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Schedule 1

Description of the Software:

This HG3D software stands for head pose and gaze tracking in 3D. It contains the implementation of algorithms related to those tasks, while profiting from calibrated RGB-D data (standard vision and depth). The head pose tracking is based on an implementation of the Iterative Closest Points (ICP) algorithm, for which a user specific facial template (face 3D mesh) is needed. The gaze tracking is based on a sparse reconstruction algorithm from head pose rectified eye images. This methodology is proposed and described in the following publication:


Nevertheless, depends on the usage (such as combining appearance models from different users), the following publication is also relevant:


As the algorithms require the learning of user specific models of the facial shape and the eyes appearance (while gazing at different directions), we provide auxiliary tools for the models learning.

In the case of the facial shape learning, we provide an standalone application to collect some RGB-D frame samples of the subject, place a small set of landmarks and then run the fitting of a 3D Morphable Model (from which we recommend the Basel Face Model, developed at the University of Basel). For the learning of gaze appearance models we provide both a simple strategy, in which the user is requested to gaze at the camera while rotating the head, and the capabilities for extension, in which the user can define a callback function from which to extract the gazed 3D point.

There is compatibility with the EYEDIAP dataset and further extensions of the methodology are possible.

The software can indeed be improved, especially with the addition of different gaze estimation methods, head pose tracking and respective training methodologies. It was also designed such that users can take the obtained head pose and gaze parameters and use them in applications of their own (e.g. human robot interaction).

There is indeed some commercial potential for this system, as a Kinect like camera is a cheap device and they are becoming available everywhere. Even though there are some strong competitors for different areas (see below), this software can attract scientific interest for different applications and, with improvements, can lead to a valuable product.

The competitors are: faceshift is an already strong start-up working on facial expression mapping for animation. They nevertheless do an accurate head pose tracking from a Kinect-like device, which is based on a similar strategy, but theirs might no longer require an initialization. In terms of gaze, there are many eye tracking systems in the market from companies like Tobii, SMI, Smarteye, etc. but they are costly (>10000CHF) and require specialized hardware. Our system is much less accurate, but it is accurate enough for many applications. An extension of this system can nevertheless improve much more the accuracy (under research).