A FULLY AUTOMATED MOTION ANALYSIS SYSTEM FOR HAND HELD CAMERAS

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INTRODUCTION

Traditionally much of the study human movement has relied on collecting film or video data using very stable cameras mounted on tripods. The geometrical positioning of the camera(s) and the introduction of complex reference frames have also been used to justify the accuracy of motion data. The data is then subjected to an often time consuming digitisation process of questionable reliability. Automated tracking systems have almost entirely relied on specialist cameras with some form of sensor attachment to the moving object restricting the system mainly to a laboratory/clinical environment. The inaccuracy and time consuming nature of manual digitisation systems using normal video systems has been demonstrated by Turner and Newton (1992) and Newton Turner and Greenwood (1994). None of these systems have addressed the problem of large volume space. Cameras have been positioned in order to cover the filming area without employing camera motion. This, at times, involved very small image data. A pan and tilt camera analysis system was used at the Calgary Winter Olympics (Yeadon 1989) and more recently commercial systems have been marketed which rely on cameras to be mounted on tripods with special ppan and tilt headsp.

The new system is an extension of the method demonstrated Turner and Newton 1992 and now allows for the analysis of movement sequences with no constraint on camera position. Fixed cameras may pan, tilt and zoom, however the camera does not need to be fixed and may be mobile or hand held. Motion sequences are automatically processed from the motion data alone without the use of external camera calibration. Once processed measurements may be made directly off motion data and caters for 2D and 3D analysis. The system also retains the desirable characteristic that it does not need any form of surface markers (reflective or otherwise)and does hot require special cameras or lighting. It will run on standard p.c., workstation or lap top and connect to any standard video source. It is also possible, within limits, to analyse previously recorded data such as commercial video with no knowledge of camera position.