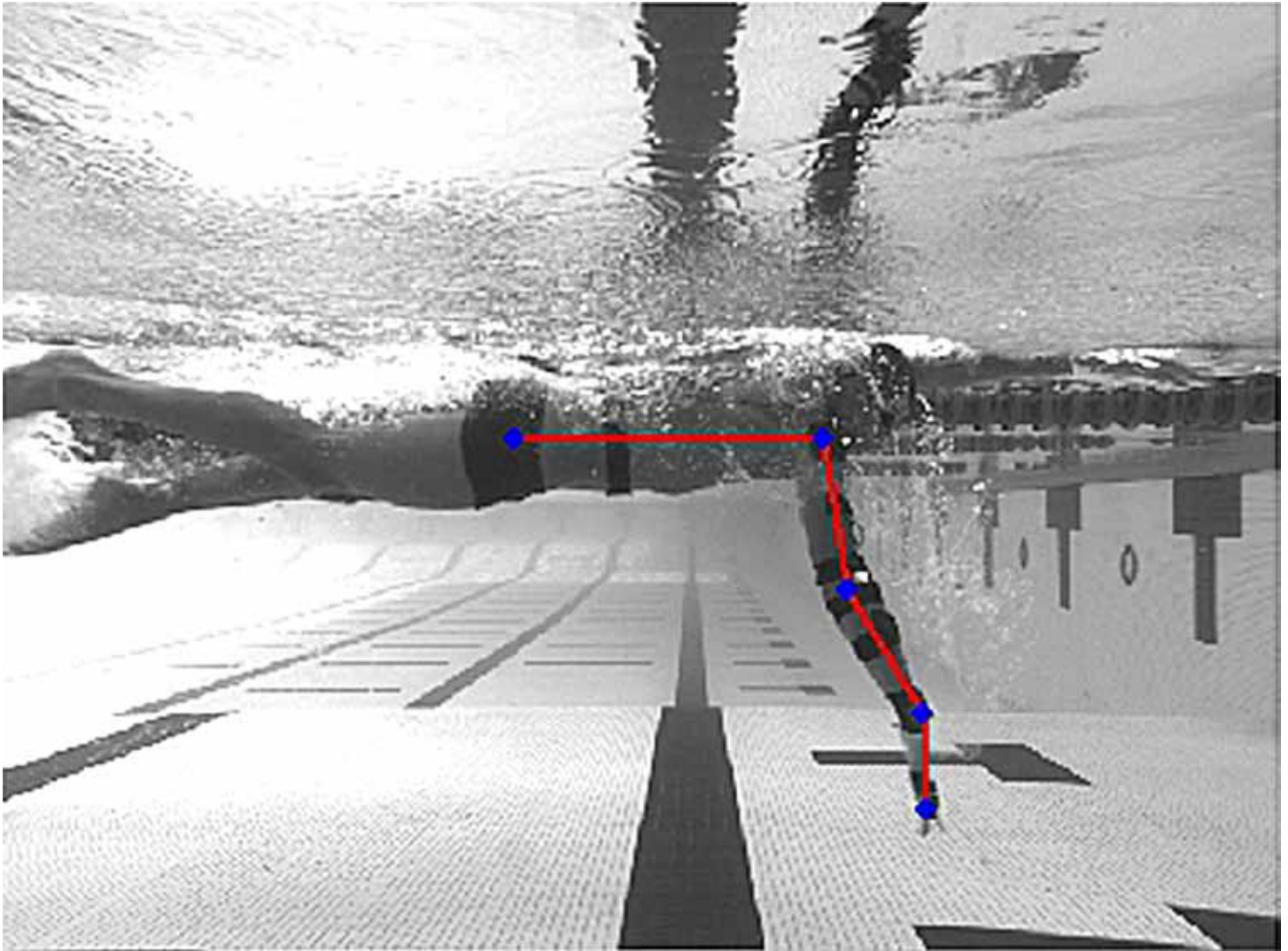


UNIVERSITY OF HAWAII AQUATIC RESEARCH LAB



“THE VICON MOTUS MULTI-2D FEATURE PROVIDES THE MOST EFFECTIVE MEANS OF OBSERVING SWIMMING STROKE MECHANICS WHILE MONITORING SELECTED KINEMATIC PARAMETERS.”

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UNIVERSITY OF HAWAII USES VICON MOTUS SOFTWARE TO ANALYZE THE STROKES OF ELITE SWIMMERS AND IMPROVE EFFICIENCY

CHALLENGE

The University of Hawaii has been conducting analysis of the swimming stroke mechanics used by elite swimmers. Former head swimming coach, Jan Prins, PhD, Director of the Aquatic Research Laboratory, is interested in analyzing selected kinematic variables associated with swimming stroke mechanics, starting with the Freestyle (Front-Crawl). The focus of this research is to increase awareness of how subtle variations in underwater movement stroke mechanics can have a dramatic effect on swimming efficiency.

In the past, Prins has used cameras limited to standard frame rates (30 fps or 60 fields/sec), which consistently produced blurring of the hands, particularly during the last half of the underwater pull phase. These distortions are further amplified with the caliber of swimmer being filmed.

Prins needed a motion analysis system that could cope with the speed of the professional swimmers and still deliver precise, accurate data.

SOLUTION

The University of Hawaii, already a long time Vicon customer, upgraded their system to include three high-speed digital Basler cameras with Vicon Motus software. The cameras were installed in custom housings and mounted to rigid frames bolted to the pool deck. Controlled via dual cables

from a desktop computer, one cable was assigned for camera control and a second cable was used for camera frame synchronization with a new frame rate of 100fps.

The Vicon Motus motion analysis software is used for video capture, data analysis, and generating reports. The software includes a multi-2D feature, which enables multiple cameras to be synchronized. Prins used a system of custom-designed LED's that are attached to the swimmer's limb segments, taking advantage of the Motus software's "Automatic Digitizing" features.

RESULTS

The six swimmers from the Men's & Women's University of Hawaii Intercollegiate swimming team were filmed for a total of six trials. During three of these, they were instructed to maintain their natural bent elbow position, followed by three trials using a straight-arm underwater pull.

"The Vicon Motus multi-2D feature provides the most effective means of observing swimming stroke mechanics while monitoring selected kinematic parameters," said Prins. "With respect to the ability to film at higher frame rates, the results were immediately apparent. By increasing the frame-rate to 100 fps, there was a significant change in the image quality, which increased the accuracy of the digitizing process.

"The data analysis provided by our Vicon Motus software has enabled me to create detailed reports, which have unearthed some intriguing results, which appear to contradict original beliefs with respect to where maximum hip velocities were produced within each swimming stroke cycle" Prins explained. "Determining whether these results are coincidental or a trend will have to wait for a more in-depth analysis and an increase in subject number as the study is continued."

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