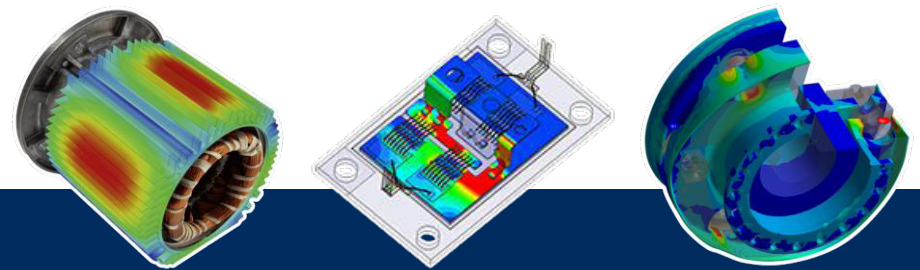


CADFEM®



Simulation is more than Software®



Investigation on body surfaces with SoS on the example of the female breast

Eric Quadrat

Project

- Government-funded research project
development of new methods to generate patient specific 3d model for computer aided surgery planning in plastic surgery
- Project partner:
 - CADFEM GmbH, Grafting bei München
 - DYNARDO GmbH, Weimar
 - Research group CAPS, Klinikum rechts der Isar, München
 - Department of Informatics, Chair for Computer Vision and Pattern Recognition, Technical University of Munich



Supported by:

