

Towards a model of the human face

Cormac Flynn



Wintec

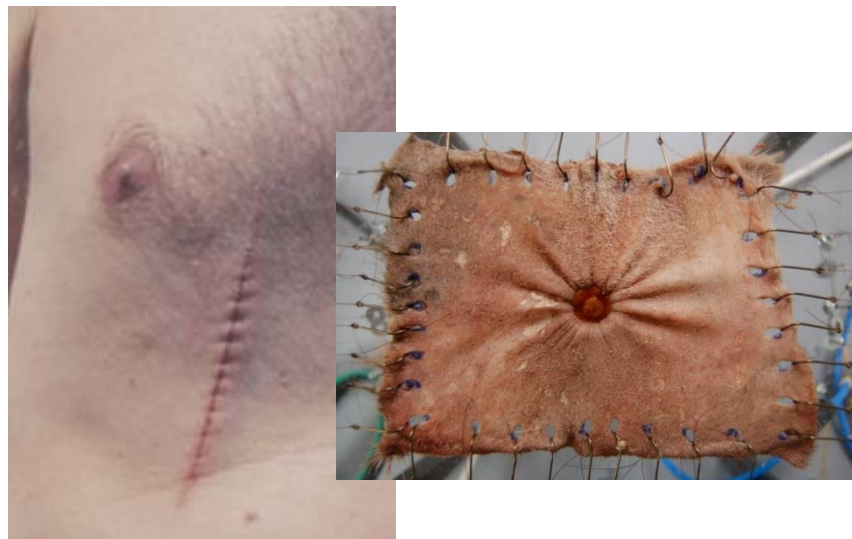
WAIKATO INSTITUTE OF TECHNOLOGY
Te Kuratini o Waikato

Metro ITP Tutor Forum

10th February 2015

Why measure skin properties?

Superior surgical incision methods
to reduce scarring



Physically-based animation



Zhang et al (2006)

Personal care product development



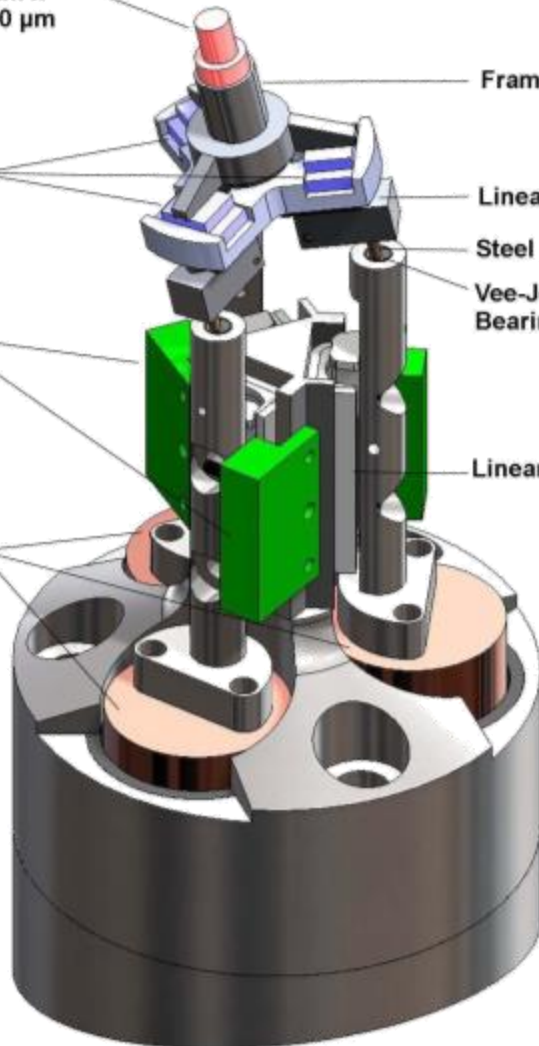
3D Force-Sensitive Micro-robot

Probe moved within working volume (10 mm x 20 mm x 9 mm) with 50 μm resolution and 60 μm repeatability

Force transducers (Honeywell)

