ΕΘΝΙΚΟ ΚΑΙ ΚΑΠΟΔΙΣΤΡΙΑΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ
ΣΧΟΛΗ ΘΕΤΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
ΤΜΗΜΑ ΠΛΗΡΟΦΟΡΙΚΗΣ ΚΑΙ ΤΗΛΕΠΙΚΟΙΝΩΝΙΩΝ
ΔΙΑΤΜΗΜΑΤΙΚΟ ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ
"ΤΕΧΝΟΛΟΓΙΕΣ ΠΛΗΡΟΦΟΡΙΚΗΣ ΣΤΗΝ ΙΑΤΡΙΚΗ ΚΑΙ ΤΗ ΒΙΟΛΟΓΙΑ"

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Unobtrusive Extraction of PPG signal and heart rate through video processing

Abstract

This thesis investigates the potential non-invasive measurement of physiological parameters such as the heart rate. These parameters derive from the remotely acquired Photoplethysmography (PPG) signal through video depicting a specific region of interest of the patient's face. In the framework of this thesis, a thorough literature review of Photoplethysmography as well as a study of the recent advances and its unobtrusive application was carried out. Main principles of face detection and dimensionality reduction algorithms which constitute basic tools of these non-invasive methods are presented. A dataset collection procedure with the participation of 42 patients took place and is described in detail. A novel multi-level algorithm for the estimation of the heart rate is proposed, differing from the already existed methods in taking into account the variability of the light conditions. Our results show that unobtrusive remote measurement of vital signs of high accuracy is feasible even in variable environments in terms of the light conditions and for distances between the patient's face and the web-cam of up to 1 meter.

SUBJECT AREA: Medical data mining through video processing
Keywords : face detection, photoplethysmography, signal processing, heart rate estimation