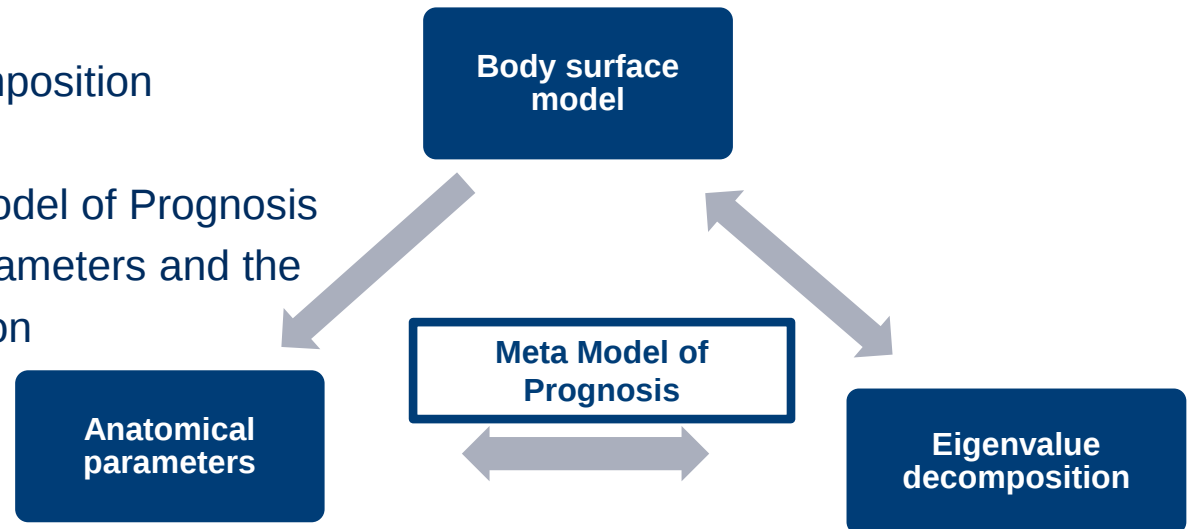


Federal Ministry
for Economic Affairs
and Energy

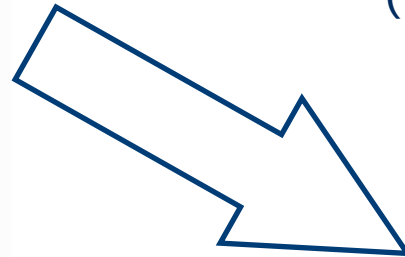
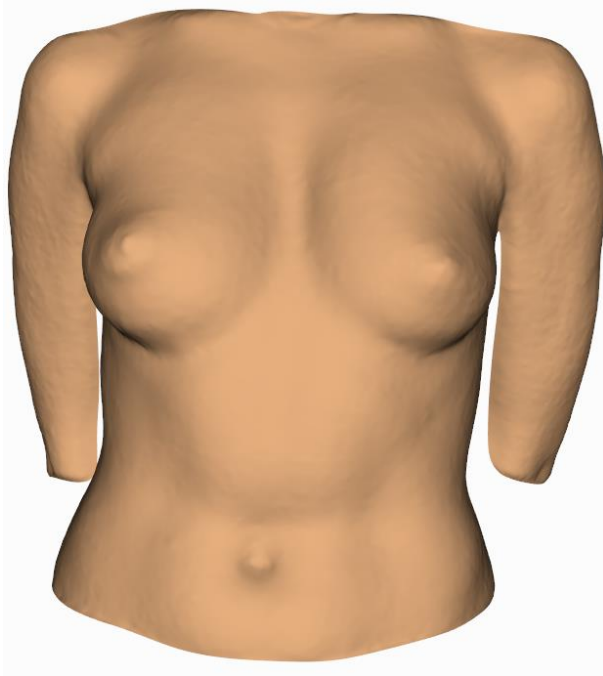
on the basis of a decision
by the German Bundestag

Objective and solution approach

- Objective :
 - Development of methods to generate high quality patient specific 3D models of the female breast
 - Development of parameterized body surface model
 - Parameterized with anatomical parameters
- Solution idea:
 - Using eigenvalue decomposition
 - Generation of Meta – model of Prognosis between anatomical parameters and the eigenvalue decomposition

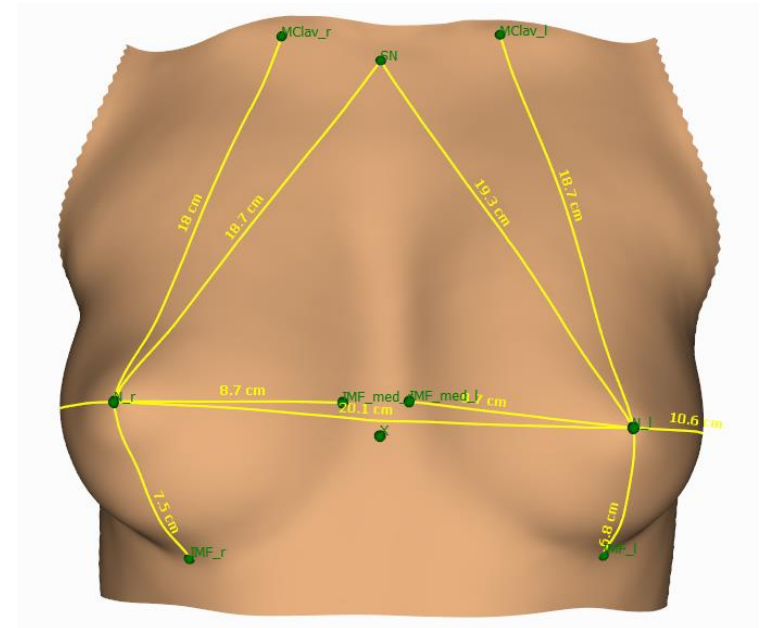


Objective and solution approach



- 57 patients
- Generation of body surface model with a 3D scanner
- Fitting of a standard mesh (Template) on scan

- Calculation of different anatomical Parameters:
 - 77 distances – euclidean and on surface
 - Volume of breast