Position transducers (ALPS) measure axes displacements

Voice-coil actuators (BEI KIMCO) drive three parallel axes



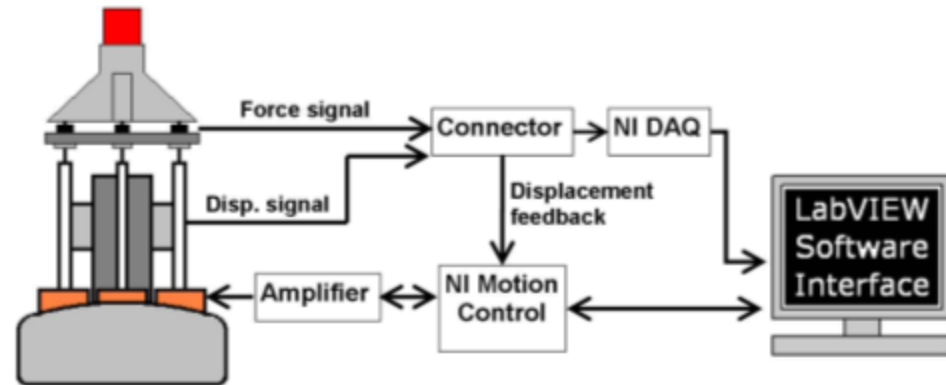
Frame

Linear slide (IKO)

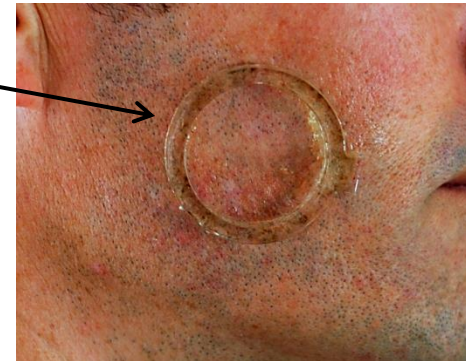
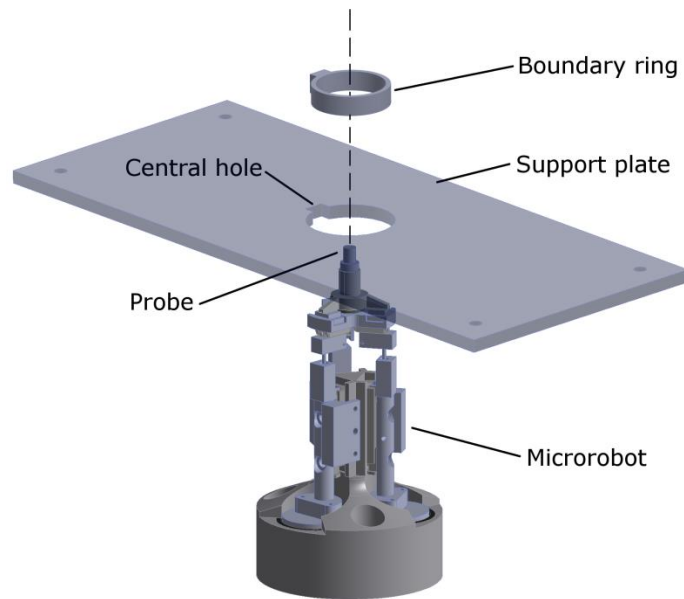
Steel pivot

Vee-Jewel Bearing

Linear slide (IKO)



