ENHANCING THE USABILITY OF THE HUMAN MACHINE INTERFACE

HANDHELD INTERAGENCY IDENTITY DETECTION EQUIPMENT (HIIDE)

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Handheld Interagency Identity Detection Equipment (HIIDE)

- Handheld multimodal biometric device
  - Collection & matching of iris and fingerprint biometrics
  - Collection of face biometrics & document information and images

- Deployed by the Department of Defense in the war zone
  - Fix the identity of unknown individuals (assist in friend/foe decision)
  - Packaging requirements (size, weight, battery life, etc)

Human Factors Attributes

- Device Form Factor
  - Tactical device
  - Light weight, small (fit in BDU)
  - Two hands required for operation
- Biographical Data Entry
  - 3x2 inch touch screen + stylus to enter tasks and data
  - Alternate approach is offline through laptop docking station
- Quality Control of Biometric Capture
  - Controlled by user
  - Awkward subject positioning
  - Untrained user, harsh environment
  - Ability to override quality requirements

System Functions

- Enrollment
  - Collects fingerprint, face, iris and document (biographic information)
  - Creates new record with unique id
  - Stored according to EBTS standard and including timestamp
- Match
  - Collect fingerprint and iris information
  - Match local watchlist, result conveyed in red/green alert
  - No record match result allows for enroll
  - Record kept of all matches
- Upload/Download
  - Uses laptop docking station
  - Synch with authoritative database

Task Analysis

Data

- Type
  - First hand knowledge and observation of training and novice interaction
  - Data collected on novice, moderate and experienced users
- Collection
  - Observation
    - Training courses
    - Demonstrations
  - Unstructured interviews
    - Discussions with operators returning from field
    - Discussions with trainers
  - Personal experience
    - Biometric expertise
    - Training instructor

Human Functions

- HIIDE Function Decision
  - Provides the function direction to the device (enrollment, matching or upload/download)
  - Controls the transitions between each function
- Data Collection
  - Essential to the accuracy of biometric matching
  - Position the subject and the device to capture a high quality face, iris or fingerprint image

Human Functions (cont.)

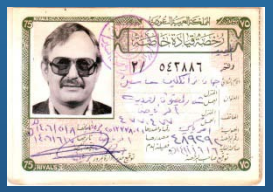
- Acceptable Quality Determination
  - Provides quality decision for face, fingerprint or iris image to be stored/matched
  - Override poor quality indicators
- Data Entry
  - Enter the biographic and contextual encounter information
  - Essential information for most utility from device
- Decision Processing
  - Process the match decision by considering the quality of the match and the contextual information

Deficiencies for Redesign Consideration

- Decrease of Sequential Tasking
- Capturing High Quality Biometric Data
- Reduce Collection Errors from Mislabeled Data
- Modify Device Form Factor

Decrease of Sequential Tasking

- Deficiency
  - Tasks completed in high stress environment
  - Many repetitive tasks
  - Difficult to complete on 3x3 touch screen with stylus & gloves
- Proposed redesign
  - Audio recording for contextual information to be entered at docking station
  - OCR of identity document data
  - Addressed via software and hardware modifications



Biometric Algorithm → OCR Algorithm → Enrollment Information Automatically Populated

Capturing High Quality Biometric Data

- **Deficiency**
  - Capturing high quality data requires a patient and well-trained operator
  - Poor quality data leads to ‘Garbage in, Garbage out’
- **Proposed Redesign**
  - Remove quality control from hands of user
  - Allow device software to collect video stream of face, iris or document
    - Analyze each frame (or every n^{th} frame) and generate a quality score.
    - Top quality Image used for matching or stored for enrollment
    - The operator is notified when an image of sufficient quality is obtained,
      - Retry using video streams
      - Use default manual process
  - Addressed by a software modification.

Reduce Collection Errors from Mislabeled Data

- Deficiency
  - Collection errors often occur due to incorrect collection of fingers or irises (subject's or operator's right)
  - Significant implications in binning applications
- Proposed redesign
  - Fingerprint redesign through multi-finger collection
  - Iris redesign through multi-eye collection
  - Requires software and hardware modifications

Modify Device Form Factor

- Deficiency
  - Bulky and heavy design difficult to collect high quality images
  - Two handed design difficult in war zone environments
- Proposed Redesign
  - Leverage developments in cell phone industry
    - Small, cheap, compact, high quality lenses and sensors
    - Gyroscopes for position awareness and device reversal
  - One handed use
    - Re-balance device for one-handed operation

Conclusions

- Biometrics serve as an enabling technology in the war zone
- Usability should be considered to improve device and biometric system performance
- Incorporation of suggested design considerations may
  - Improve data quality
  - Improve biometric system performance
  - Enable enhanced distribution of identity information to military and law enforcement
- Note: HIIDE 5.0 released in July 2010

Questions?

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