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## Design & Evaluation of the Human-Biometric Sensor Interaction (HBSI) Method

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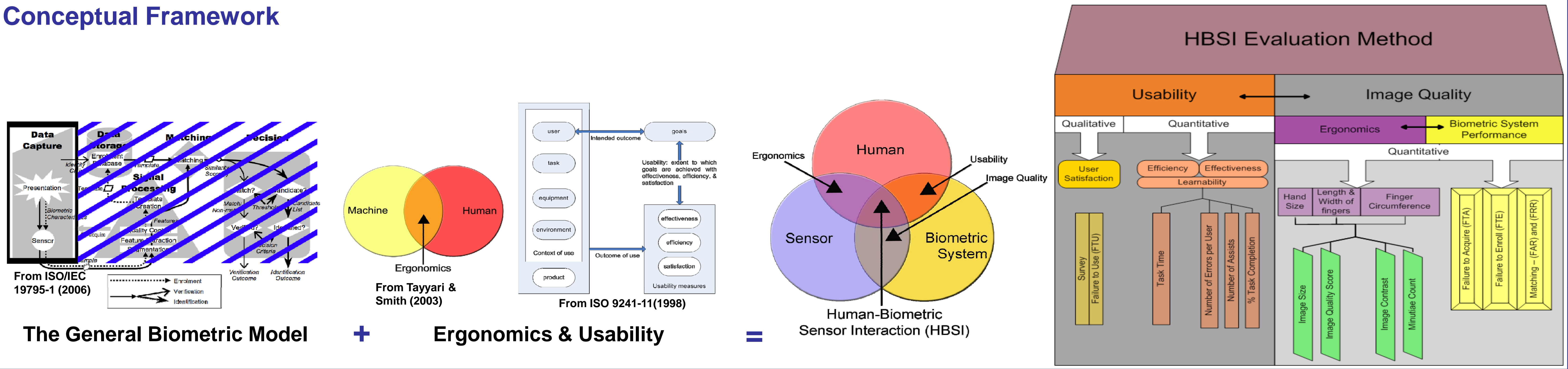
<http://www.biotown.purdue.edu>

### Overview

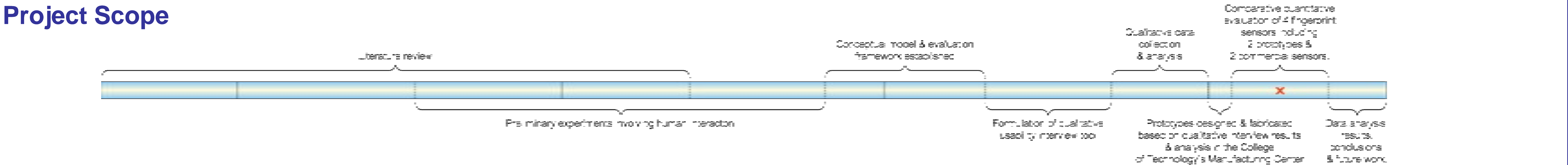
The goal of this research is to provide the biometrics community with a comparative evaluation method for biometric devices that uses ergonomics, usability, and image quality criteria as explanatory variables of performance of the independent variable – form factor design. Four objectives within the scope of the project are:

- Analyze literature in the fields of: biometrics, ergonomics, HCI, & usability to determine what influences the interaction between the human and the biometric device and what aspects can be applied to the design of biometric devices.
- Develop a conceptual model for the design of biometric devices and propose an evaluation method to assess the created form factors.
- Create two alternate form factors based on the conceptual model that includes: biomechanics and anthropometry of the hand and fingers, biometric literature, and focus groups and interviews to gather personal perceptions and common interaction problems for biometric devices.
- Evaluate the commercially available and new form factor devices in a comparative performance evaluation using the proposed HBSI evaluation method.