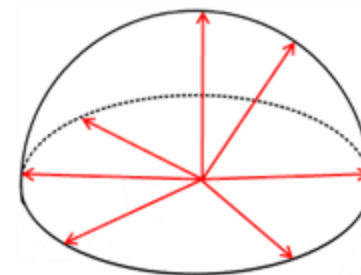
In Vivo Deformation of Facial Skin



Boundary ring attached to position face relative to robot



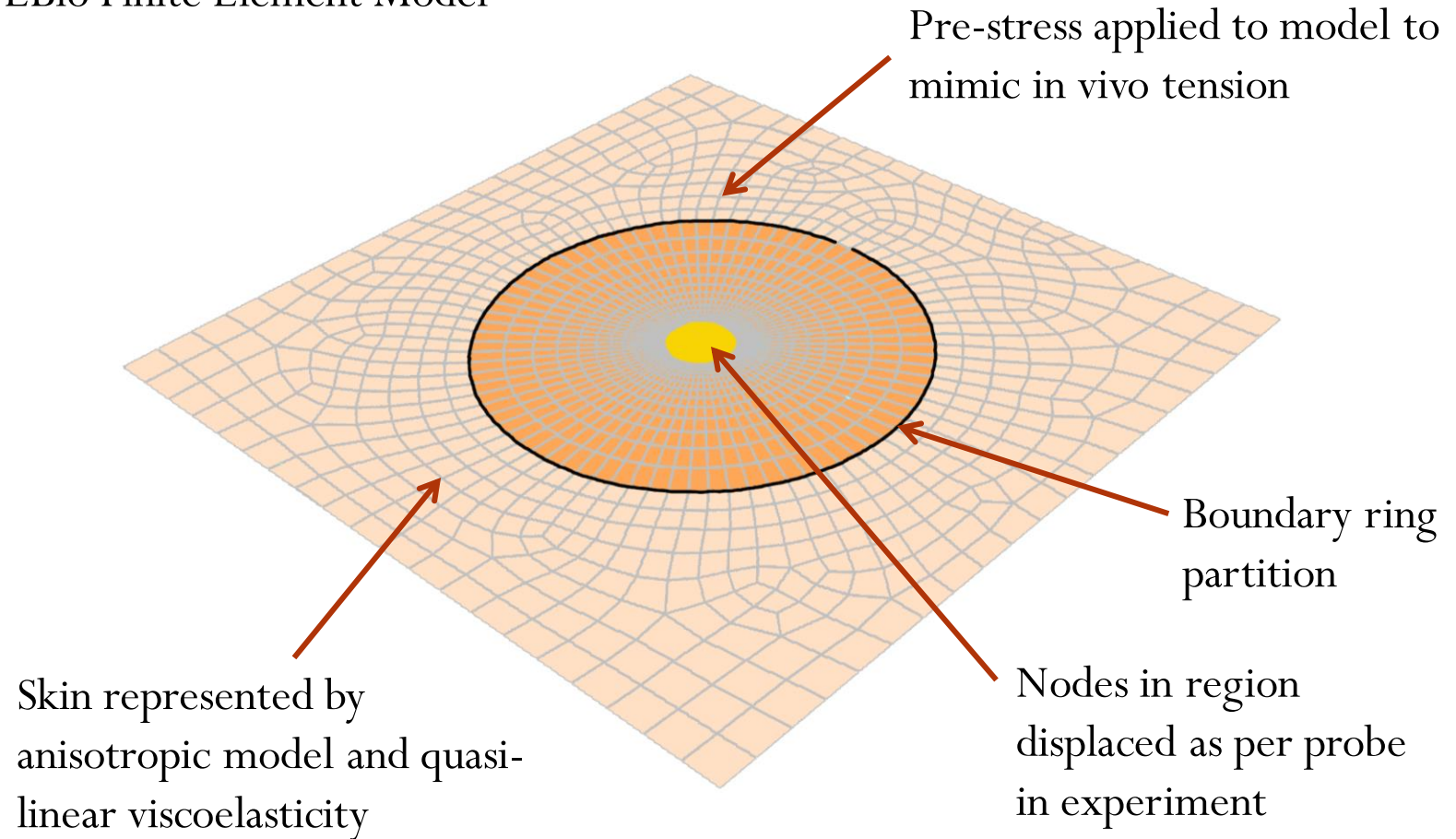
Six points on the face tested



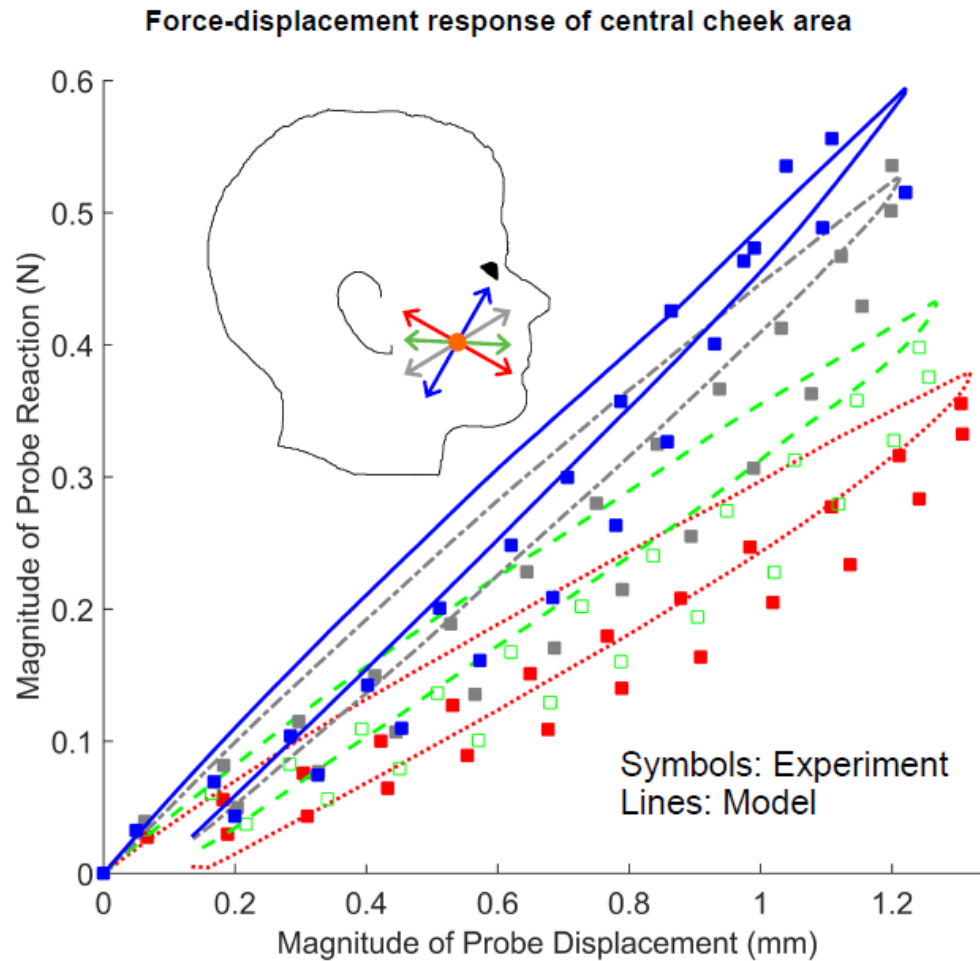
