

Single Camera Photogrammetry System for EEG Electrode Identification and Localization

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Abstract

In this study, photogrammetric coordinate measurement and color-based identification of EEG electrode positions on the human head are simultaneously implemented. A rotating, 2MP digital camera about 20 cm above the subject's head is used and the images are acquired at predefined stop points separated azimuthally at equal angular displacements. In order to realize full automation, the electrodes have been labeled by colored circular markers and an electrode recognition algorithm has been developed. The proposed method has been tested by using a plastic head phantom carrying 25 electrode markers. Electrode locations have been determined while incorporating three different methods: (i) the proposed photogrammetric method, (ii) conventional 3D radiofrequency (RF) digitizer, and (iii) coordinate measurement machine having about 6.5 mm accuracy. It is found that the proposed system automatically identifies electrodes and localizes them with a maximum error of 0.77 mm. It is suggested that this method may be used in EEG source localization applications in the human brain.