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The Effects of Human Interaction on Biometric System Performance

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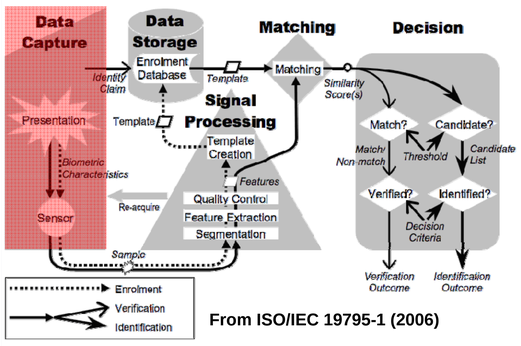
Introduction

BIOMETRICS is defined as the automated recognition of behavioral and physiological characteristics of an individual. As the biometric industry matures, the research and development has remained focused on three areas: increasing performance, increasing throughput, and decreasing the size of the sensor or hardware device. Limited consideration has been given to the users. In addition, testing and reporting efforts generally report performance of the algorithm in terms of False Acceptance and False Rejection Rates.

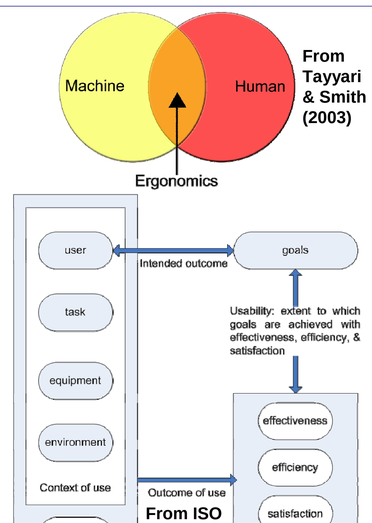
This research asserts that performance of a biometric system will be dependent upon the user. ***Therefore it is important to understand how the physical design of the biometric sensor affects not only system performance but how the user interaction.***

More importantly, ***does the performance of a biometric system performance satisfy the purpose of the users or organization using it?*** The authors have named this research the Human-Biometric Sensor Interaction (HBSI), as it investigates how users present their biometric data to a sensor, as every process in a biometric system is dependent upon the collected biometric characteristics.

Conceptual Framework

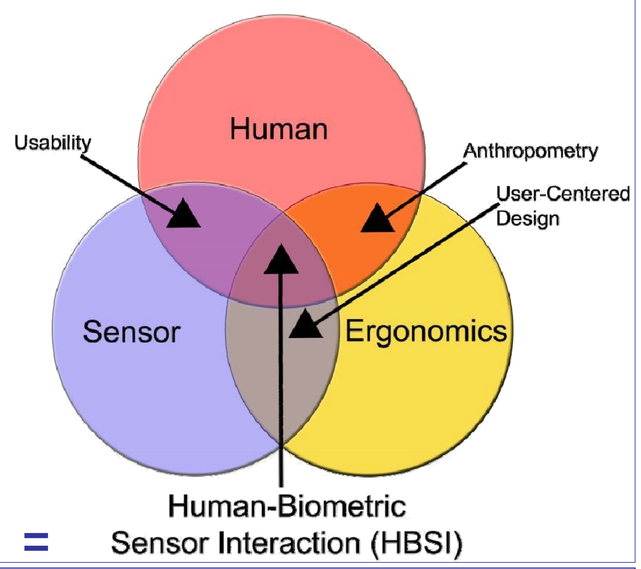


From ISO/IEC 19795-1 (2006)



From Tayyari & Smith (2003)

From ISO 9241-11 (1998)



The General Biometric Model + Ergonomics & Usability = Human-Biometric Sensor Interaction (HBSI)

Expected Outcomes

The expected results from this study will not solve all usability and ergonomic problems as they relate to biometrics, as the process is iterative. However, it is expected the users will:

- **Find the swipe sensor easier to use → providing more repeatable images.**
- **Prefer the ergonomic form factor to the current form factor → satisfying the usability criteria.**

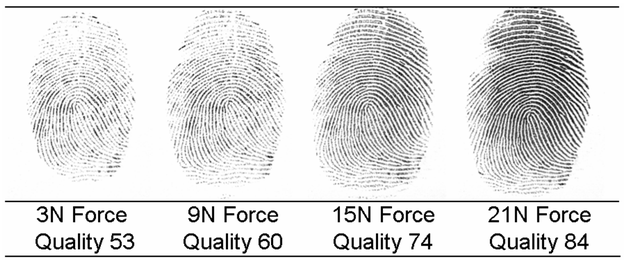
Since the ergonomic form factor is *easier to use* and *produces more repeatable images*, the amount of training and interaction required to successfully create repeatable images will decrease.

Preliminary Research

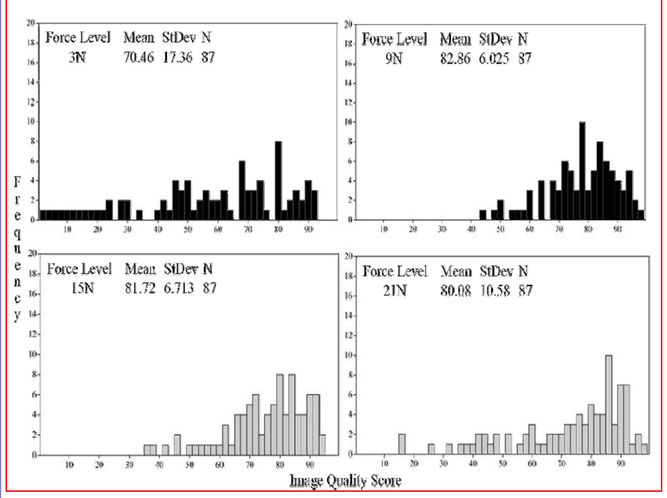
Impact of Fingerprint Force on Image Quality

The motivation for this research was to determine if the force (pressure) an individual applies to an optical fingerprint sensor can be correlated with the resulting image quality. It is well documented that many factors affect fingerprint image quality such as age, ethnicity, moisture, temperature and force, although force has only been subjectively measured in the literature.

