Development of the AFRL CAESAR Web User Interface
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Introduction

• AFRL has over 70 anthropometric databases that were collected over the years through:
  – Anthropometric surveys
  – Studies of workstation and cockpit accommodation
  – Fitting of clothing
  – Fitting of equipment such as oxygen masks, ear plugs, helmets etc.
  – Biomechanics testing and human modeling

• Difficult to access, search, and obtain data sets
• No relationship/integration among databases
Introduction

• New anthropometric databases such as CAESAR emphasize on individual raw data
  – Summarized population data such as percentile and average are incorrect biometrics for use in engineering
  – Individual raw data such as 3-D body scan/shape is needed for effective anthropometric engineering

• The new databases require more sophisticated data search and handling capabilities
ARIS Objectives

• ARIS - Anthropometry Research Information System
  – Database structure to integrate and manage multiple anthropometric databases
  – Web user interface to make the right anthropometric information available to anyone, anywhere
  – Basic data process and analysis
  – First phase consisting of CAESAR and a few other surveys
Database Design

• Three blocks: Web interface block, indexing/mapping block, and raw data block

Web Interface Block
- Measurement Web Interface Data
- Landmark Web Interface Data

Indexing/Mapping Block
- Measurement Definition
- Surveys
- Landmark Definition

Index/Map to Raw Data

Raw Data Block
- Raw Data of survey 1
  (Demographics, Measurements, Landmarks, external scan files)
- Raw Data of survey 2
  (Demographics, Measurements, Landmarks, external scan files)
- Raw Data of survey N
  (Demographics, Measurements, Landmarks, external scan files)
Measurement Indexing

• Currently ARIS uses sequential numbers (M-number) to index measurements

• M-number needs to be upgraded into a structured universal measurement index

  – Precise enough to separate similar measurements defined differently among surveys

  – Orderly enough to allow grouping of them if needed

  – Simple enough to be used as database primary keys for measurement indexing

  – Flexible enough to allow future expansion
Measurement Indexing

- Use XML schema to standardize measurement definition
  - Structured metadata
  - Each definition will adhere to the schema
    - Human readable, machine parser-able, and web accessible
- Single number of layered measurement descriptor
  - Automatically created from corresponding measurement XML definition
    - Layers mirroring the hierarchy of XML definition
    - Can be extended with future XML extension
Web Interface Challenges

• Evolving standards, terminologies, and methods used by various surveys over many years
  — Requires ARIS web interface to find, select, and group anthropometric variables that are meant for the same measurement in the user’s mind
  — Requires ARIS web interface to handle new type of data such as scan data

• User-friendly interface that is both precise and in-depth for anthropologists as well as intuitive and easily understandable for casual inexperienced users
  — Anthropometry data has wide applications
Menu-Driven Selection
• Visual Atlas – measurement selection

**Measurement Name:** Waist-Circumference-Preferred

**Description:** Maximum circumference of the waist at the subject's "preferred" waist level

**Survey(s):**
- CAESAR

**Method:**
- CAESAR: Subject stands fully erect with weight distributed equally on both feet and the arms hanging freely downwards. The subject's feet are placed in footprints adhered to the standing surface (the footprints are positioned approximately 10 cm apart at the heels and rotated 33° at the toes). The subject's preferred waist level is marked using an elastic band. NOTE: Preferred waist level is established by the subject, who places and elastic band at the level he or she would prefer to wear the waist of their pants.

**Instrument:**
- CAESAR - Steel tape measure
Landmark Atlas

- Visual Atlas – landmark selection
Creation of New Variables

- Groups and treats similar measurements from multiple surveys as a new single variable
- Combines two variables with an arithmetic operator and treats it as a new single variable

![Measurement Query Variables](image)
Query Results

- Summary statistics
- Raw data in excel format
Other Data

- Scan files
  - Parameter search produces links to corresponding scans with multi-angle quick views
Summary

• A database structure handles surveys of different formats uses indexing / mapping mechanism with standardized master definition list

• ARIS Web interface offers both
  – Menu-driven detailed parameter search for experienced experts
  – Intuitive atlas search for novice and casual users

• Customized query hides complexity from users and returns refined data sets of both summarized statistics and raw individual data
Future Plan

- Addition of 3-D shape search module
- Addition of statistical analysis module
- Integration with the Biodynamics Data Bank under the Collaborative Biomechanics Data Network
- Integration with other outside anthropometric databases through XML and Web services

Possible URL: http://www.biodyn.wpafb.af.mil
Check WEAR web site to confirm