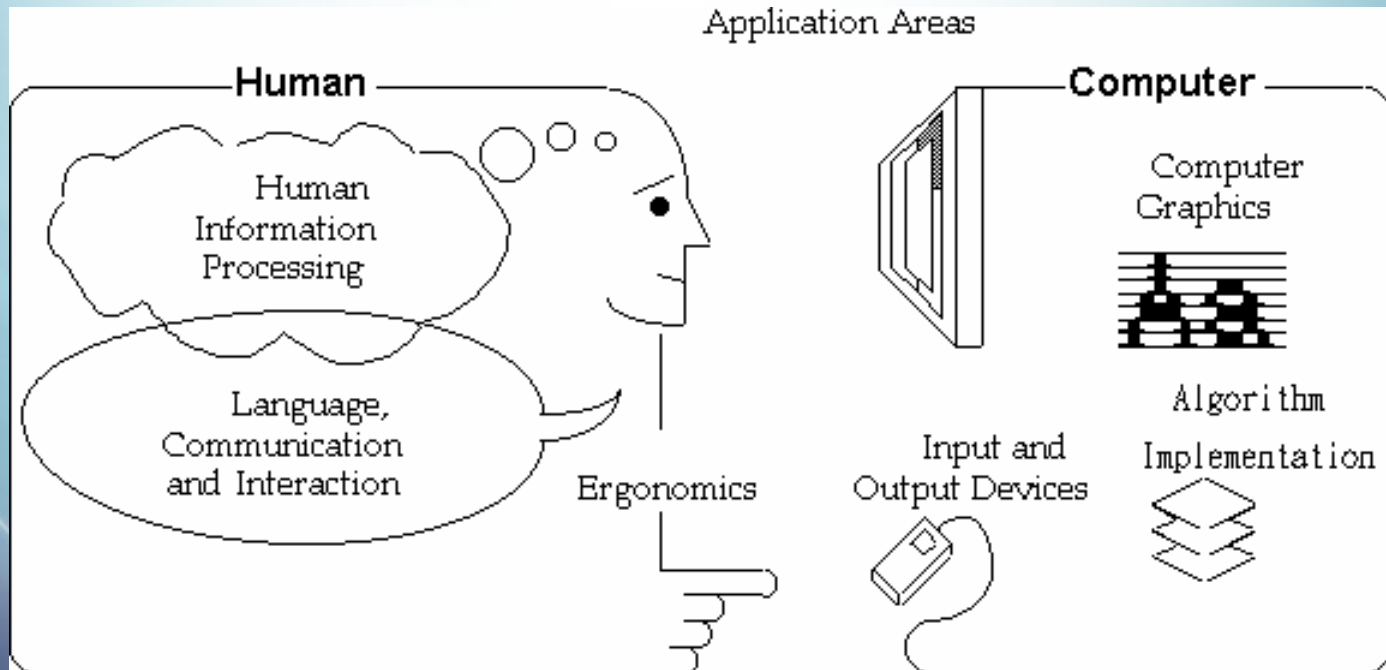


Introduction

- More and more researchers recently have great interests in the research topics of **HCI** (Human Computer Interface).



Introduction

- 📌 Personal identification is the problem in our daily life.
 - 📌 credit card, ATM, intelligent house and network security, etc.
- 📌 Traditional personal identification aren't reliable enough.
 - 📌 signatures, cards and so on,.
- 📌 **Biometric identification** is based on features of human body and behavior, such as fingerprint, voice and iris.
- 📌 With the increasing need for high security levels, biometric systems have been widely used.

Introduction

✎ The **iris recognition** would be the best biometric applications.

✎ The objective

✎ (1) eye tracking
(Machine)