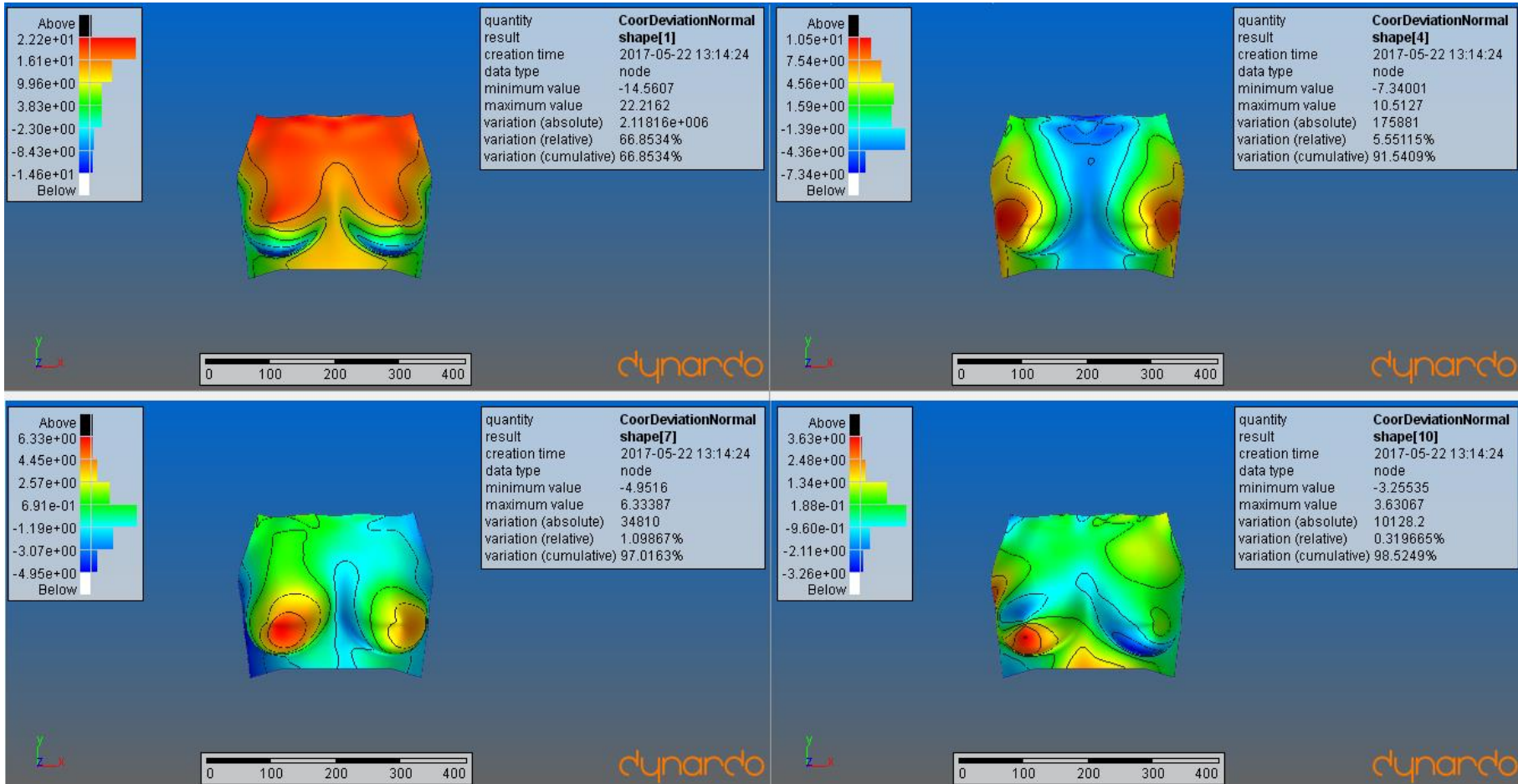


Results

	CoordDeviationNormal	CoordDeviation[1]	CoordDeviation[2]	CoordDeviation[3]
shape[1]	 66.85 %	 46.06 %	 70.98 %	 72.64 %
shape[2]	 78.78 %	 66.87 %	 88.19 %	 85.05 %
shape[3]	 85.99 %	 77.88 %	 92.32 %	 90.22 %
shape[4]	 91.54 %	 86.69 %	 94.96 %	 93.56 %
shape[5]	 94.74 %	 91.86 %	 97.04 %	 96.13 %
shape[6]	 95.92 %	 94.51 %	 97.62 %	 96.97 %
shape[7]	 97.02 %	 96.15 %	 98.15 %	 97.71 %
shape[8]	 97.75 %	 97.08 %	 98.59 %	 98.24 %
shape[9]	 98.21 %	 97.82 %	 99.00 %	 98.64 %
shape[10]	 98.52 %	 98.27 %		 98.87 %
shape[11]	 98.82 %	 98.61 %		 99.07 %
shape[12]	 99.04 %	 98.85 %		
shape[13]		 99.06 %		

- 95% variation of geometry can be modeled with 7 eigenshapes
- 99% variation of geometry can be modeled with 13 eigenshapes

