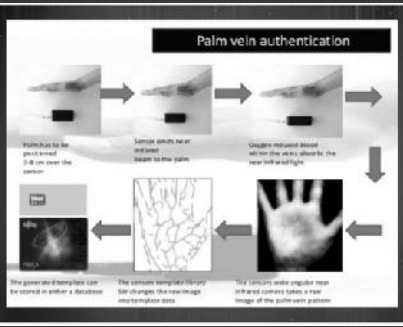
Biometrics (Vascular, Signature, Voice recognition)

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 pattern . 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

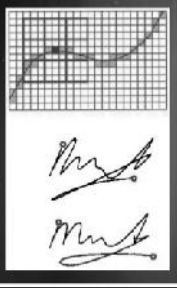
- Palm vein recognition is invasive because it creates fear among the user that it can be a painful process.
- It is relatively expensive and not available for mass production yet.
- It is not applicable to people who lost their palms.

Signature recognition:

Off-line or **static** signatures are scanned from paper documents, where they were written in conventional way. Off-line signature analysis can be carried out with a scanned image of the signature using a standard camera or scanner.

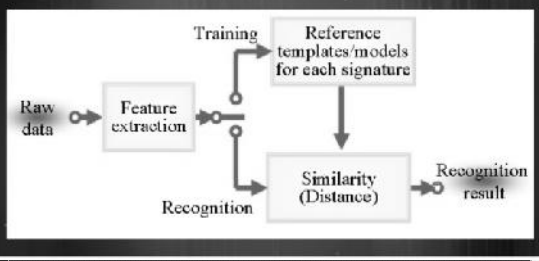
On-line or **dynamic** signatures are written with an electronically instrumented device and the dynamic information (pen tip location through time) is usually available at high resolution, even when the pen is not in contact with the paper.

Pre-processing



- **Smoothing:** the input signal from a digitizing pen can be very jagged. The pen used 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 few pen-ups can be found in the signature, we have to establish a maximum pen-up duration (e.g. 3 s).

Principal structure of signature recognition systems



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 shape of the signature (100-150 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 hardware costly.
- Some people have palsies, 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 tries to capture the properties of a language, and to predict the next word in a speech sequence.

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

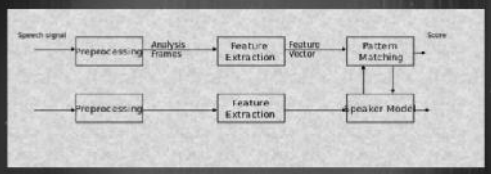
Digitization
Converting analogue signal into digital representation
Signal processing
Separating speech from background noise
Phonetics
Variability in human speech

Phonology
Recognizing individual sound distinctions (similar phonemes)
is the systematic use of sound to encode meaning in any spoken
Human language
Lexiology and syntax
Lexicology is that part of linguistics which studies *words*, their nature and meaning, words' elements, relations between words words groups and the whole lexicon.

Separating speech from background noise

- Noise cancelling microphones
  - Two mics, one facing speaker, the other facing away
  - Ambient noise is roughly same for both mics
- Knowing which bits of the signal relate to speech

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; stutters etc.
  - Every human being has differences such as their voice, mouth, and speaking style.
- Filtering background noise is a task that can even be difficult for humans to accomplish.