### Conceptual Framework



### Project Scope



### Results

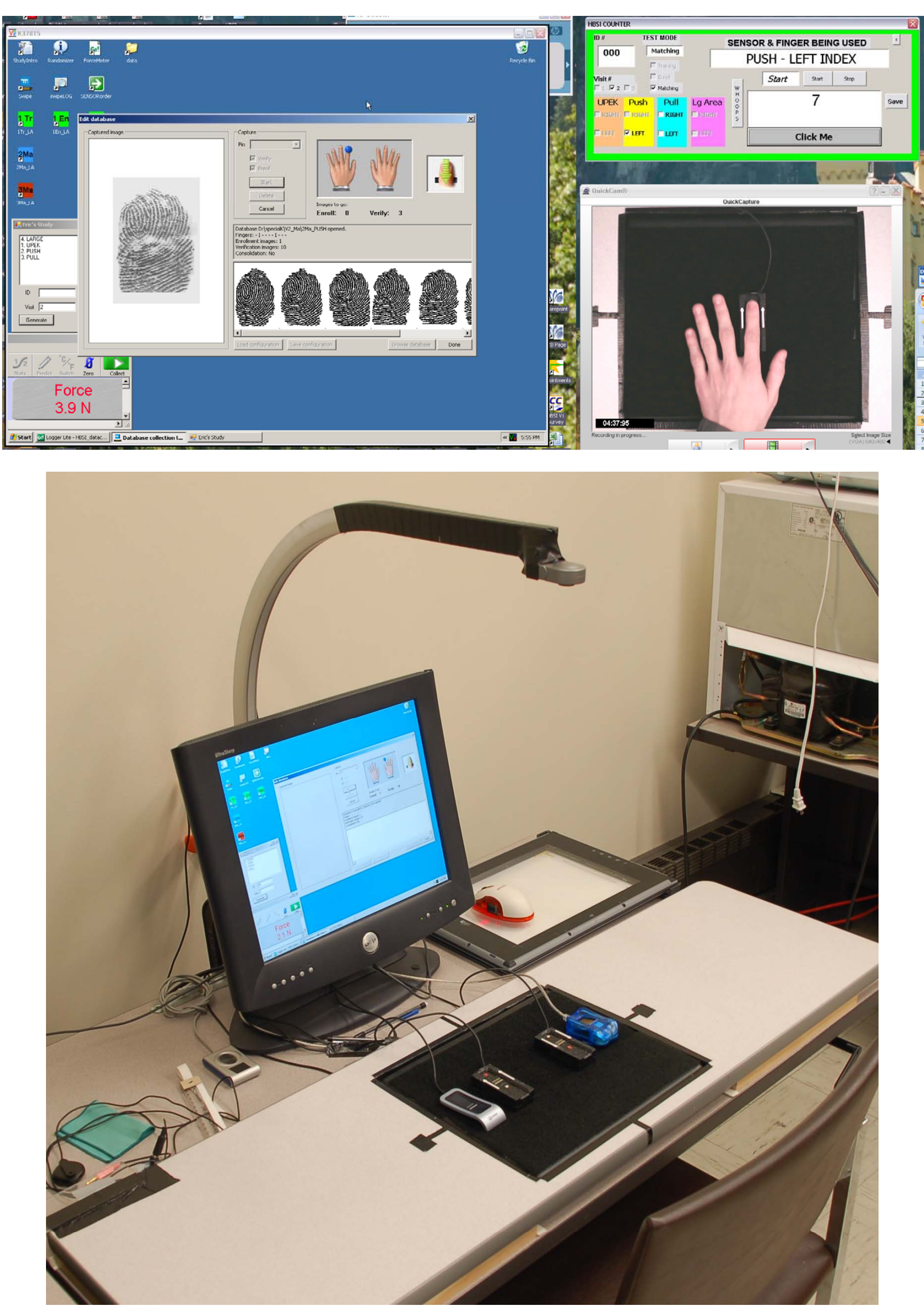
#### Qualitative Data Interview Results

Coding Scheme	Frequency
Shape	
Groove	
Movement	
Visual	15 6%
Tactile	47 18%
Depth	14 5%
Start/Stop Position	0 0%
Visual	22 8%
Tactile	35 13%
Smooth	2 1%
Raised Sensor	6 2%
Angle Position - Roll	3 1%
Angle Position - Yaw	4 1%
Slope	0 0%
Flat	4 1%
No Hump	5 2%
Up	6 2%
Down	13 5%
Flatter	9 3%
Size	0 0%
Length	0 0%
Too Long (make shorter)	7 3%
Fine as is	2 1%
too short (no support/make longer)	12 4%
Width	0 0%
Variable	1 0%
Fine as is	1 0%
too narrow	6 2%
too wide (like more compact)	6 2%
Height	0 0%
too low	7 3%
too high	1 0%
Manual Holding / Positioning	6 2%
Back Surface	10 4%
Not Intuitive	0 0%
Shape	4 1%
Movement (swipe)	4 1%
Alignment / Start-Stop	11 4%
Other	5 2%
TOTALS	268