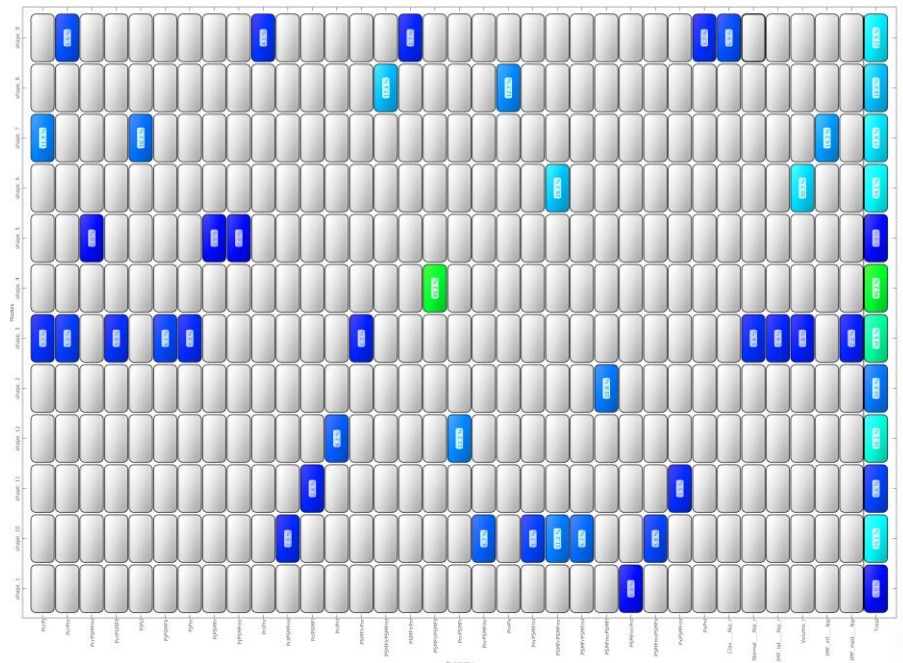
Results



Results

- Generation of field – MoPs with anatomical parameters as input values
→ no useable CoPs
- Direct distances better than surface distances
- Distances better if they are measured between the two halves of the body
- Alternative:
MOP from anatomical parameter to amplitudes of eigenshapes
- Poor results but candidates for useable parameters

F-CoP[PnrPnl]		2.24 %		
F-CoP[PnrPx]	0.10 %	0.12 %	0.97 %	
F-CoP[PxPSMFm]			0.08 %	
F-CoP[PxPnl]	2.32 %			
F-CoP[Sternal - Nip r]	0.26 %			
F-CoP[Total]	11.42 %	24.94 %	15.37 %	8.40 %
F-CoP[Volume r]	0.36 %	0.70 %		0.10 %

