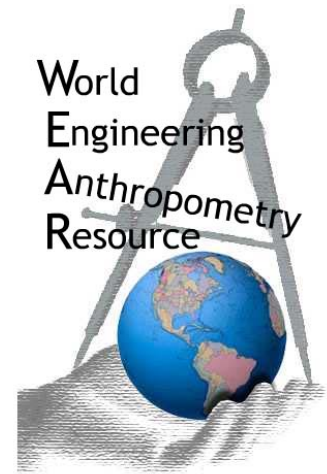




CODATA 2006



Anthropometric Databases and Applications

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October 24 2006

World Engineering Anthropometry Resource

The WEAR Group

USA- Canada - France - Japan - Korea -The Netherlands

Taiwan - Brazil - South Africa - Australia

.....+

Setting up during IEA-2000-HFES San Diego August 2000

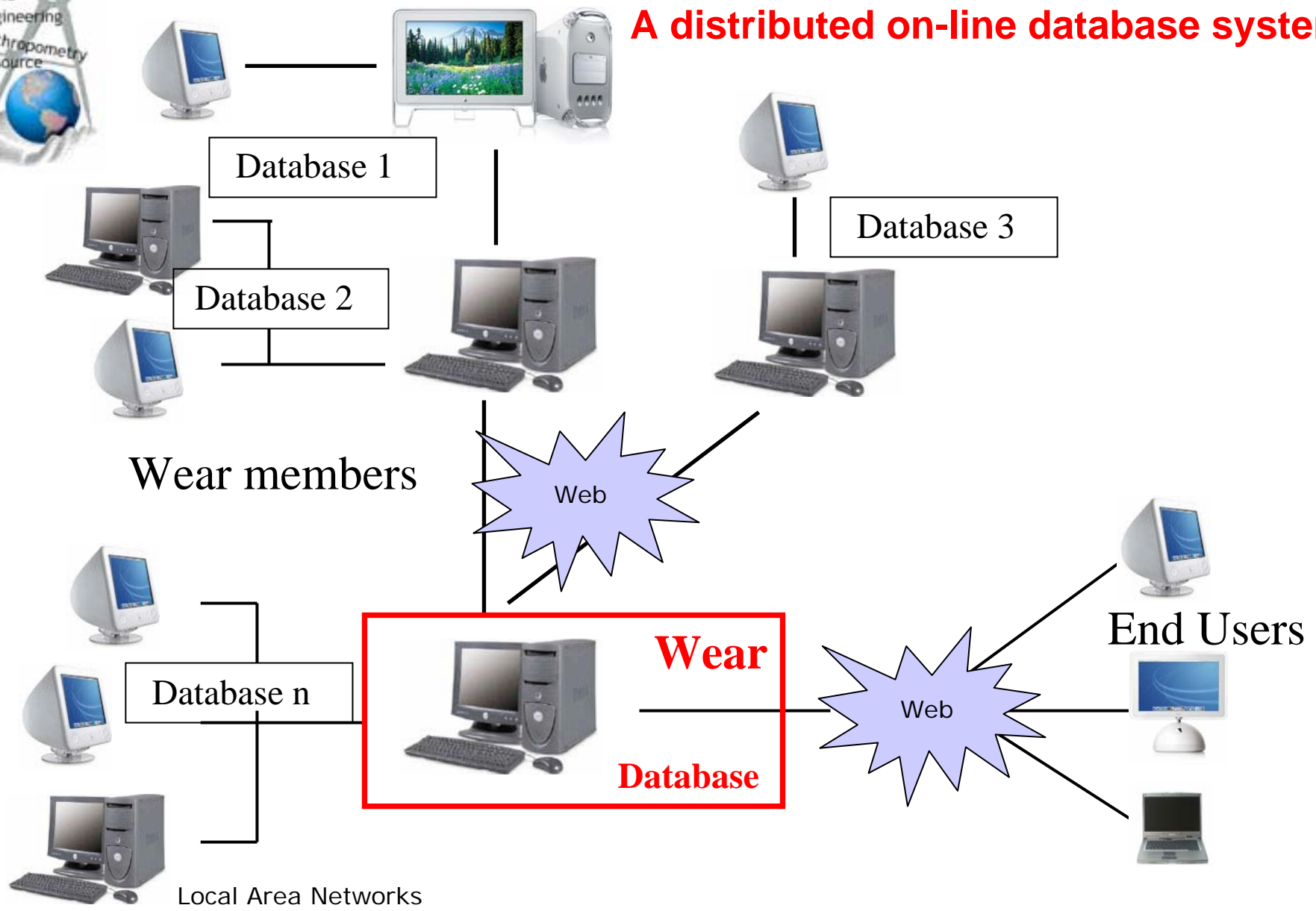
Aim

- Gathering the existing methods in Anthropometry and related disciplines - Identifying the databases
- Defining the structure of the on-line information system - Developing databases, data models and software tools
- Characterizing populations of 3-D subjects in a manner that can be effectively searched, mined and visualized
- Understanding the cognitive processes of anthropometry experts when dealing with such 1-D and 3-D databases - Identifying a means to computationally replicate these processes





