



CADANS – Advanced digital technologies for the improvement and customization of wearable products

CADANS seminar 2015. Conclusions on R&D and valorization of enriched statistical body shape models

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Items to be considered for valorization and further R&D

1. Potential application domains
2. Data acquisition
3. Algorithms and mathematics
4. Enrichments
5. Tools and techniques for valorization
6. Collaborative research infrastructure



Potential application domains I

- In the process of product development
 - Improved fit by true body mannikins
 - Improved ergonomics by taking account of true body shape and variation
 - Parametrization of body parts allows for parametrized design
 - Applications in the front-end, concept development and product life cycle e.g. deployment in point of sale and manufacturing
 - Enriched statistical shape models (ESSM's) might serve as a catalysator for the development of categories of new products including exoskeletons, robotics, incorporating wearables, sensors for monitoring body parameters and actuators.
- Manufacturing
 - Applications in CAD/CAM
 - Drivers for personalized production techniques especially due to parametrized models
 - Catalysator for incorporating shape memory materials and flexible molding
 - Facilitating online manufacturing



Potential application domains II

- Apparel, Retail, Shoe trade and Fashion contain lead cases and might steer and benefit from further developments of enriched statistical shape models.
- Health care contains established applications in Orthopedics, Dentistry, Surgery, Prostheses. Potential new applications are contained in
 - Wellness and body management
 - Somatotyping
- Applications in Sports for:
 - Optimize performance
 - High end product development
 - Coaching
- Genetics, mapping genes to body form and conversely, identifying evolutionary traces.



Data acquisition

- Opportunities in merging data captured by different media (Kinect, Smartphone, Medical images, body sensors,...).
- Challenges and opportunities in ambulant posture registration.
- ESSM's might can be used for data pre-processing techniques.
- Challenges and opportunities in the development of Data Standards for ESSM's.
 - Dynamic platform to anticipate on meta-data and enrichments
 - Development and implementation of a viable business model
 - taking account of licences and ownership
 - Development of quality control systems



Algorithms and mathematics

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Data acquisition

- Need for approachable ESSM's, for example to compare delimited body parts, in function of the target product.
- Development of mathematical theories
 - to cope with limitless multitude of variations, for example rich enough to take account of evolutionary traces,
 - to cope with meta-data,
 - to cope with enriched models.
- Development of a framework to conduct statistical tests taking account of all data types.



Enrichments I

- meta-data and big data
- modelling the interior, for example
 - ear channel, as is established by existing techniques
 - nasal cavity, which should be established by medical images
 - Modelling bones, organs, tissue, ..
- modelling physical and physiological parameters, such as already done with pressure distribution, forces and moments, heat transfer, ...
 - Further applications in e.g. resolution maps for vibrotactile perception, skin conductivity (to gain insight on wearable sensors)



Enrichments II

- Strong challenges and opportunities in linking enriched shape models to motion:
 - generating articulating models joining skeletons and shape
 - modelling articulation by posture monitoring,
 - opportunities in mapping range of motion and motion patterns as a function of shape, building motion databases,
 - predicting motion by skeleton, shape and motion databases.
- Enriched models should be verified physically and digitally



Need for tools and techniques for valorization of ESSM's.

- Systematic study of the deployment of ESSM's in the process of product development and entailed improvements, including appropriate verification.
- Opportunities in the development of CAD/CAM environments that contain current state of the art ESSM's and that can be dynamically completed with newly available data.
- Development of online tools for defining, manufacturing and selling body-related products.
- Development of demonstrator cases and tutorials.
- Usable measurement systems to determine fitting products in shopping context, online, pda based and in physical world shopping



Need for collaborative research infrastructure I

- Imaging devices for body monitoring along state of the art gold standards in lab conditions
 - Skeleton bases,
 - 3D
 - 4D
- Outdoor measuring equipment
 - standard posture tracking equipment
 - plug and play wearable posture and motion tracking for outdoor application, extendable with sensors for physiological data
 - Inter-body parameters (eg personal distance) and interactions (e.g. registration if synchronism of a group of dancers, choreography registration)
 - relevant mechanical, electrical, optical, biochemical sensors



Need for collaborative research infrastructure II

- Wearable sensors and actuators for motion management (e.g. vibro-tactile feedback) and optimizing (individual as well as groupwise optimization)
- Flexible databases, incorporated in a viable business model for
 - Motion
 - body shape models
 - Special challenge is to integrate medical data*
 - new databases comprising ESSM's
 - ✓Skeleton
 - ✓Somatotype-Shape
 - ✓Range of motion-Shape
 - ✓Movement patterns-Shape
- Current tools and techniques to translate data into products
- Tools for physical verification



More information?

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