Presentation Content

INTRODUCTION

It was concluded in UK in 1983 that no two individuals can have the same fingerprints, it set in motion a series of events that led to the widespread use of fingerprint pattern systems, known as the AFIS (Automatic Fingerprint Identification Systems). These systems are actively used mainly for security purposes all over the world today. In fact, these fingerprint matching systems have become so successful that the term fingerprint has become synonymous with the word inherent characteristic or unique characteristic.

BACKGROUND

1. The success of fingerprint identification systems has spurred a wide spiral of its application geared towards civilization application such as biometric authentication. This widespread is known as the “Second Generation”.
2. The “Second Generation” has spearheaded the race for efficient fingerprint matching algorithms. With the most popular algorithm being Minutiae
3. Minutiae works by locating local landmarks where fingerprint ridges either terminate or bifurcate (Minutiae Points) and then match minutiae relative placements between a given fingerprint sample and the stored template
4. Minutiae is not always accurate as it struggles when given poor quality images, this shortcoming meant that there was a need to extend feature recognition beyond minutiae points.

RESEARCH PROBLEM

* Problem Statement
  + There is a need to develop a fingerprint matching system where the underlying sensing, representation and matching technologies extend beyond minutiae points

RESEARCH PROJECT CONTRIBUTIONS

AIMS

* Identify a suitable algorithm that extends the capabilities of Minutiae
* Implement Algorithm
* Test matching capabilities of both algorithms using fingerprint samples
* Compare the performance of both algorithms
* Draw conclusions from results

OBJECTIVES

* Multiple papers will be consulted and referenced to properly discuss a suitable algorithm that extends the capabilities of Minutiae
* Both algorithms would be implemented using the Python Programing Language
* A GUI (Graphical User Interface) would be built to observe the processes involved in both algorithms
* Run both algorithms on a standardized dataset of fingerprint images and collect necessary information to compare both algorithms

SCOPE

This research falls under the **computer vision scope** as it uses various techniques and libraries such as from that study including gaussian blurring and OpenCV2 respectively.

METHODOLOGY

* RESEARCH DESIGN
  + Combines various techniques to seek answers to the following questions
    - “**What** are fingerprint matching algorithms?”
    - “**How** do these fingerprint matching algorithms work?”
    - “**How** are they implemented?”
    - “**Which** algorithm is more accurate?”
    - “**What** are the times each algorithm takes to finish?”
* DATA COLLECTION

Various research papers were consulted and referenced to understand the nature of both Algorithms.

* DATASET

A standardized data set Sokoto Coventry Fingerprint Dataset (SOCOFing) was used. It contains over 6,000 fingerprint images. Included within the data set are 3 levels of alterations. Namely

* + Altered Easy
  + Altered Medium
  + Altered Hard

Each alteration type further contains 3 types of alterations

* + Cross cut (CR)
  + Obliteration (Obl)
  + Z-cut
* ALGORITHM IMPLEMENTATION

Both algorithms are implemented using python version **3.9.13 MSC v.1929 64bit (AMD64),** for its simplicity and stability. Other accompanying libraries are

* + NumPy
  + OpenCV2
  + Matplotlib
  + PyQt5