A distributed on-line database system



Anthropometric and Ergonomic Database System

Principle

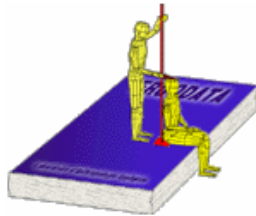
Additional files



Synthesis sheets



Bibliographical Data



Dictionary of measurements

Demographic data
+
Quality Evaluation
of
Anthropometric Data
+ **XXX XXXX**

Sorting Query



Data files



Individual Data



1-D

Aggregated Data



3-D



+

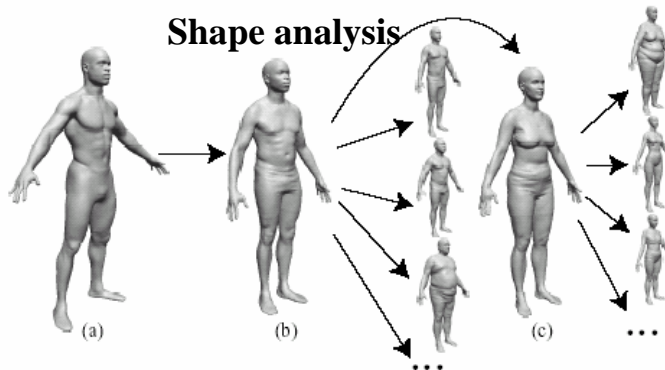
XX

Data processing

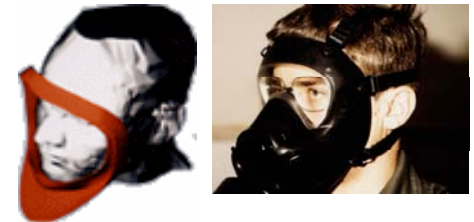
Digital man-models



Shape analysis

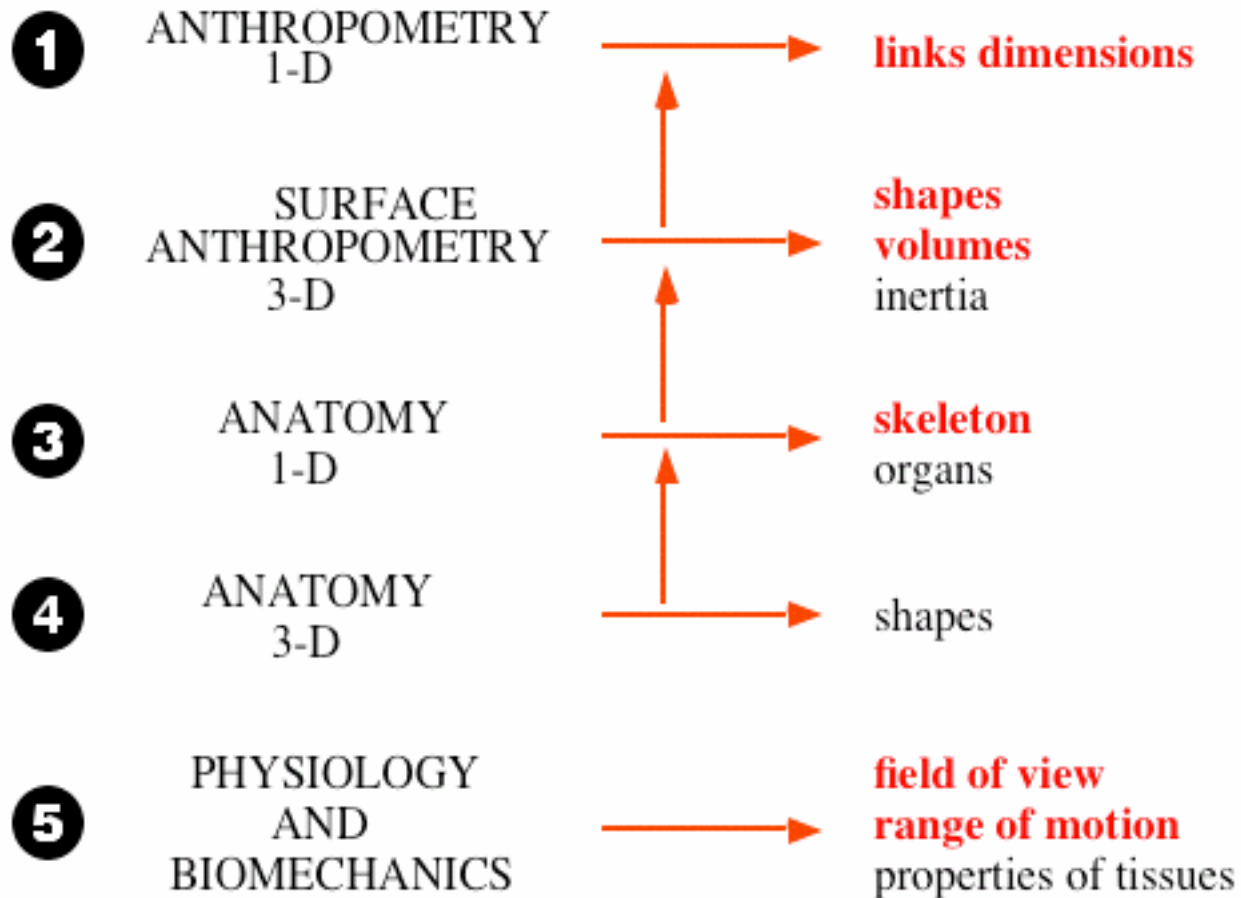


Fit tests



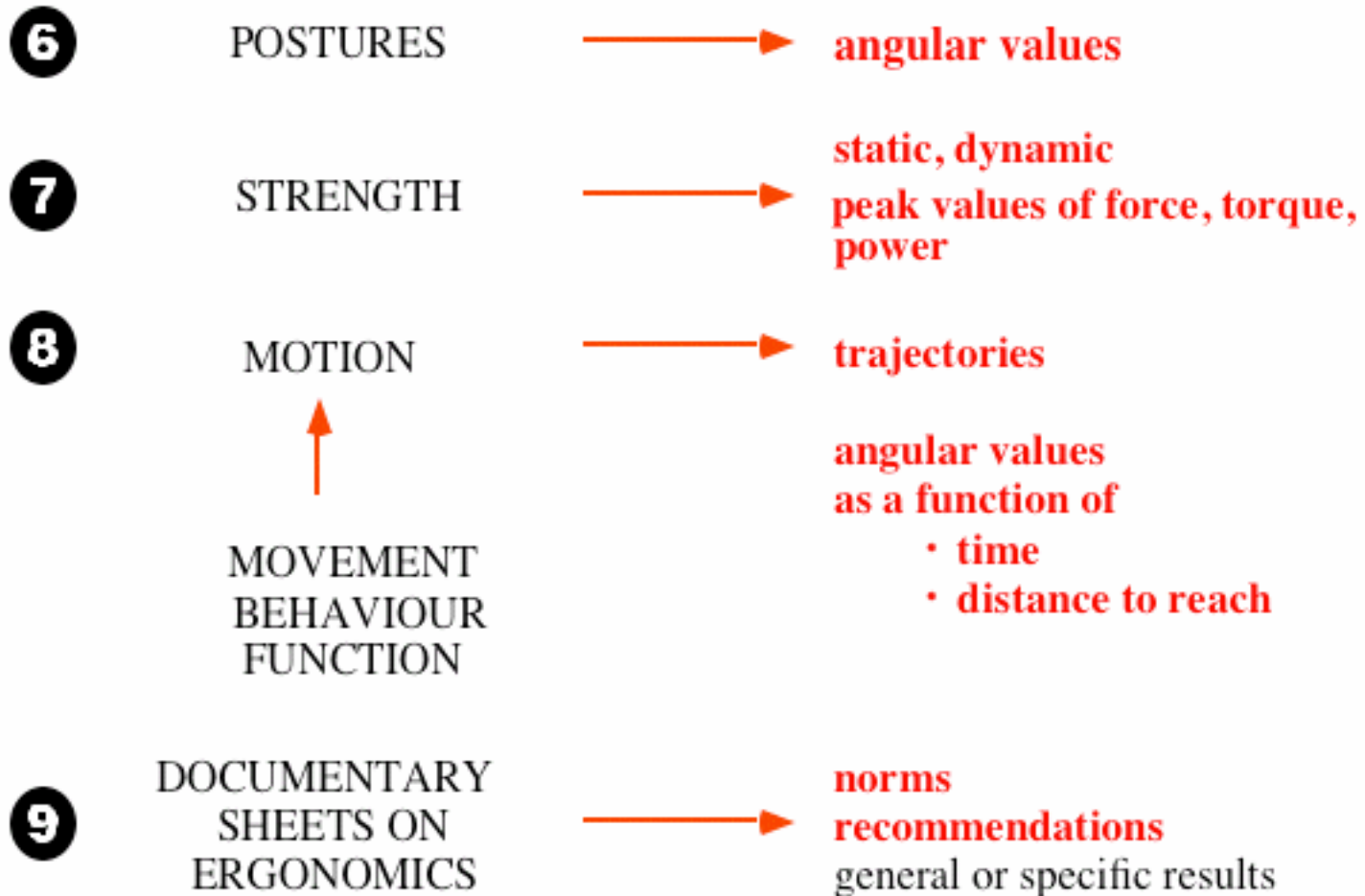
Database components

MAIN SECTIONS : 1 to 5



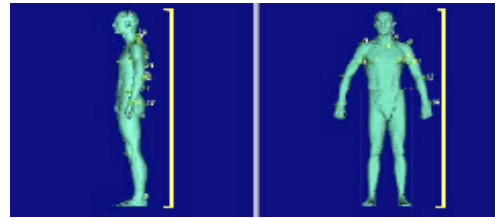
