

MARKER LESS TRACKING OF WEIGHTLIFTING SNATCH MOVEMENT USING XTION PRO LIVE

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Weightlifting is all about applying appropriate force and acceleration in correct position to lift the mass. It is a power sport that requires highly accurate techniques. But as the whole lift last only less than few seconds, it is extremely difficult to master the correct techniques by monitoring without tools. Most approaches to computer vision based motion capture make use of special markers attached to the athlete that disturbs athlete free movements.

Asus Xtion PRO is a low cost 3D Gaming camera which can be used for sports biomechanics and motion analysis. A feasibility study was conducted to measure how accurately the Xtion PRO sensor can track the athlete's joint movements in three dimensional space. This bio mechanical model analyses the player's bone structure movements during a sporting event. Hence it can be used to obtain metrics such as distance travelled and velocity profile for training the athlete to achieve an injury free optimal lift.

OpenNI/NITE is a free and open source driver that enables the skeleton tracking by registering an initial pose which a skeleton tracking algorithm 'locks' onto the participant, allowing tracking in subsequent frames. Using the OpenNI tracking algorithm one can obtain a joint position as well as segment orientation.

Along with the Xtion PRO camera a video camera is used to capture the Weightlifting process for verification purposes. The joint positions of the athlete in the video sequence are tracked by Correlation Coefficient Template Matching Algorithm and these positions are validated against the positions given by the 3D model created. The three phases of Weightlifting snatch (1st pull, 2nd pull and receiving) were tracked separately. A statistical hypothesis testing procedure, the paired t-test is used to do an empirical comparison between video track measurements and Xiton track measurements, since there is a one-to-one correspondence between those measurements.

Modifying the skeleton tracking algorithm of the OpenNI/NITE SDK to resolve the overlaps of body parts and increasing its efficiency in user segmentation should cause some improvement in the output. However, replacement of the Xtion sensor with another stereo sensor with higher frame rate is necessary for obtaining tracking data with sufficient accuracy