Megapixel Cameras Improve The Results Of Facial Recognition Technology In Physical Security

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Until just a few years ago, artificial intelligence was considered more science fiction than reality. The viewer's imagination was stretched when watching contemporary entertainment where robots had seemingly human capabilities and emotions, or where crimes were solved with lighting fast speed using intelligent software. Today, these types of systems have dramatically matured and solutions such as facial recognition have become mainstream technology in the physical security marketplace.

Technology Benefits

One of the reasons that facial recognition has been so readily adopted in physical security is because it is a non-intrusive application compared to other identification solutions. No physical contact is required in order to complete the process of comparing an image to images in a database. And the system is easy to install and use on an IP network. Individual video images used in a facial recognition application can be captured at single points such as an entryway at a research facility or at a bank counter. Facial recognition software can also be applied to images from multiple video feeds such as at casinos or in retail environments. And it's an easy adjustment if the system needs to be scaled up or adapted to new requirements.

Beyond the video surveillance and security applications, facial recognition technology is also getting traction in sales and marketing activities. In retail applications, the data from facial recognition software tells management – by gender, age and ethnicity – who is looking at specific merchandise and/or sales promotions. Facial recognition can provide fast results with actionable insights at a lower overall research cost than conventional methods.

Behind the Scenes

Facial recognition is no different from other intelligent systems in that the process follows a simple flowchart; namely acquire, detect, align, extract and compare:

- **Acquire** – the image is captured from a digital stream.
- **Detect** – the face is isolated from the whole of the image. If parts of the face are missing due to positioning or object interference,

the software will reconstruct the facial image based on symmetry.

- **Align** – the facial image is vertically aligned.
- **Extract** – the final step in constructing the facial image may take into account a variety of measurement combinations such as facial contour, distance between the ears, distance between the eyes, length and width of the nose, length of the mouth, facial feature mesh and the colour of eyes, skin and hair where applicable.
- **Compare or Match** – The obtained results will be compared to recorded data or white and black lists.

The on-going refinement of facial recognition technology has provided results that are accurate and fast. For example, search capacities have reached one million records per second. It is also generally acknowledged that facial recognition is 10-times faster than a fingerprint recognition system in a like environment and with the same database.

Resolving Challenges

Facial recognition systems face several challenges in real world applications, some of which may not have a resolution at this time. More often than not, the issues are related to something other than the process and algorithms of the facial recognition technology. For example, images may be required from cameras installed in locations with ambient lighting conditions such as a windowed lobby or a parking garage. The overly bright or overly dark scene can cause poor images to be captured, making the data more difficult to process. Video surveillance cameras with true wide dynamic range (WDR, 100dB) produce a near-to-reality image in ambient light with the detail needed for the facial recognition process.

In other cases, the database contains photos that have a standard face-forward pose (i.e. driver's license, passport, etc.) Matching the captured image to the database photo can be more complicated if the angle of the pose captured by the camera is different than the pose in the database photograph. Megapixel video cameras can cover a wider field of view than conventional video surveillance cameras and with higher resolution. This allows cameras to be positioned to capture more of the scene and potentially a better angle of view for image capture and matching to the database.

Facial recognition algorithms require significant amounts of data to assure a successful process. Conventional analog video surveillance cameras will often not produce sufficient detail to meet the minimum requirements of the algorithms. With IP megapixel cameras, the more pixels that make up an image, the more detail that can be seen. Pixel density calculators can provide the necessary data for determining the pixels per foot (ppf) needed to produce the detail to meet minimum requirements. For facial identification, 50ppf or better is generally considered the minimum level of clarity needed. Some software may require as high as 150ppf. To calculate manually, simply divide the field of view by the horizontal resolution of the camera.

Many databases contain photos that are out of date and do not accurately portray how an individual looks today. No camera is able to fix this problem, but there are alternative solutions. In the case of registered users in a system (i.e. frequent flyers, fidelity cards, etc.), a regular update can be made each time the individual is in the area covered by the subscribed system. Photos also exist in social media and website spaces and it is possible to search outside the system in these spaces to update a database.

Facial recognition and other intelligent technology solutions are showing tremendous potential in the physical security market when matched with the higher resolutions delivered by megapixel cameras. The effort is assisted by the expertise of software developers and by the experience and support of systems integrators who can take the solution from concept to implementation for the customer.

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