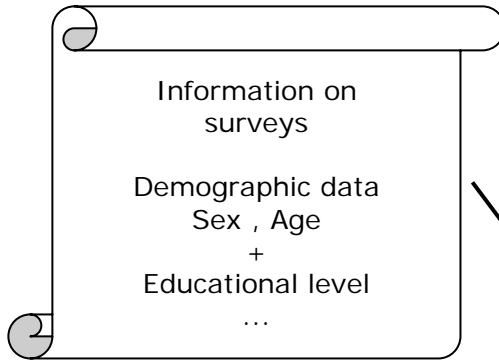
Database components

MAIN SECTIONS : 6 to 9

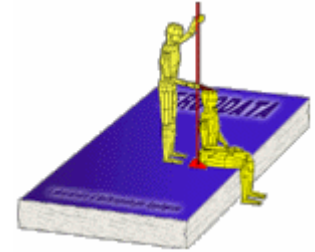




Database components

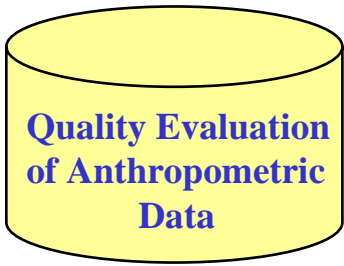
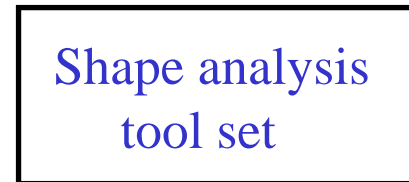
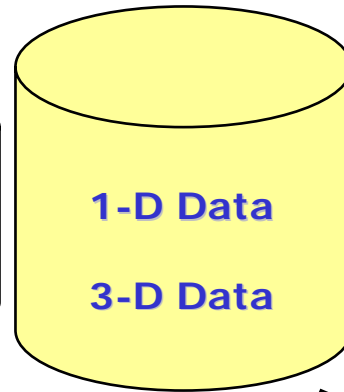
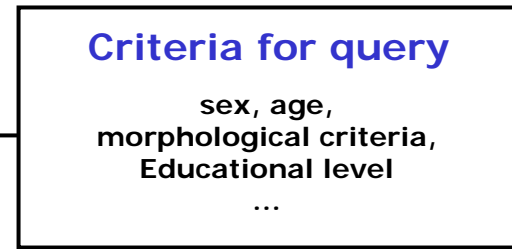


3-D scans

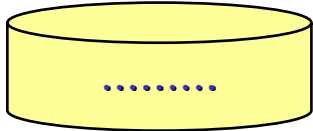
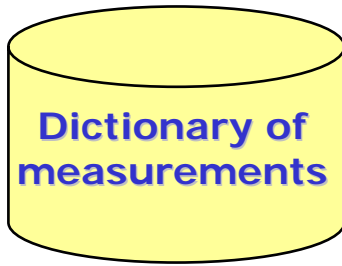


1-D data

New Data



+





Example of database structure (simplified)

INDIVIDUAL DATA

Surveys
Institute
Date (start-end)
Population
Origin
Civilian/Military
...

Subjects
Sex
Age
Civilian/Military
Date of measure
Educational level
Function
...

1D Data
Lengths,
widths,
perimeters ...

Biomechanical Data

