



# COMSATS Institute of Information and Technology, Wah Cantt

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Project Title:

# ***Biometric Gait Recognition***

**(identify human's by the way they walk)**

# What is Gait?

Gait is the term used for human walking pattern

The way they walk

The movement of human limbs

# What is Gait Cycle?

A Gait cycle is the time period or pattern in between one foot of human hit the ground and when it again contact with ground.

# Phases of Gait Cycle:

Each gait cycle has two phases:

**Stance Phase**, the phase during which the foot remains in contact with the ground.

**Swing Phase**, the phase during which the foot is not in contact with the ground.

# What is biometric ?

- ✓ Authentication based on the physiological characteristics of people.
- ✓ It is a pattern recognition system which establishes a person's identity by comparison of data .

## Examples of biometric:

- ✓ Fingerprint
- ✓ Handwritten signature
- ✓ Facial recognition
- ✓ Speech recognition
- ✓ Gait recognition

# Biometric Gait Recognition

It aims to discriminate or identify individuals by the way they walk



# Why Biometric Gait Recognition?

People often feel that they can identify a familiar person from afar simply by recognizing the way the person walks.

This common experience, combined with recent interest in biometrics, has led to the development of gait recognition as a form of biometric identification.

# Applications of Gait Technology

- ✓ **Security**
- ✓ **Medical**
- ✓ **Sports**

# Why for Security?

- ✓ Non invasive nature
- ✓ 3<sup>rd</sup> party cooperation not required
- ✓ High efficiency even over a long distance

# Improve security in:

- ✓ Air ports
- ✓ Embassies
- ✓ Banks
- ✓ Military
- ✓ Shopping Malls

# Problems with CCTV Cameras

Most of the time the video or image of some criminal which CCTV capture are not clear because of :

- ✓ Noise
- ✓ Low camera quality
- ✓ Long distance

# Use of Gait Recognition

- ✓ Enable identification even from long distance
- ✓ Allow identity association by matching to database
- ✓ Differentiate the attitude of the person based on walking style

## Successful examples:

After a bank raid in Sweden police get blur image of the criminal face from CCTV

By relying on gait matching ,police successfully identify the person

This emphasize the effectiveness of gait as biometric identification

# Successful example in Pakistan

Lahore mall road bomb blast helper was capture through identifying his gait in several CCTV videos





# Our Contribution

The field of biometric gait recognition gain too much interest from past several years and many researcher work on it with many methods.

“We aim to identify human gait using his gait cycle”

# Different source of Gait data acquisition

- ✓ Wearable sensor
- ✓ Floor Sensor
- ✓ Radar
- ✓ Kinect Device
- ✓ Camera

# Dataset We use

- ☐ We use CASIA Dataset which was publically available in internet
- ☐ Source of CASIA dataset acquisition was Camera

# Tools and Languages Used:

## Tools:

Matlab R2016a

## Languages:

Matlab

## Methodology we use:

- ✓ We identify a person using his gait cycle or stride.
- ✓ We achieve this using gait analysis algorithm

# Points we use from Gait Cycle

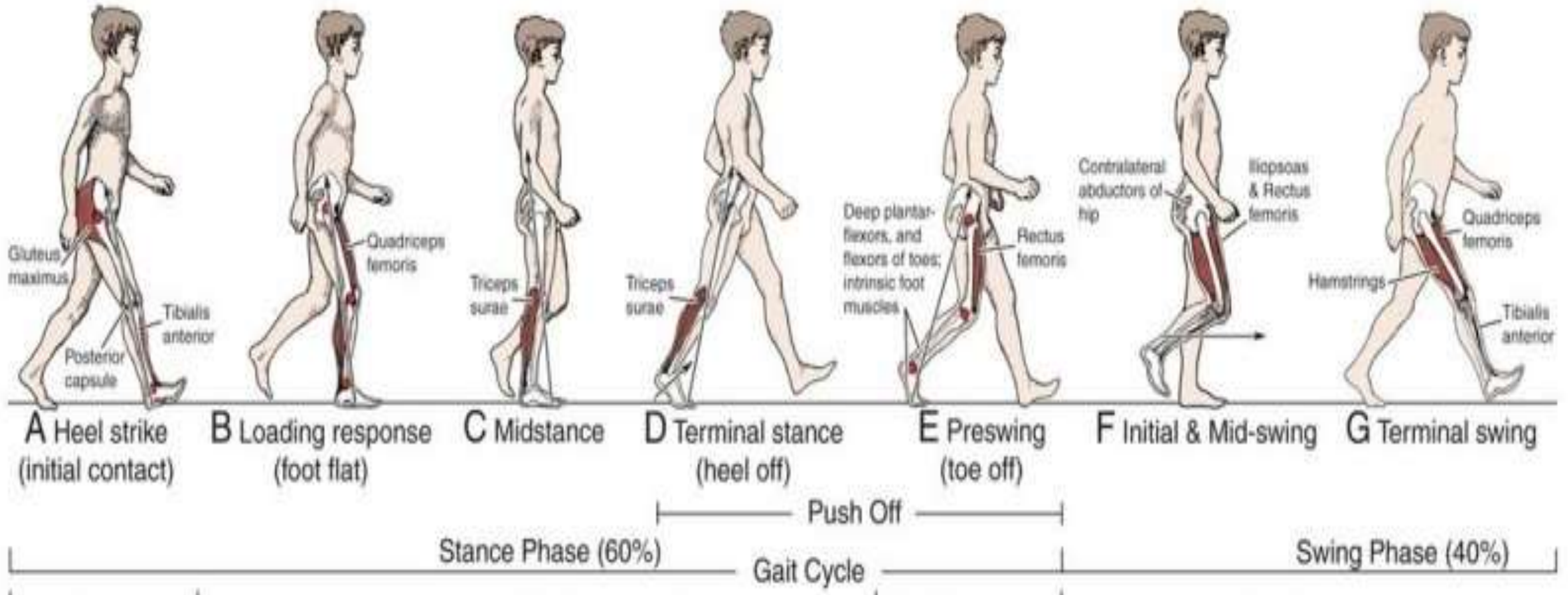
## Point of high Maxima:

- ✓ Initial Contact
- ✓ Terminal Stance
- ✓ Terminal Swing

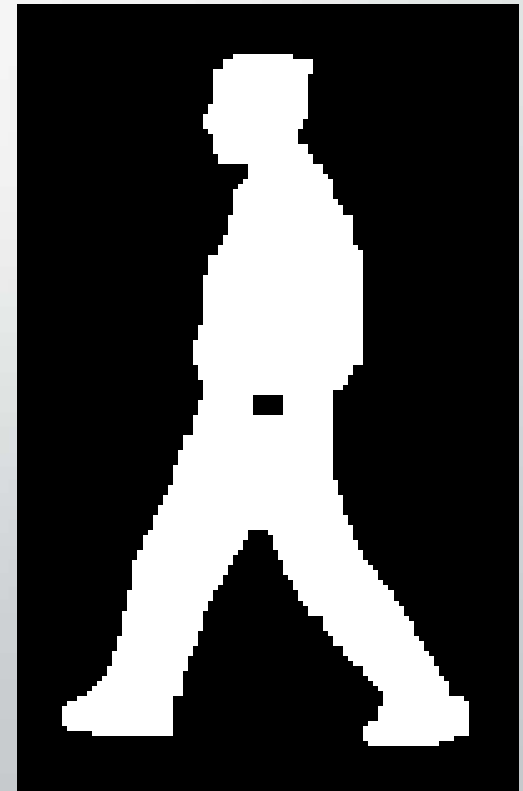
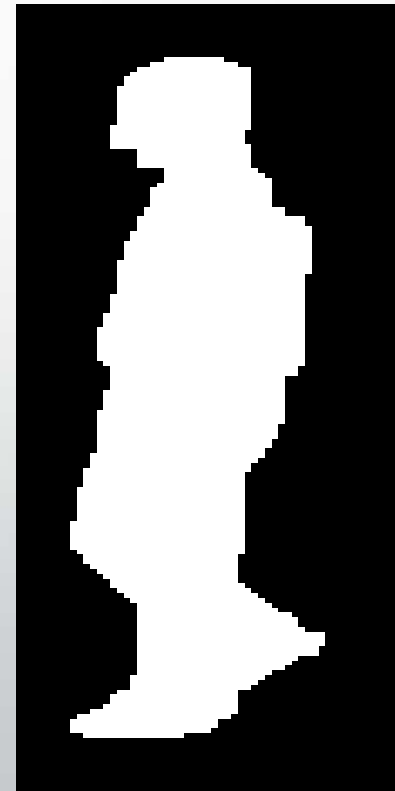
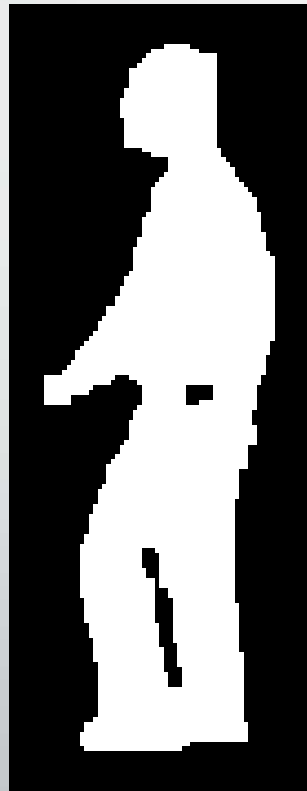
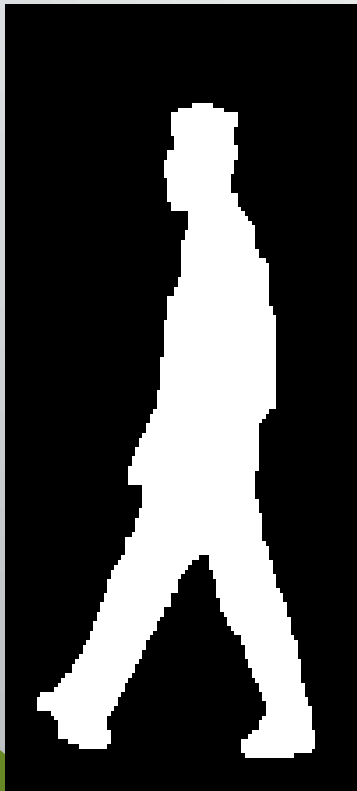
## Points of low Maxima:

