Project ReMeDi

• Goal: develop a tele-operated robotic system for telemedicine
• Enable doctors to remotely perform examinations such as:
  – Palpation
  – Ultrasonography
• Multifunctional robotic device at the patient side
• Mimic the real examination process through:
  – Teleconferencing
  – Haptic interfaces & force-feedback at doctor side
  – Multisensory data represent the remote environment

Abstract
The European FP7 project ReMeDi (grant 610902) aims to develop a system that allows doctors to remotely perform physical and ultrasonography examinations by teleoperating a multifunctional robotic device. In order to perceive the patient and to estimate his/her pain sentiment, the body pose as well as the patient’s facial expression is recognized using CV methods. The interactive nature of the application requires the RGB-D data to be processed in real-time. Our research focus lies on developing and evaluating both efficient and robust algorithms to meet these demands.

Challenges
Perceiving the patient in the examination context
• Localize patient & estimate body pose
• Estimate patient’s body shape
• Analyse & monitor facial expression

Constraints
• Kinect RGB-D sensor mounted on robot
  – Viewpoint limitations
  – Self-occlusions (robot arm)
• Real-time processing
  – Run-time efficiency
  – Limited hardware capacity on the patient’s side

Facial Expressions
• Real time monitoring of discomfort/pain level during examination

Body Shape Model
• Statistical body shape models to synthesize realistic training data
• Map measurements to 3D model for improved analysis, storage, visualization

3D Body Tracking
• Fast, random forest-based pose and shape estimation pipeline


Dantone et al., “Random Forests for Real Time 3D Face Analysis”, ICJV 2012

Girshick et al., “Efficient regression of general-activity human poses from depth images”, CVPR 2011