3D landmarks
(x, y, z)

3-D Scans
Series of points,
Surfaces,
...

Quality Evaluation of Anthropometric Data

Dictionary of measurements
+
Definition
Method
Units
Graphs
Pictures...

SQL
Structured Query Language

Relational Data Base Management System

Articles
Institute/Authors
Date
Population
Origin
Civilian/Military
...

Samples
Sex
Age
Civilian/Military
Date of measure
Educational level
Function
...

Statistical processing
Mean, standard deviation
Min, max, centiles...
+
Analysis tool set
(Integrate, PSD,..)

Documents
Reports,
Graphs
(format: pdf, jpg...)

AGGREGATED DATA

Dictionary of measurements

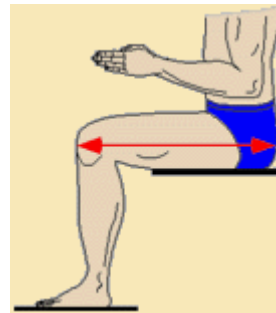
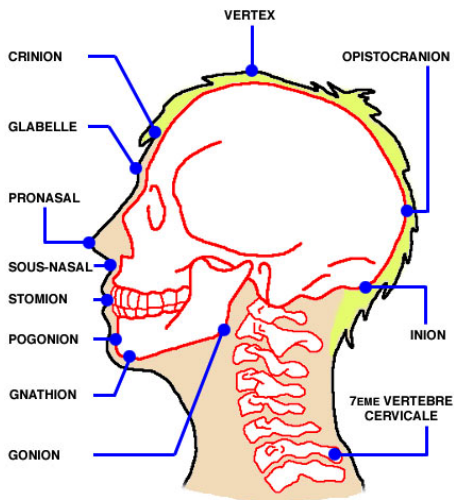
(example)

