The Development of Low Cost Sensor technology to provide Augmented Feedback for On-Water Rowing

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INTRODUCTION Investigations to identify ways to improve stroke technique of rowers are on going (Anderson *et al* 2005). However, the majority of these studies are laboratory based and thus neglect the effects of the oar and water have on the rowing stroke. Traditionally on-water testing has tended to concentrate on the forces produced by the rower at the oar handle, foot stretcher and on boat by the rower but not the actual rowing technique (Hill, 2001). The purpose of this study was to design and develop a system that would provide quantitative feedback of the rowers' technique on the water. This was accomplished through the integration of low cost electronic sensors, specific software interface and use of wireless technology (Anderson & Collins 2004).

METHODS: A full-scale model of a rowing station of a coxless four sweep rowing boat was constructed. This model allowed for the testing and validation of the sensors using a 3D motion analysis system (MotionAnalysis, USA). All sensors were to be fixed to the model as not to hinder the rowers' performance. A rotary potentiometer, fixed to the swivel of the gunwale, was chosen to measure the oar angle. From this position the oar's angular velocity and acceleration is calculated through differentiation. A string based potentiometer was used to measure the blade angle (Celesco, USA). In order to measure the blade angle, the potentiometer was fixed to the oar collar and to the oar. To measure the seat speed and position a second string potentiometer (Celesco, USA) was fixed at the end of the slide rails and attached to the back of the seat. A laptop with a DAQ card (DAQCard-6024E - NI Corporation, USA) acquired the data from the sensors. The information was then transmitted across a wireless network. The received data was then processed using NI LabView 8.2 software (NI Corporation, Texas, USA) to calculate and display the acquired data. The interface allows the coach to select what aspect of the stroke they wish to view in real time. The system was tested in full in a rowing tank at the University of Limerick Boat House before being tested out on the water.

RESULTS: Initial laboratory based results have proved successful (Linear R^2 values of >0.990 when individual sensor data are compared to the Motion Analysis system data) and testing is currently at the rowing tank stage.

CONCLUSIONS: The study will conclude having developed a complete wireless augmented feedback system for on-water rowing.

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