Smart Sensors Ltd

Tools for Iris Recognition Engines

IRIS IMAGE CAPTURE SETUP

Setup - The camera-rig setup was assembled using a high resolution machine vision camera mounted on a height-adjustable camera-stand equiped with a chinrest. An array of infrared LEDs were positioned below the camera and set at an angle such that its reflections were restricted to the pupil and no iris texture was lost. An infrared pass filter was used to cut out surrounding light reflections.

Procedure - A typical capture procedure consists of the subject placing his/her head onto the chinrest while the operator adjusts the lens to get the iris texture into focus. A sequence of 200 frames is then acquired from each eye and 20 best ones selected for inclusion into the final database. The entire procedure is carried out in apporimately 5 minutes.

Camera - The ISG LightWise LW-1.3-S-1394, 1.3 Megapixel Area Camera provides a high performance 1.3 mega-pixel CMOS area imager with high quality video and excellent response characteristics. Its low cost and ease of integration made it an excellent option for our image capturing purposes. The deciding factors in its favour were its good spectral response in the near-infrared region and high rate of video capture at 30 FPS for 1280 x 1024 resolution.

Lens - In order to maximize the use of the entire image resolution a Pentax C-3516 M, 35 mm lens with two extension rings was used to capture the iris image. It is a C-Mount lens with a focal length of 35mm and has a manual Iris with Locking & Thumb Screws. The minimum object distance is 0.4 m. The camera-lens combo was set up at a distance of 10 cm from the eye so as to make the eye fill up the entire screen. In order to get a sharp image of the iris, the lens was focused on the iris and not any other part of the eye like the eyelashes or the pupil. Keeping the curvature of the eye-surface in mind, it is important to focus on the iris-texture as a lot of information may be lost due to a slight out-of-focus lens setting.

Lighting - Infrared light is used to obtain better iris texture than is possible with the use of visible light. In order to constrict the pupil there is a need for sufficient visible light during the capture. This has the added benefit of protecting the cornea by restricting the amount of light going in. To achieve this, an Infrared LED array obtained from The Imaging Source was modified and additional visible LEDs put in. To prevent shadows from appearing over the iris due to eyelashes, the light was shone at an angle from below the camera. The specular reflections were restricted to the pupil region to avoid losing iris texture due to bright spots falling onto it.

Filter - A daylight cut-off filter was used to remove reflections caused by environmental light sources. The filter passed Infrared light without any attenuation, thereby retaining all image information. For purely infrared images, radiation below approx. 780nm must be filtered out. For this purpose, a RM-90 IR filter was selected as its spectral response was deemed suitable for the task.