✎ (2) iris recognition

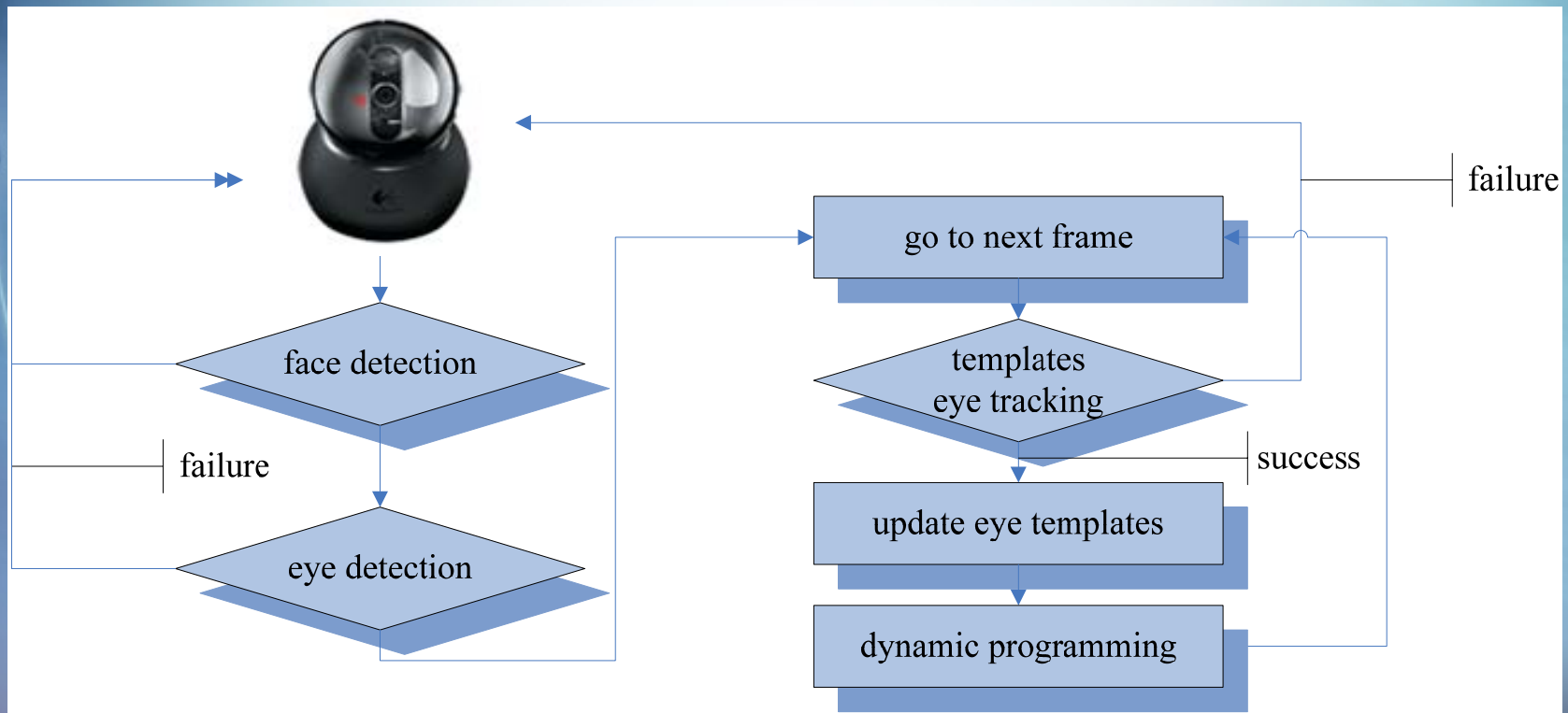


es on two topic:

Support Vector

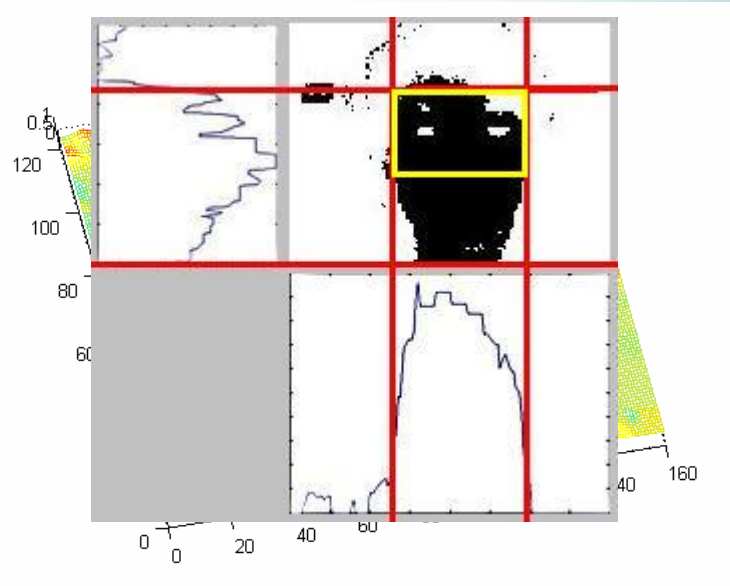
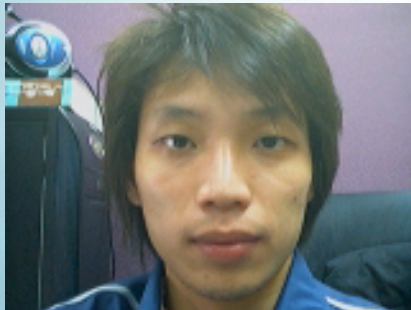
Matching Pursuit)

