Do you recognise me?

Julia Farrugia

Automatic facial recognition could change the world of law enforcement. Profile photos of suspects are rarely available, so investigators still rely on face sketches based on eyewitness descriptions. Julia Farrugia (supervised by Dr Ing. Reuben Farrugia) implemented an automatic face recogniser that is able to retrieve a photo based on a sketch. This narrows down the number of potential criminals before trails start to go cold.

Sketches and photos have different natures (modalities)—photos are generally captured using a digital camera, while sketches may be hand-drawn or computer generated. In order to tackle this problem, Farrugia developed an inter-modal approach to sketch retrieval. Without changing the nature (modality) of the images, common features in the sketch and photo were used as a basis for retrieval. Testing was carried out using the Chinese University of Hong Kong

The future of transport

Brandon Spiteri

The world has globalised. People and cargo need to get about in cheaper, faster ways that use better transport technologies. Magnetic levitation is one way to achieve higher speeds at a cheaper fuel cost whilst offering a smoother ride. There is less friction since the vehicle floats on electromagnetic waves that make this transport method very efficient.

Brandon Spiteri (supervised by Dr Ing. Maurice Apap and Prof. Joseph Cilia) designed and built a model in which a vehicle was moved at constant speed whilst levitating 1 cm above the track. Spiteri identified three levitation techniques. Firstly, the German approach eliminates needing wheels to initially move the train, but requires complex control methods. Secondly, the Japanese approach requires wheels to initially move the train, but achieves higher speeds than German technology. Lastly, the MDS type system is still being developed but aims for higher

The Japanese MLX01 Maglev train

Photos used with permission: X. Wang and X. Tang, "Face Photo-Sketch Synthesis and Recognition," IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), Vol. 31, 2009

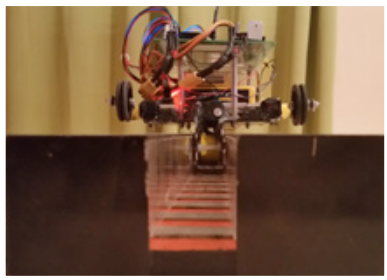
(CUHK) student database, which contains 188 photo-sketch pairs.

The implementation makes use of an Active Orientation Model (AOM), which is freely available. 68 strategic points on a query sketch and suspect photo are plotted. Dots depict features like eyebrows, hairline, and nose. The distance was calculated between the respective points on the sketch and photo. The smaller the difference in distances, the closer the match. 55.85% of tests resulted in a correct match between sketch and photo. To improve these results, texture features of the query sketch and each photo in the dataset were extracted using Local Binary Patterns (LBP). The distance was again calculated but included the texture features. The results were then merged with the distances obtained using the AOM method. Giving a higher priority to the distances obtained using the texture features increased the recognition rate to 60.11%.

Results could be improved by filtering the photos according to gender and by experimenting on larger datasets with subjects from different ethnicities, wearing glasses, or having facial hair. Advancements in computer vision means that soon humans will not be the only eyes narrowing down possible suspects.

This research was carried out as part of a Bachelor of Science in Computer Engineering at the Faculty of ICT, University of Malta.

The model built by Spiteri, levitating over the track.



speeds than the German model without the need for wheels.

After this research, Spiteri built a model by using an industrial-power DC motor. Levitation was achieved by using magnets of similar polarity that repel each other. Opposing permanent magnets were installed on the track and vehicle. Permanent magnets retain their magnetic properties (North and South poles) even when no current or electromagnetic field is present. The train moved by having permanent magnets on the track and electromagnets on the vehicle. The strength and polarity of the electromagnet varies with the size and direction of the electrical current passed through it. By manipulating the electromagnets the vehicle moved forward. The built model achieved a top speed of 1.41 km/hr. In his study, Spiteri proved the energy efficiency of these systems: the model uses the same energy as a 12 W bulb, much less than a train on wheels.

Magnetic levitation will shape the future of transportation worldwide. Monorail may be vital to reduce Malta's transport problems to have a less polluting and more efficient system. Fresh graduates Justin Zarb and Luke Lapira recently proposed a plan called Maltarail (elevated, suspended trains running on a single rail) to government. This project has been submitted to the European Investment Initiative. Such a project would place Malta on par with European transport leaders.

This research was carried out as part of a Bachelor of Engineering at the Faculty of Engineering, University of Malta.