#### Design & Fabrication of Prototypes

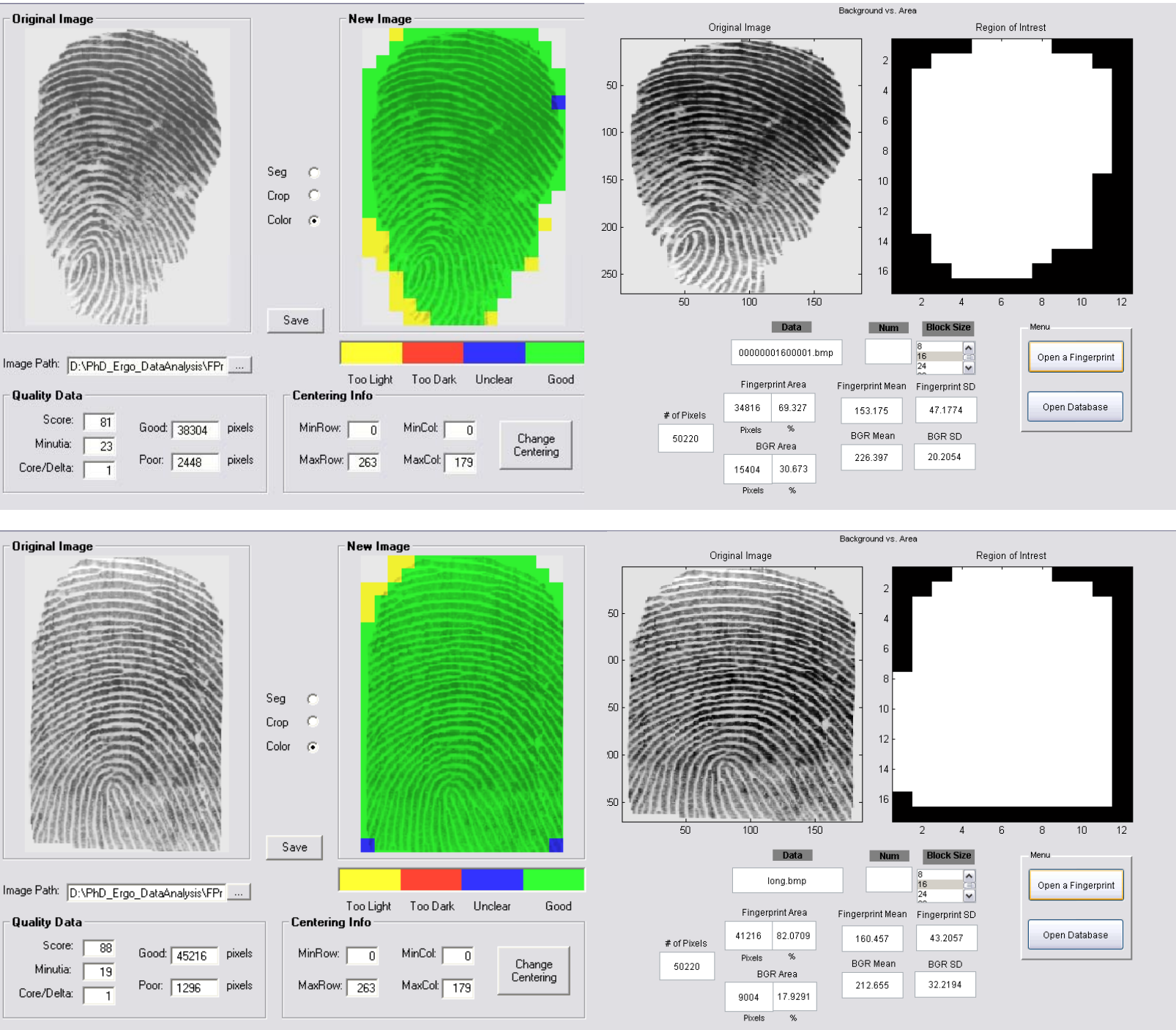


#### HBSI Quantitative Data Collection



#### HBSI Quantitative Data Analysis

##### Image Quality & Area (Ergonomics)



##### Usability

- Post study questionnaire
- Number of Assists
- Task Completion % and Time

##### Biometric System Performance

- FTA
  - System & Interaction
- FTE
- FAR vs. FRR