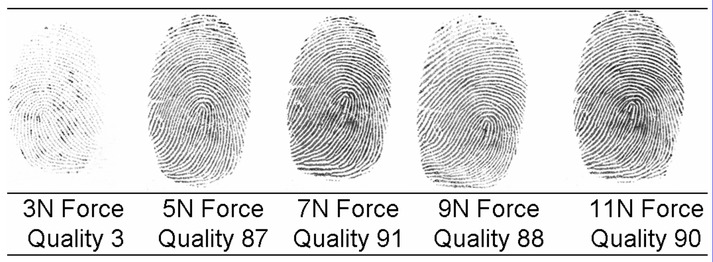
Experiment 1



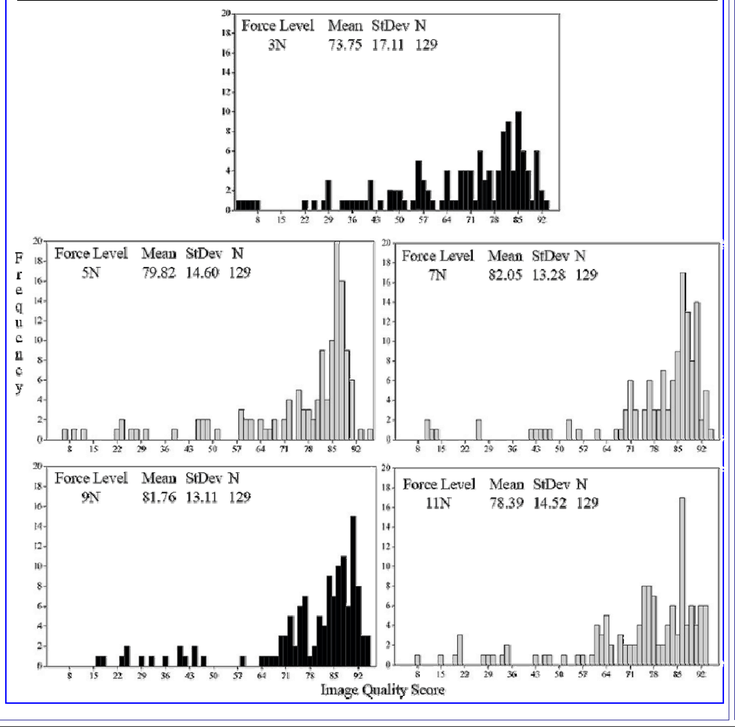
3N Force Quality 53 | 9N Force Quality 60 | 15N Force Quality 74 | 21N Force Quality 84



Experiment 2



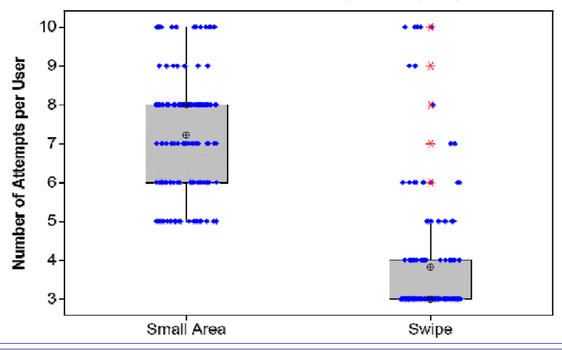
3N Force Quality 3 | 5N Force Quality 87 | 7N Force Quality 91 | 9N Force Quality 88 | 11N Force Quality 90



Small Area vs. Swipe-Based Fingerprint Sensors

The purpose of this research was to understand the differences in performance between small area and swipe fingerprint sensors regarding FTA & FTE.

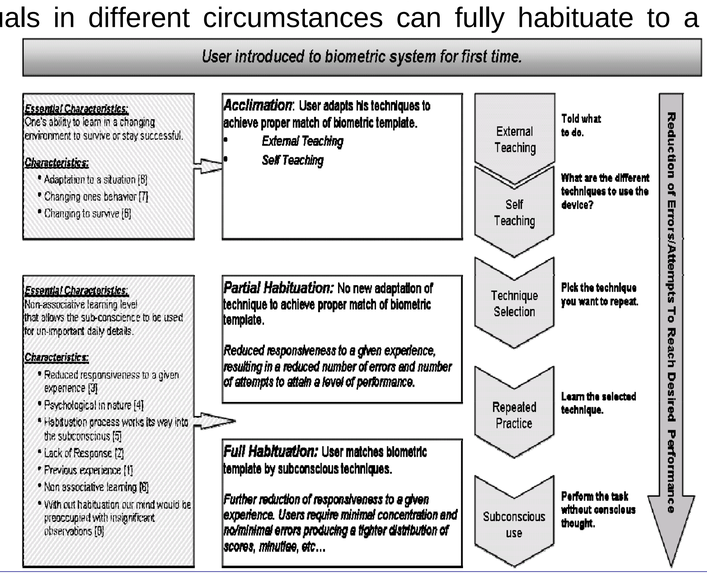
Small Area



Swipe

Habituation with Biometric Devices

How an individual interacts with a biometric device so as to make consistent, repeatable presentations is an important topic of discussion within the biometrics community. In this study we proposed a novel process to define habituation and provided data on how quickly individuals in different circumstances can fully habituate to a biometric device.



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