Biometrics
(Vascular, Signature, Voice recognition)

Palm Veins Recognition:
- Veinal Recognition: A system for identification using a person’s unique vein patterns.
- Veins as a biometrics tool involve the measurement of the blood vessels of your hand.

Advantages
The palm vein pattern is the most complex and covers the widest area. Because the palm has no hair, it is easier to photograph its vascular patterns. The palm also has no significant variations in skin color compared with fingers or back of the hand, where the color can darken in certain areas.

Disadvantages
- Palm vein recognition is invasive because it requires the user to insert something into the palm.
- It is relatively expensive and not available for mass production yet.
- It is not applicable to people who lost their palms.
Signature recognition:
Off line or static signatures are scanned from paper documents, whereas digital signatures are written or captured using electronic devices. Off line signature analysis can be carried out with a scanned image of the signature using a standard camera or scanner.

On line or dynamic signatures are written with an electronically instrumented device, and the dynamic information (pen tip location through time) is usually available at high resolution, even when the pen is not in contact with the paper.

Principal structure of signature recognition systems:
- Sign data
- Feature extraction
- Training reference templates/models for each signature
- Similarity (Distance) recognition
- Recognition result

Pre-processing:
- Smoothing: smoothing the input signal from a digitizing pad can be very helpful. The parameters can affect the smoothness and the size of the signature.
- Segmentation: determination of the beginning and ending of signing.
- Signature beginning: first sample where pressure information is not null (first pen down)
- Signature ending: last pen-up because the pressure can be used by the signature, we have to establish a maximum pen up duration (e.g., 5).

Advantages:
- Signature is a man-made biometric where forgery has been studied extensively.
- Enrollment (training) is fast.
- Signature verification in general has a fast response and low storage requirements.
- A signature verification is independent of the native language user.
- Very high compression rates do not affect shapes of the signature (100-500 bytes).

Disadvantages:
- There is much precedence for using signature to authenticate documents and not for security applications.
- A five-dimensional pen may be needed to arrive at the desired accuracy. This makes the handwriting task difficult.
- Some people have a problem, while others do not have enough fine motor coordination to write consistently.

Voice Recognition:
What is Voice Recognition?
- Also known as automatic voice recognition or computer voice recognition, which means understanding voice by the computer and performing any required task.
**Where can it be used?**
- Dictation
- System control/navigation
- Commercial/Industrial applications
- Voice dialing

**Acoustic Model**
- An acoustic model is created by taking audio recordings of speech and their text transcriptions, and using software to create statistical representations of the sounds that make up each word. It is used by a speech recognition engine to recognize speech.

**Language Model**
- Language modeling is used in many natural language processing applications such as speech recognition. It tries to capture the properties of a language, and to predict the next word in a sequence of words.

**Types of Voice Recognition**
There are two types of speech recognition. One is called speaker-dependent and the other is speaker-independent. Speaker-dependent software is commonly used for dictation software, while speaker-independent software is more commonly found in telephone applications.

**Different Processes Involved**
- Digitization
  - Converting analog signals into digital representation
- Signal processing
  - Separating speech from background noise
- Phonetics
  - Variability in human speech

**Phonology**
- Recognizing individual sound distinctions (similar phonemes) is the systematic use of sound to encode meaning in any spoken language
  - Lexicology is the study of words, their nature and meaning, words' elements, relations between words, words' groups, and the whole lexicon.
Generic Speaker Recognition System

ADVANTAGES
- People with disabilities
- Organizations - increases productivity, reduces costs and errors.
- Lower operational Costs
- Advances in technology will allow consumers and businesses to implement speech recognition systems at a relatively low cost.

DISADVANTAGES
- Conversations
- Difficult to build a perfect system.
  - Involves more than just words: non-verbal communication: emotions, etc.
  - Every human being has differences such as their voice, manner, and speaking style.
- Filtering background noise is a task that can even be difficult for humans to accomplish.

Thank You