison to be made.

"Depending on the optics, we can therefore identify people up to a hundred metres in optimum situations," says Pampus.

Product placement

A non-co-operative system such as that developed by Cognitec works best when cameras are placed in ideal locations, where everybody would naturally be looking into the lens. Pampus notes that, on down escalators, airport visitors can be unconsciously prompted to present a frontal facial image by siting an upward-pointing camera. Because they are moving relatively slowly, a high-quality image can be captured.

"This is the most challenging form of facial recognition, because many of the people being sought don't necessarily want to be found," he says.

"However, in controlled trials at airports and railway stations, results show that around 80 per cent of target faces contained on a given database can be picked out by our system. Although this is much lower than would be the case on a co-operative system, we believe this is an encouraging success rate."

Pampus notes that those not spotted directly by the software – because they were either deliberately not looking into the camera, were wearing dark glasses or had their faces hidden by hats – would automatically draw attention to themselves anyway and be picked up by security personnel undertaking scans to identify aberrant behaviour.

"False positive and false negative rates are inextricably linked to one another. We could, for example, set thresholds so high that there would not be



C-True: 1354275

any false acceptances, but this would, therefore, reduce the number of positive recognitions," concedes Pampus.

"Practically, the false acceptance rate would be in the region of one-tenth of 1 per cent. However, while we are confident of making a match if we get 50 pixels, ambient lighting conditions and extreme facial expressions can distort images and make matching much more difficult."

The Israeli company C-True Ltd is currently in negotiations with both airlines and airports in respect of its C-Gate passenger authentication system, which makes use of facial recognition techniques as part of an integrated solution.

Moty Grossman, vice-president for marketing and business development, explains that C-Gate offers airlines and airports assistance in implementing IATA regulations that specify that only the person that checks in can board the aircraft. To do this, an image of the passenger has to be captured at check in. Enrolment, which takes less than a second to complete, demands only that the passenger looks into the system.

This is little different from other facial capture

systems currently on the market. With C-Gate, however, there is a very subtle difference. To emphasise this, Grossman notes that statistics recently released by the National Institute of Standards in America reveal that up to 70 per cent of photographic images taken as part of the US VISIT scheme prove effectively worthless. This, he suggests, is because the immigration official does not get to see on screen the image captured by the camera. However, with C-Gate, this image is instantly displayed, allowing automatic face capturing so the official immediately knows how good the quality is.

On-the-spot results

For this reason, he suggests that C-True is faced with little in the way of direct competition in the market that it is now targeting. Although other companies have married cameras with facial recognition software, results have been variable, effectively because the official taking the photograph does not actually have the system to deliver quality images.

"Once enrolment has been completed, it then becomes possible to authenticate passengers as

they move through the airport towards the boarding gate," remarks Grossman. "Initially, this could take place at the security checkpoint, but also later at a duty free shop, if the passenger were taking a non-Schengen flight, for example. If the passenger wanted to make use of a VIP lounge, facial recognition could be used to confirm identity. Finally, at the boarding gate, the airline would simply seek an identity match before allowing the passenger on the aircraft."

Grossman suggests that C-Gate could also be deployed as part of a registered-traveller programme, pointing out that facial recognition is much more user-friendly and less intrusive than either iris or fingerprint authentication.

Similarly, with e-passports, immigration officials using the newly announced C-Pass would be able to make use of the information stored on the chip to compare the official passport photograph with the actual face of each individual, simply swiping it and allowing the software to make a match. Grossman points out that while staff have trouble recognising subtle facial differences across races, thereby making accurate authentication difficult, C-Gate has no such shortcomings.

"By eliminating the need for one person to recognise another, you get more accurate matching time after time, since C-Gate never gets tired."

In addition, the move towards ever more automated check-in means that C-Gate could be used in airports with unstaffed bag-drop systems in place. By taking photographs of passengers as they drop off their luggage, the system would effectively be matching bags to owners.

Crucially, C-True claims, C-Gate is simple to

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operate. Airport employees need minimal training to use the equipment. It also works well in any ambient lighting conditions and also when, for example, passengers have removed spectacles or applied make up between enrolment and authentication. Nor is it deterred by the differing heights of passengers.

Match-making

If, for whatever reason, a match is not made, the C-Gate software will log this information for later analysis. Nevertheless, under normal conditions, false acceptance rates are up to 0.01 per cent. To achieve these, the software has to be extremely complicated, which means that false rejection rates are higher, up to 2 per cent, although Grossman notes that the latter causes far fewer problems than would be the case if a larger number of false acceptances took place.

Asked to explain what the software does when it first enrolls a passenger and then authenticates an image, he notes that, effectively, it is making a template of the face. "We look at the features of your face, the skin tone, the texture and special distinguishing marks. [Search] engines then work

together to determine whether a match is made or not," he says.

One terminal costs around EUR3,500 (USD5,000), which Grossman says is very competitive. The price is offset by a saving in human resources, the better quality of the photographic image captures and a reduction in delays to flights.

"By deploying C-Gate, you can also reduce the need to expand the size of an airport, simply because you can expedite more passengers through existing space," he says.

For airlines, the investment could be justified simply on being able to reduce the number of fraudulent passengers they carry. For example, an airline that carries an illegal passenger into the US is faced with a fine of USD3,300. It is also required to put that passenger up in a hotel and then fly the person back to the country of origin at their own expense.

"Some airlines are no longer willing to wait for airports to incorporate a facial recognition system; they want it themselves. They are, therefore, looking at acquiring portable units that they can use on their check-in counters and gates at whatever airport they operate from. So, they have every incentive to acquire C-Gate," notes Grossman.

Barry Cross ■

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