

The problem with video surveillance systems is that their purpose is generally to capture as much of a scene as possible in order to observe people's activity. A typical video camera in a convenience store or bank will be mounted high on a wall looking down at the checkout cash register or bank teller station and also able to see background such as the entrance door and aisles.



Figure 1. Example of a very poor video surveillance image for use in facial recognition.

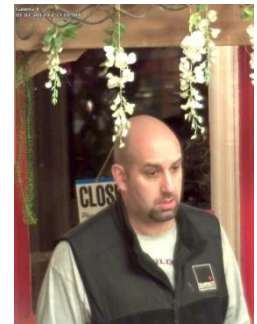
This purpose serves well to possibly catch a person shoplifting, or the act of a robbery. However these types of images usually do not work well, or work at all, for the requirement to send the image which contains some level of visible face to a facial recognition system with the intent to search for a match in a watchlist. Why? There are a number of reasons such as (1) person's head size is too small. We see often the head is less than $1/16^{\text{th}}$ the size of the image size. (2) the number of pixels on the face is too small. Often we see less than 15 pixels between eyes. Face recognition systems require usually 60 to 120 pixels between eyes. (3) the lighting is poor or variable causing shadows. (4) the face is rotated, or highly angulated pose (especially looking down from above), and finally (5) the person's face is obstructed by a hat (typical baseball hat) or dark sunglasses or a hoody.

There is not much we can do about (5). But we can maximize our control of (1) through (4).

Camera resolution is very important. The video frames from CCD cameras must be converted to digital. The result is sub-mega pixel frames. Typical example is a video frame being of only 320 X 240 pixels. The newer IP video cameras offer higher resolution options. 640 X 480 is a 1 Megapixel camera frame and this is pretty good resolution. However going back to issue (1) if the person's head size is too small in the frame, then the face capture is not taking advantage of the resolution. And to make matters worse, often the resolution setting on the IP camera is not set correctly even though the camera is capable of higher resolution. Of course if the camera resolution is set higher then it will require more data storage on the DVR. DVR and NVR storage costs continue to go down in price and more terabytes of storage should be considered to be added. We are seeing IP cameras now that support high definition such as 1980 X 1220 pixel frames. This level of resolution will increase the chances of a good facial image capture.

Ultimately to maximize video camera set up for the capability to acquire facial images for subsequent processing in a facial recognition system , the following features should be considered:

(a) **Focus on targeting the face.** Is the volume space of the captured scene by the camera resulting in acquiring frontal faces, ie able to see both eyes of the person? The image on the right is good target on face. Even though the face is angulated, a face matching system that utilizes 3D to correct the pose will solve this issue.



(b) **Consider the camera angulation.** Is the camera catching more of the top of the head than the front of the face? If so, that's not good.

(c) **Size of the face relative to the frame size.** This variable is dependent on camera resolution. If the video frame resolution is 640 X 480, then we need to see a face that is at least 1/8th the size of the image. This would yield about 80 pixels across the face ear to ear, and thus about 40 pixels between the eyes. Even that is a little low for FR systems to process. Make sure your camera resolution is set to the maximum capability.

(d) **Consider the lighting.** A video camera pointed in the direction of an outside window or front door can have extremely bright light in the background during the day resulting in the facial image being very dark. The camera should capture the background with an average uniform lighting thus the lighting on the face is well illuminated. Image shown on the left shows poor contrast due to too bright outside and not enough inside light to provide a balance.



The best plan for capturing video imagery for the purpose of facial recognition is to set up separate cameras from the overall video surveillance system and set those cameras to the specifications explained. You will then have the most powerful capability to resolve identities when it comes time to processing the video stored from a crime.

For more information and to get a demonstration of the next generation facial recognition systems utilizing 3D technology capable of processing video surveillance imagery talk to Animetrics. Contact them at (603) 447-5600 ext. 2041, email: info@animetrics.com or check them out at www.animetrics.com .