- ✓ Mid stance
- ✓ Mid swing

# Gait Cycle Illustration



# After Background subtraction





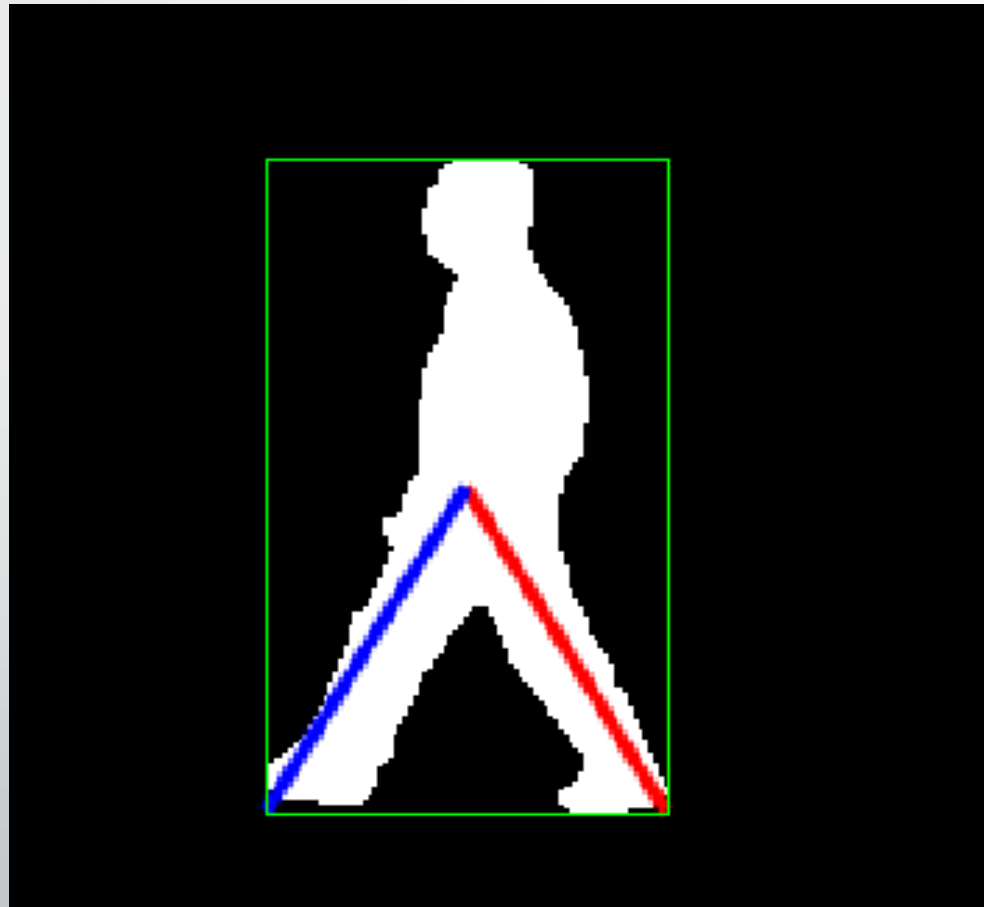
# Workflow of application:

- ✓ Get dataset from local directory
- ✓ Set Dataset as default path and draw bounding box around silhouette
- ✓ Get gait cycle information using gait analysis
- ✓ Draw points of gait cycle and plot graph
- ✓ Compare the mean of the result with Database

