FACED-UP: Fast Analysis of CErvical Dystonia – Unobtrusive and Precise

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Overview

The *FACED-UP* project is a collaboration between TU Delft and LUMC. It aims to develop a tool for objective, patient-friendly quantification of movement disorders of the head, based on RGB-D videos (recorded with Kinect™). The project is embedded in the Technology In Motion (TIM) laboratory, where researchers from LUMC, TU Delft and VU University work together to develop and implement patient-friendly tools for evaluating movement disorders.

Background

Cervical Dystonia (CD) is characterized by sustained contractions of muscles in the neck. This results in abnormal, repetitive head movements and abnormal head postures, which can be very painful and typically leads to severe limitations in daily functioning (both physically and socially).

Currently, clinical rating scales (such as TWSTRS) are used for diagnosis and evaluation of treatment effects. Such rating scales are subjective and strongly dependent on the experience of the clinician. If CD is incorrectly diagnosed as essential tremor, patients will be unnecessarily exposed to ineffective medication or botulinum toxin (BOTOX) will be injected in the wrong muscles.

It is therefore important to develop a method for objective, user-friendly quantification of (subtle and extreme) head movements and postures. Quick, cheap and standardized assessment of head movements and postures using RGB videos will contribute to improved diagnosis of CD, which will lead to better treatment selection and better evaluation of treatment effects.

Examples of abnormal head postures (at rest) in two anonimized CD patients

Work plan

High-resolution RGB video and low-resolution depth video (Kinect™) have already been collected in 20 CD-patients, 5 patients with essential tremor, and 20 healthy individuals according to a standardized protocol. Reference data from an accelerometer, a 6DOF electromagnetic tracking system, and a clinical rating scale are available for validation.

1. Develop/apply/improve computer vision methods for accurate detection of abnormal postures and movement disorders (e.g. shaking) of the head from RGB and depth videos (recorded with Kinect™ cameras).
2. Validate results against clinical rating scale (TWSTRS scores) and/or reference measurement systems
3. *Optional:* explore whether machine learning can be used to discrimate between CD patients and patients with essential tremor.