Probe displaced in 16 directions

Simulating the Face Experiments

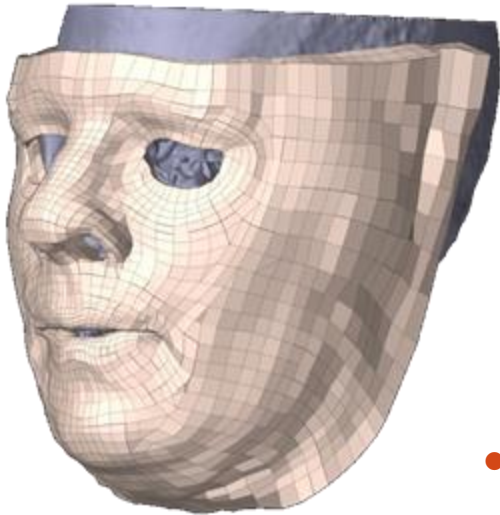
FEBio Finite Element Model



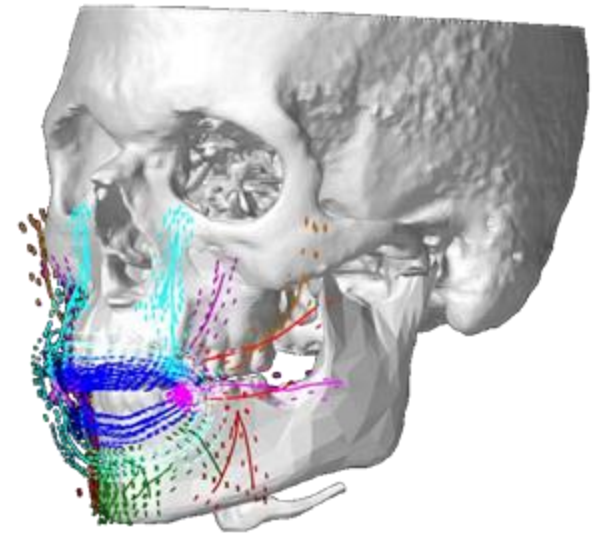
Force-Displacement Response of Skin in Forehead Region