Flowchart of Our System



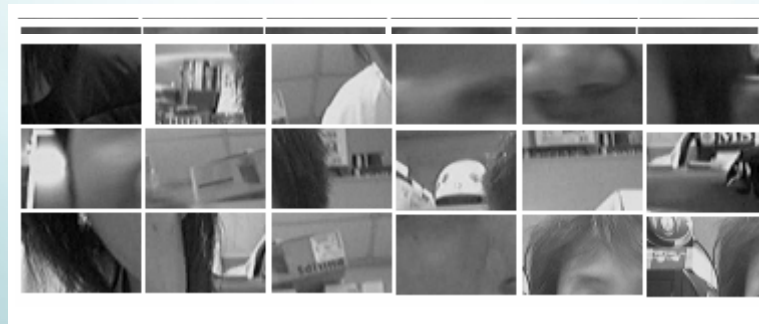
Coarse Face Region

- ✍ In order to reduce the eye search region, we first roughly locate the face region.
- ✍ The H of HSI(hue, saturation , intensity) color model is applied.



SVM Training

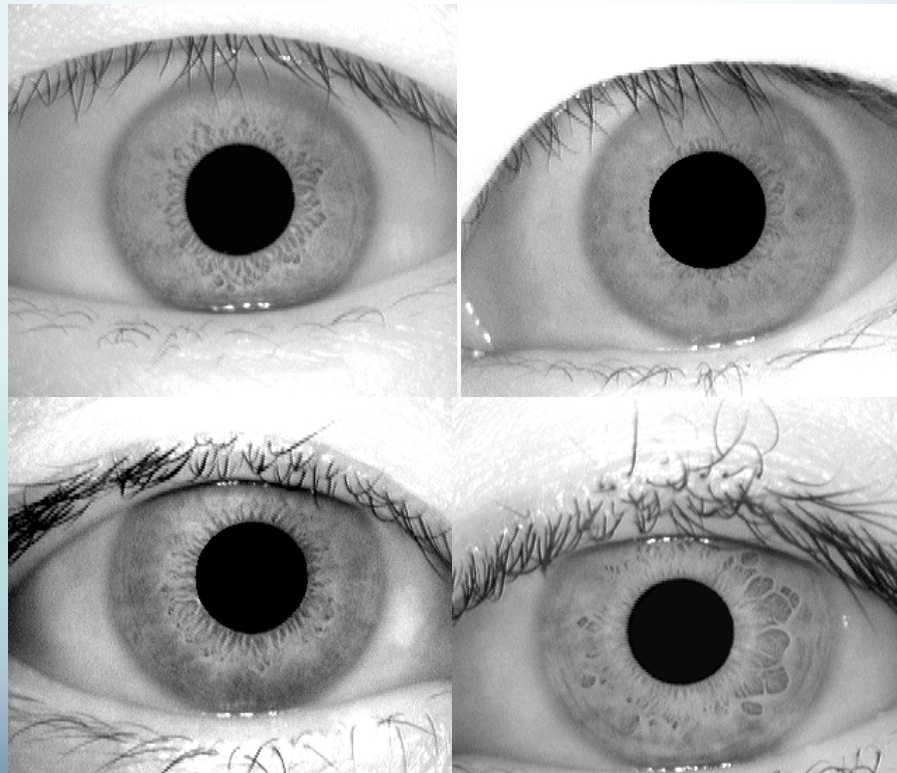
- ✍ An eye image is represented as a feature vector consisting of the edged pixel values.
- ✍ Positive set (eye) and negative set (non-eye).
- ✍ The eye images are processed using histogram equalization and normalized size to 20×20.