Aim

- Give an unambiguous definition for each measurement
- Help to define necessary measurements for each survey

Contents

- Graphic representations of the human body with locations of anatomical points
- For each measurement, for each point
 - definition
 - method of measurement
 - graphic



Definition

« Distance plan postérieur du massif fessier - face antérieure du genou »

Method

« Sujet assis, jambes fléchies à angle droit, fesses appuyées au mur, distance à partir du mur servant de plan de référence entre la face postérieure des fesses et la face antérieure du genou »

The need to create an Ontology?

- *Common set of terminology*
- *Formal/Testable representation*
- *Take advantage of advanced tools*
 - *(why reinvent work when you can steal from others!)*
- *Integration with new web services and W3C semantic web architecture*

Protégé (Stanford Ontology Tool)

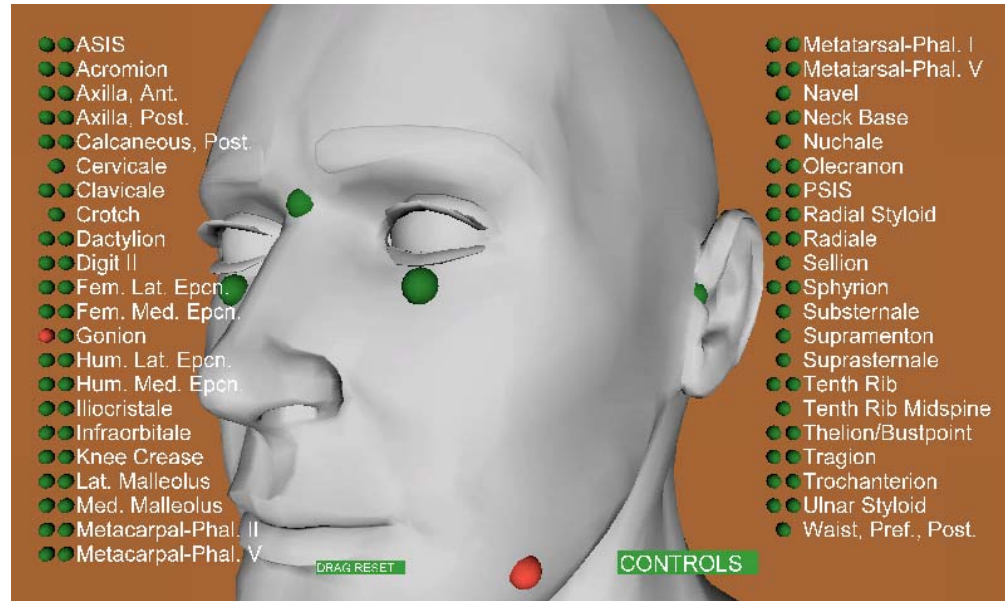
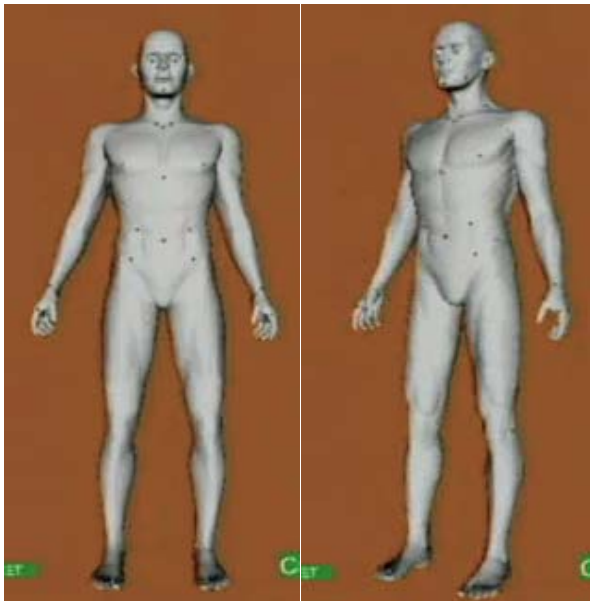
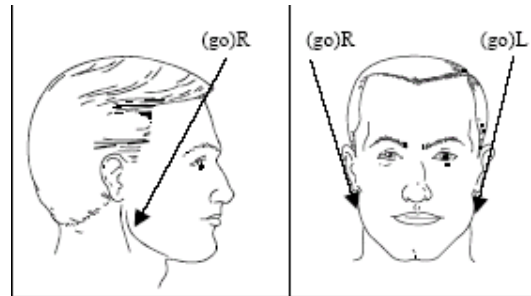
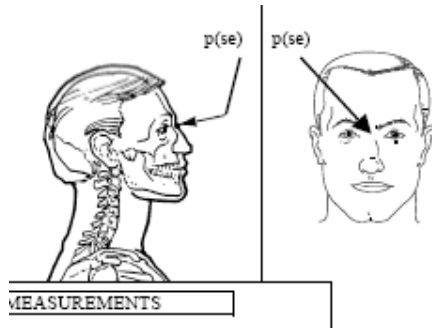
The screenshot displays the Protégé 3.0 beta interface. The main window title is "newOWL Protégé 3.0 beta (file:/Users/sressler/anthro/onto2/OWLNEW/newOWL.pprj, OWL Files (.owl or .rdf))". The menu bar includes File, Edit, Project, OWL, Wizards, Code, Window, and Help. The toolbar contains various icons for file operations and ontology editing. The interface is divided into several panes:

- Subclass Relationship:** Shows the asserted hierarchy for the project "newOWL". The hierarchy is: Landmark > JohnRoebuck > Joint > Line > Plane > Point > Acromion. Other classes under Point include AbdominalDepthPoint, AbdominalDepthPointSta, AbdominalPointAnterior, AbdominalPointAnteriorSt, AcceleratorHeelPoint, AcromionExtendedForwa, AcromionMark, Acropodion, Alare, AnkleAnterior, AnkleLateral, AnkleMedial, AnklePosterior, AnteriorSuperiorIliacSpine, AnteriorSuperiorIliacSpli, Aurale, AxillaryFoldAnterior, AxillaryFoldPosterior, BicepsPoint, BicepsPointRelaxed, BustPoint, and BustPointSternale.
- Class Editor:** For Class: Acromion (instance of owl:Class). It has tabs for Name, SameAs, and DifferentFrom. The Name field contains "Acromion". The rdfs:comment field contains "ACROMION, Left/Right (a-kro'-mee-on)".
- Annotations:** A table with columns Property, Value, and Lang. It contains one entry: Property: rdfs:comment, Value: ACROMION, Left/Right (a-l..., Lang: (a-l...).
- Asserted Conditions:** A list of conditions for the class. The conditions are: Point (NECESSARY & SUFFICIENT), comment \exists "" (NECESSARY), detaildescription \exists "According to McGuire's translation of...", direction \exists "HeightQs Acromial Height [A], [G]Qw Acro...", image \exists "Acromion.jpg", \exists locatedOn Torso, posturalconstraint \exists "Normally, subject must have upper...", reference \exists "[G] 1988 Anthropometric Survey of US Arm...", and side \exists "".
- Properties:** A list of properties for the class: comment (multiple String), detaildescription (multiple String), direction (multiple String), image (multiple String), locatedOn, posturalconstraint (multiple String), reference (multiple String), and side (multiple String).
- Disjoints:** A section for defining disjoint properties, currently empty.

At the bottom of the interface, there is a section labeled ":FROM" with a text input field and some icons.

Adapted from S. Ressler, 2006

Enhanced Web Pages (visualizations)




Adapted from S. Ressler, 2006

Semi-Automatically Generated Web Page

testNEW Project: Stylium

file:///Users/sressler/Documents/AfzalOntology/OntologyEA/Anthopomet... Google

Web3DBlog hot v my del post 2 del NIST phone NISTCal Google Earth OVRT .Mac Finance News (1032) SIMA

 **NIST**
National Institute of
Standards and Technology

Ontology

Class: Stylium

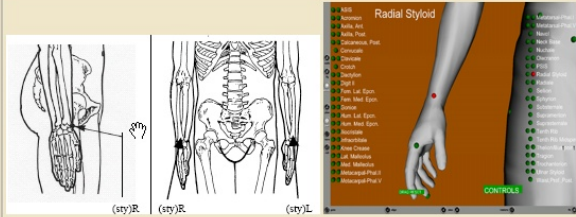
Documentation: STYLION, LEFT/RIGHT

Superclasses
● Point

Subclasses
None

Types
♦:STANDARD-CLASS

Instances (1)

Template Slots				
	Slot Name	Documentation	Type	Cardinality
[-]	comment		String	0:1
[-]	detailDescription	On each arm, when the arms are hanging vertically, the lowest point of the radius (distal tip) The point is on the thumb side of the wrist bones	String	0:1
[-]	direction		String	0:1
[-]	image		String	0:1
[-]	posturalConstraint	Hand at neutral posture, in line with the forearm for measurement marking. For modeling, this point moves about with the wrist joint and ulna bone representations, but skin at wrist may move relative to wrist bones as wrist flexes.	String	0:1
[-]	reference	[R]Unpublished briefing charts and papers by J. A. Roebuck Jr.	String	0:1
[-]	side	Left/Right	String	0:1

Own Slots		
	Slot Name	Value
■	:ROLE	Concrete
■	:SLOT-CONSTRAINTS	

Instances
♦ test2_Instance_159
[^ back to top](#)

[Return to Class Hierarchy](#)