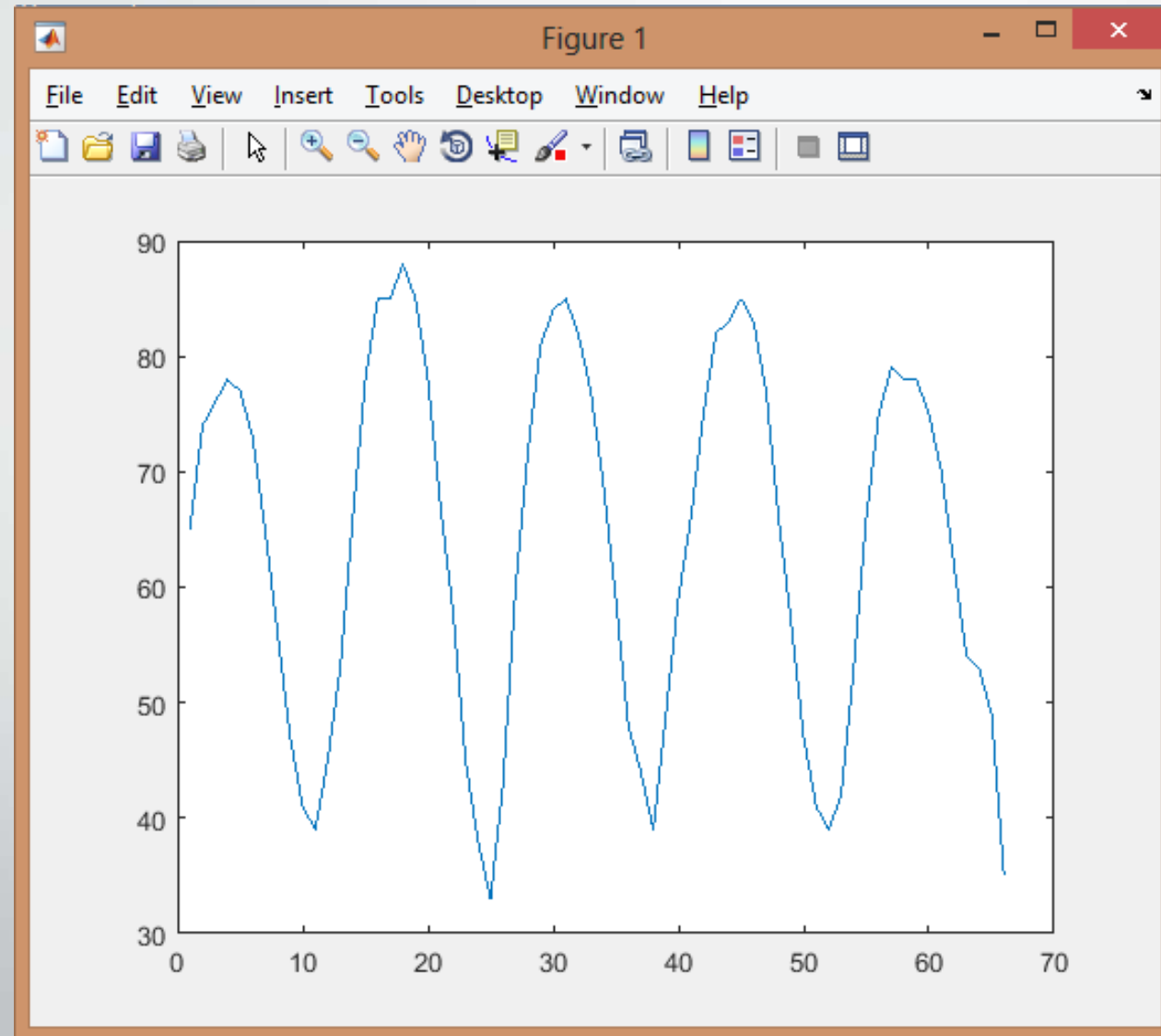
# Methods used

- ✓ `uigetdir()`
- ✓ `cd()`
- ✓ `dir()`
- ✓ `length()`
- ✓ `imread()`
- ✓ `edge()`
- ✓ `regionprops()`
- ✓ `imshow()`
- ✓ `findpeaks()`

# How regionprops() works and draw bounding box



# Gait Cycle Plotting Graph



# Matching Results of Individuals

Result	Entity	Match Rate
77.16	Hy-00-1	99.88
76.6	Hy-00-2	99.56
77	Hy-00-3	99.96
77.4	Hy-00-4	99.64
84	Ljg-00-2	99.8
83	Ljg-00-3	99.5



**Thank You**