HEAD POSE ESTIMATION

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Abstract

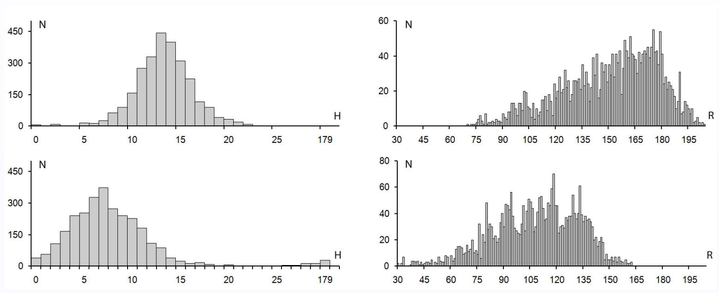
The overall aim of this research is to investigate image analysis techniques suitable for application to the accurate estimation of head pose and hence to derive improved models and methods. An important application of this work is head motion correction in Positron Emission Tomography (PET).

Motivation

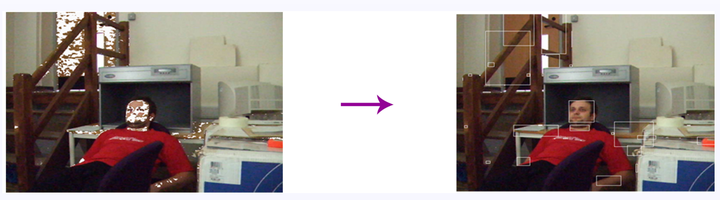
PET is a relatively lengthy procedure with a scanning time of up to one hour. It is therefore difficult for a subject to remain still during the data acquisition period. Even relatively small head motions may degrade the image resolution, and hence the quantitative accuracy of PET brain studies. Consequently, there is much interest in motion tracking and correction.

Segmentation

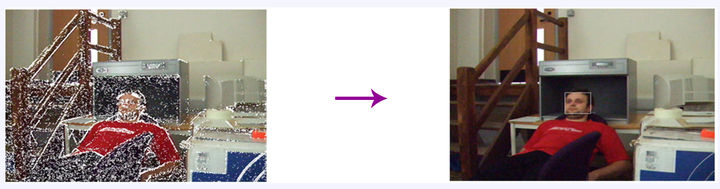
Face segmentation is based on colour attributes from HSL and CIECAM02 [1].



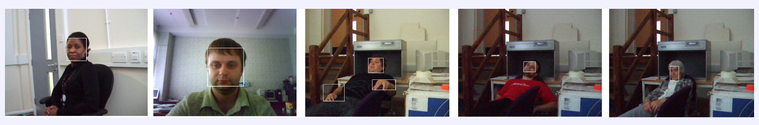
An example of colour attributes values distribution in a face area.



Pixels detection and grouping.



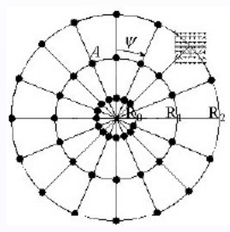
ROI's verification.



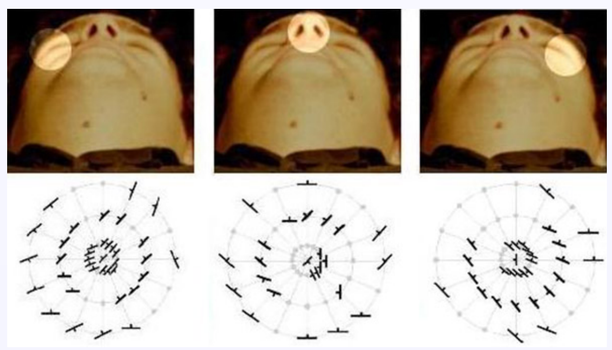
Example of segmentation results

Feature detection

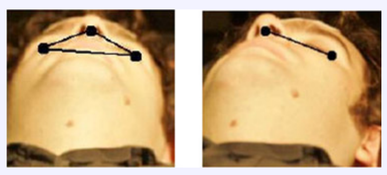
Feature (eye corners, nose basement) detection is based on a Human Behaviour Model of vision. A feature point is described by its context, in particular by edges around it.



The structure of the sensor used for feature point representation by its context.



Example of the feature vectors.

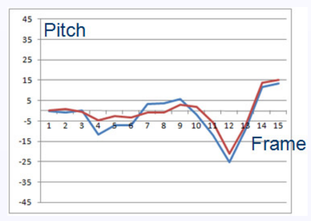


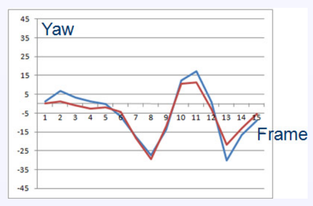
Detected features

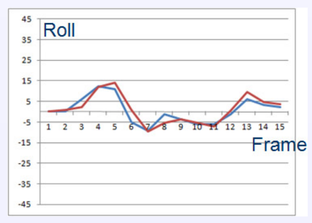
Pose estimation

By considering the spatial relationship between detected face features the head pose can be estimated.

Spatial relations between facial landmarks detected on consecutive images and their scheme.







Result of testing. Blue lines - estimated angles, red lines - real angles.

Future steps

To improve accuracy of head pose estimation two cameras will be used. Also information about head pose will be incorporated into an algorithm of brain image reconstruction. Computer simulation of the system will be performed in real condition.

Acknowledgements

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