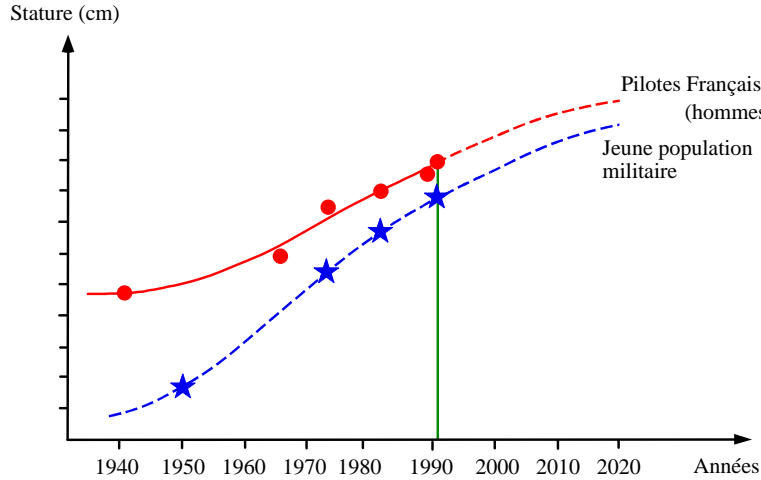
Generated: 10/17/2005, 10:01:15 AM, Eastern Daylight Time

Protégé is a trademark of Stanford University, Copyright (c) 1998-2005 Stanford University.

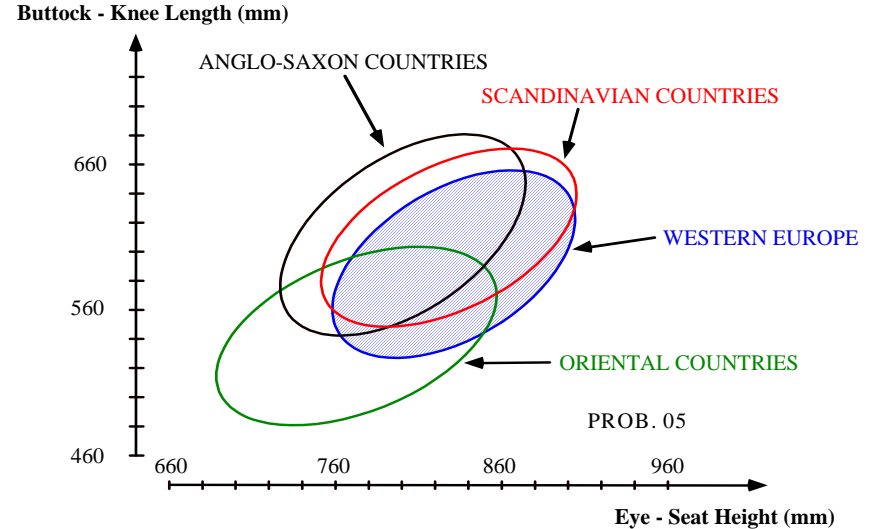
Adapted from S. Ressler, 2006

Databases Applications

Examples of 1-D anthropometric data processing using Databases of WEAR

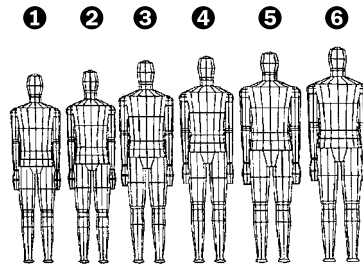
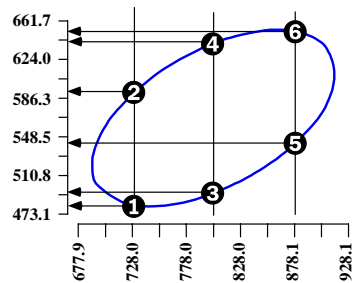


Evolution of the stature. Mean values for two french populations from 1940 to 1991. Prediction up to 2020.



Choice of well-adapted measurements

Buttock-knee (mm)




Eye height sitting	5%	5%	50%	50%	95%	95%	Percentiles
Buttock-knee length	min.	max.	min.	max.	min.	max.	




Choice of typical human body models using bivariate distributions. Example to create 5th, 50th and 95th percentiles of mannikins.

Databases Applications

Example of the visual interface of CLEOPATRA to navigate and interrogate a 3-D Database of WEAR

CLEOPATRA VII 
by Eric Paquet and Marc Rioux



1 to 12 out of 87













File:


Filter:


Keywords


Shape: Structure:

Colour: Scale:

 100.0% csr0058a1	 88.7% csr0211a1	 88.7% csr0218a1	 88.1% csr0144a1
 87.9% csr0223a1	 86.8% csr0140a1	 86.8% csr0299a1	 86.1% csr0152a1
 86.1% csr0285a1	 85.9% csr0138a1	 85.7% csr0126a1	 85.2% csr0251a1

 National Research Council Canada
Conseil national de recherches Canada

CLEOPATRA VII 
by Eric Paquet and Marc Rioux



1 to 12 out of 33











File:


