BIOLOGICAL APPROACH FOR HEAD MOTION DETECTION AND ANALYSIS (ThuPmOR11)

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Abstract :

This paper proposes a frequency method to detect head motion. Our method is based on the processing achieved by the human visual system. In a first step, a filter coming from the modeling of the human retina is applied. This filter enhances moving contours and cancel static ones. In a second step, the FFT of the filtered image is computed in the log polar domain as a modeling of the primary visual cortex. Head movements are related to the variation of the spectrum energy. They induce specific variations of that energy : the energy increases in case of moving head and is minimum in case of static head. This yields to an easy motion analysis : motion direction is related to the orientation of the maximum of the image spectrum energy and motion amplitude is related to the amplitude of the total energy spectrum. Moreover, this method allows to detect with reliability all head motion events (slow and fast motions) with the use of a robust temporal indicator which compares the current energy value of the spectrum with respect to the previous ones. Both head motion detection and analysis are done in real time. No constraint about head motion is needed. The system is working under all type of lighting conditions since the retina filtering is able to cope with illumination variations.
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Abstract : (cont.)

As a consequence, our detector is well suited for applications such as non verbal head gestures communication interpretation or vigilance surveillance system of drivers.