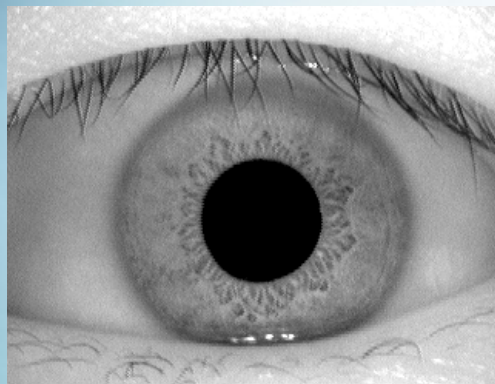
open eye
close eye

Distinct Iris Image

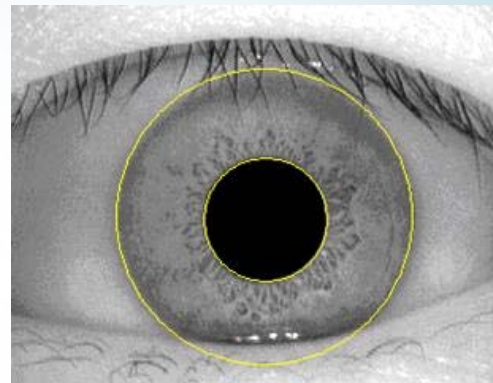
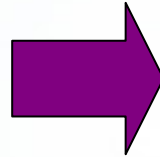
- ✎ The most unique biometric feature visible in a person is the detailed texture of iris.
- ✎ There are lots of irregular textures in irises.



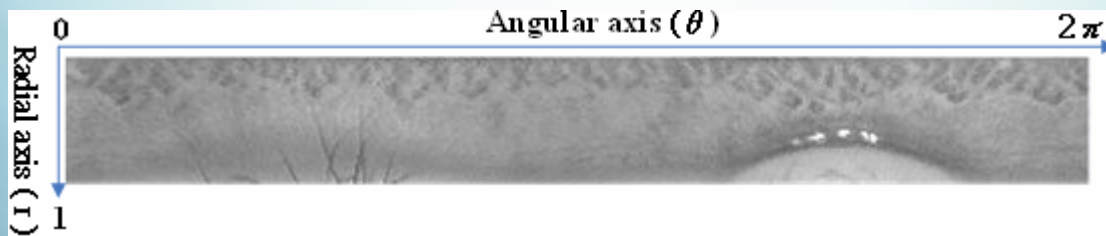
Iris Image Enhancement



circle
detection



iris
normalization



enhancement



Atom Decomposition



(a) Enhanced Iris image

atom (index, amplitude, location)



(b) 5 atoms



(c) 50 atoms



(d) 100 atoms



(e) 200 atoms

Eye Wink Control Interface

The interface consists of three main parts:

- Face Tracking:** A video feed of a user's face with two yellow boxes around the eyes. A red dot is positioned below the face.
- Command Grid:** A 3x3 grid of icons with binary codes below them:
 - Top row: First aid kit (010), Plate and cutlery (0010), TV (0100)
 - Middle row: Headphones (0110), Microwave (00100), Fan (00110)
 - Bottom row: Desk lamp (01010), Mobile phone (01100), Return (0)
- Control Panel:** Located on the right, it includes:
 - Buttons for "人眼追蹤" (Eye Tracking) and "SVM".
 - Buttons for "影像張數" (Image Count) and "載入檔案" (Load File).
 - A dropdown menu showing "Edr1" and a "Tracking" button.
 - Buttons for "WebCam" and "Terminate".
 - Buttons for "Source Dialog" and "Format Dialog".
 - A checkbox labeled "顯示眼睛放大圖示" (Show eye magnification icon).

There are nine blocks in the right plane, small block represents a command. There are two layer in the command mode, so we can create at most $9 \times 9 (81)$ commands. In our experiment, we only have $8 \times 8 + 1 (65)$ commands because each layer we have a return command.

Eye Wink Control Interface (Demo)

The interface consists of three main sections:

- User Video:** A live video feed of a person's face. Two yellow boxes are overlaid on the eyes to track gaze. A red dot is positioned below the video.
- Icon Grid:** A 3x3 grid of icons, each with a binary code below it:
 - Top-left: First Aid Kit (010)
 - Top-middle: Plate and Utensils (0010)
 - Top-right: Computer Monitor (0100)
 - Middle-left: Headphones (0110)
 - Middle-middle: Microwave (00100)
 - Middle-right: Electric Fan (00110)
 - Bottom-left: Desk Lamp (01010)
 - Bottom-middle: Mobile Phone (01100)
 - Bottom-right: Return (0)
- Control Panel:** A panel on the right side with the following elements:
 - Buttons: 人眼追蹤 (Eye Tracking), SVM
 - Text: 影像張數 (Image Count) with a value of Edit1
 - Buttons: 載入檔案 (Load File), Tracking
 - Buttons: WebCam, Terminate
 - Buttons: Source Dialog, Format Dialog
 - Checkbox: 顯示眼睛放大圖示 (Show Eye Magnification Icon)