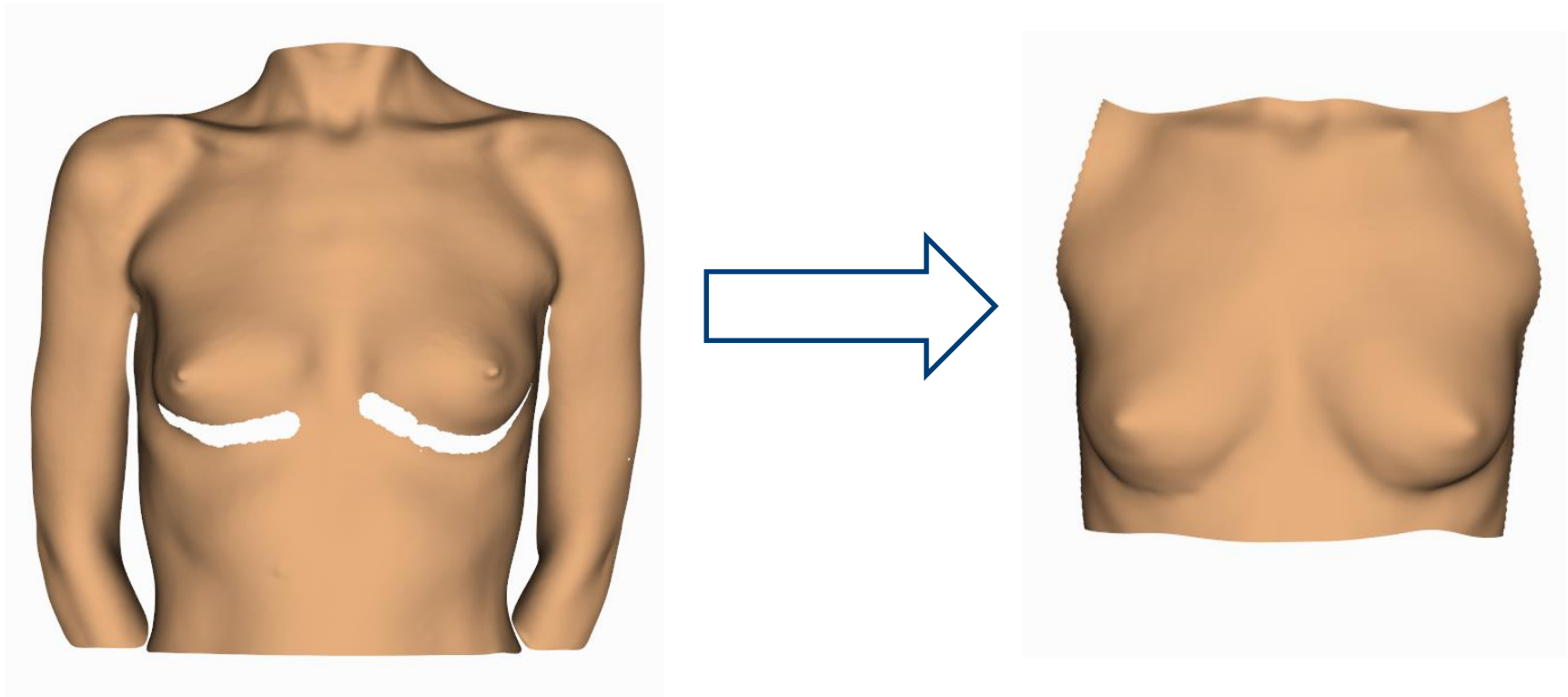


Outlook and using of results

- Generation of more data
 - Mirroring of the dataset
 - improvements of the results and CoPs
 - Take up more scans
- Implementation of parameter based modeling of surface
 - Using eigenshape amplitudes as parameters instead of anatomical parameters
 - Prediction of surface changes after a surgery

Outlook and using of results

- Results will be used to improve an eigenshape based fitting algorithm
 - For automated improvement of mesh quality



Thank you for attention!

Eric Quadrat
CADFEM GmbH
Marktplatz 2
85567 Grafing b. München
equadrat@cadfem.de

Germany

CADFEM GmbH
HQ Grafting
Marktplatz 2
85567 Grafting b. München
T +49 (0) 8092 7005-0
info@cadfem.de

Office Berlin
Breite Straße 2a
13187 Berlin
T +49 (0) 30 4759666-0

Office Chemnitz
Cervantesstraße 89
09127 Chemnitz
T +49 (0) 371 334262-0

Office Dortmund
Hafenpromenade 1
44263 Dortmund
T +49 (0) 231 99325550

Office Frankfurt
Im Kohlruß 5-7
65835 Liederbach am Taunus
T +49 (0) 6196 76708-0

Office Hanover
Pelikanstraße 13
30177 Hannover
T +49 (0) 511 390603-0

Office Stuttgart
Leinfelder Straße 60
70771 Leinfelden-Echterdingen
T +49 (0) 711 990745-0

Austria

CADFEM (Austria) GmbH
HQ Vienna
Wagenseilgasse 14
1120 Wien
T +43 (0) 1 5877073
info@cadfem.at

Office Innsbruck
Grabenweg 68 (SOHO 2.0)
6020 Innsbruck
T +43 (0) 512 319056

Switzerland

CADFEM (Suisse) AG
HQ Aadorf (Zurich)
Wittenwilerstrasse 25
8355 Aadorf
T +41 (0) 52 36801-01
info@cadfem.ch

Office Lausanne
Avenue de la Poste 3
1020 Renens
T +41 (0) 21 61480-40