Applications – Face/Head Model UBC

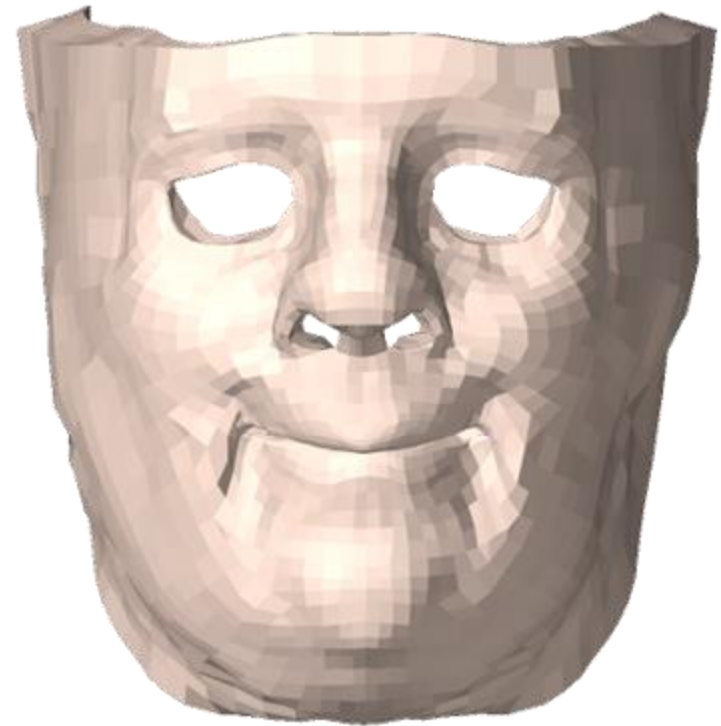
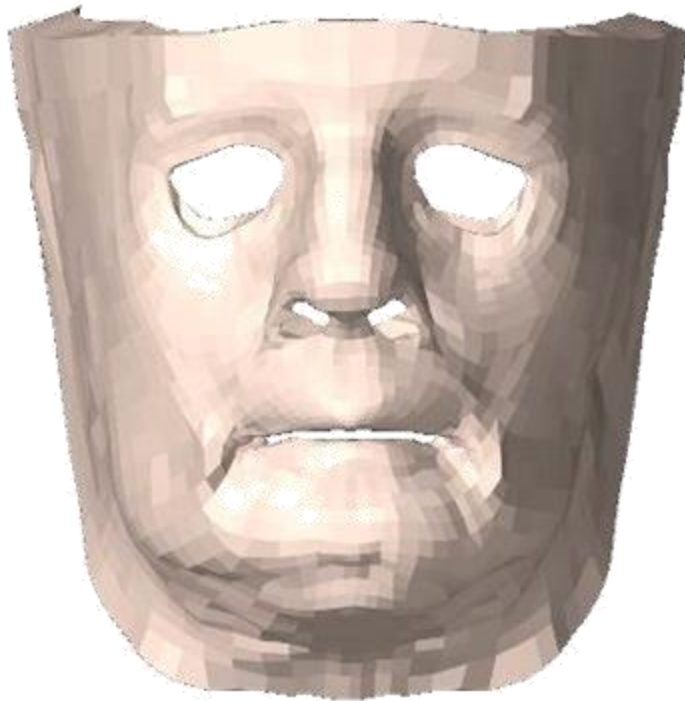


- CT data of adult male (Bucki et al, 2010)
- Parameters from in vivo experiments input into face model
- Contact modelled between soft tissue and bony structures
- 10 orofacial muscles represented



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Modelling Facial Expressions



Flynn et al, Computer Methods in Biomechanics and Biomedical Engineering (2014)

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Question

- Can Metro ITP research be autonomous?