Filter:

Keywords

Shape: Structure:

Colour: Scale:

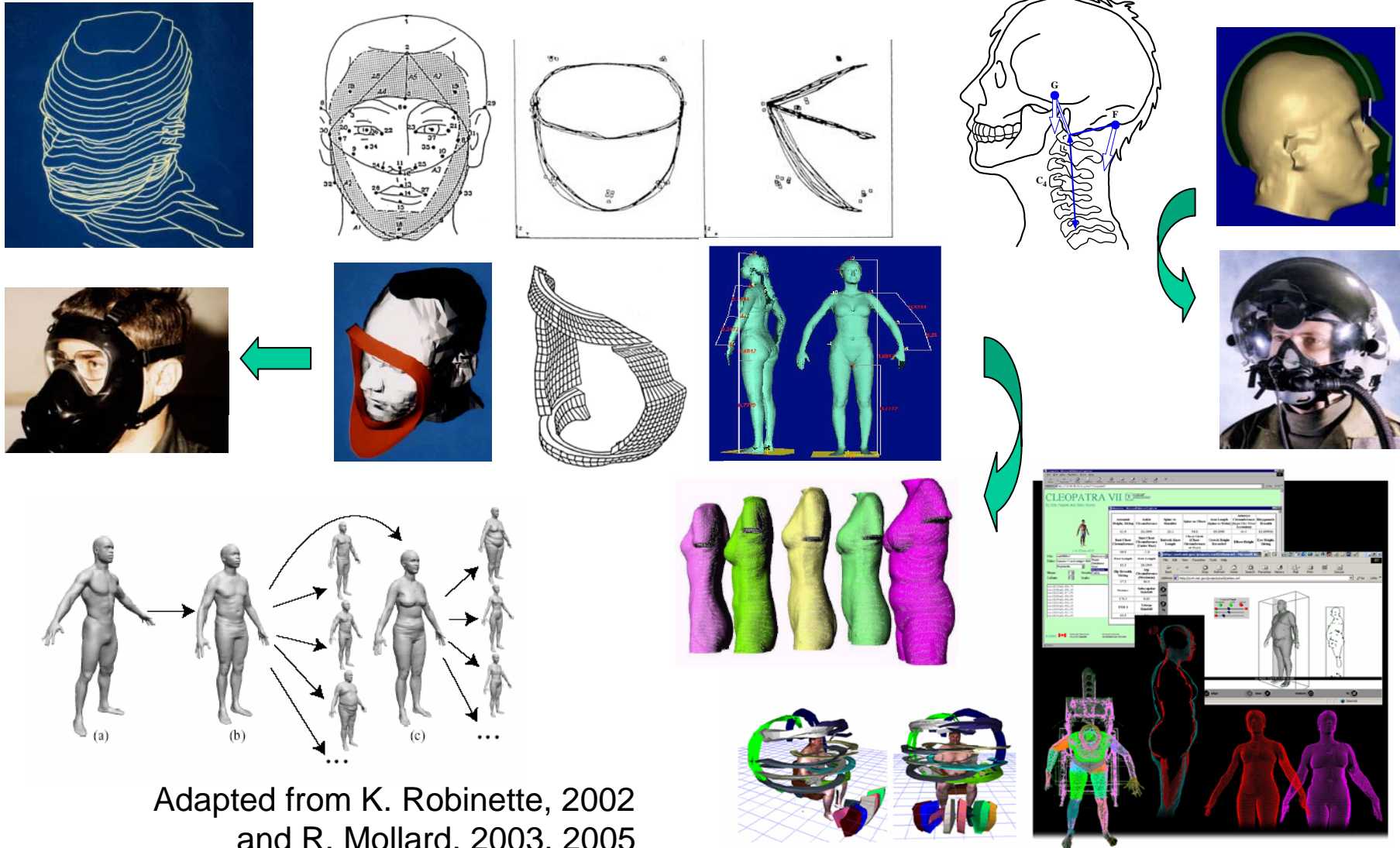
 86.8% csr0060a1	 85.3% csr0174a1	 84.6% csr0084a1	 84.0% csr0125a1
 83.6% csr0127a1	 83.1% csr0235a1	 82.7% csr0054a1	 81.1% csr0269a1
 75.7% csr0239a1	 73.2% csr0097a1	 71.9% csr0094a1	 31.8% csr0094b1

 National Research Council Canada
Conseil national de recherches Canada

Adapted from M. Rioux, 2005

Databases Applications

Examples of 3-D size/shape analysis and fit tests using 3-D Databases of WEAR for the design of equipments



Adapted from K. Robinette, 2002
and R. Mollard, 2003, 2005

Conclusion

==> to develop a Post-Database Creation Ontology

- » Enable future integration capabilities
- » Check for coverage/completeness
- » Formal description of content and methodology for adding semantic hooks
- » Improved (semi-automatic) documentation

==> to develop the WEAR on-line database system connected with existing databases