Exercise Sensing and Pose Recovery Inference Tool (ESPRIT)

A compact stereo-based motion capture solution for exercise monitoring

Crew exercise is important during long-duration space flight not only for maintaining health and fitness but also for preventing adverse health problems, such as losses in muscle strength and bone density. Monitoring crew exercise via motion capture and kinematic analysis aids understanding of the effects of microgravity on exercise and helps ensure that exercise prescriptions are effective. Intelligent Automation, Inc., has developed ESPRIT to monitor exercise activities, detect body markers, extract image features, and recover three-dimensional (3D) kinematic body poses.

The system relies on prior knowledge and modeling of the human body and on advanced statistical inference techniques to achieve robust and accurate motion capture. In Phase I, the company demonstrated motion capture of several exercises, including walking, curling, and dead lifting. Phase II efforts focused on enhancing algorithms and delivering an ESPRIT prototype for testing and demonstration.
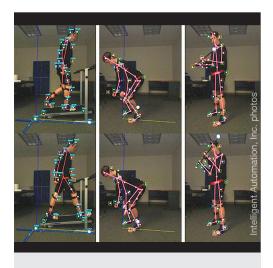
Phase II Objectives

▶ Develop an ESPRIT prototype to perform 3D motion capture from stereo
▶ Conduct detailed performance evaluation with comparison of joint location estimation from commercial multicamera motion capture system
▶ Conduct technical demonstration in a representative environment

Applications

NASA

▶ Observing crew exercise activities
▶ Performing motion capture and kinematic analysis
▶ Contributing to the understanding of the effects on microgravity on exercise activities

Commercial

▶ Rehabilitation research:
  • Gait analysis
  • Orthopedics and skeletal movement monitoring
▶ Physiotherapy
▶ Human-robotics and human-computer interactions

Benefits

▶ Compact and portable
▶ Fast set-up with minimal cabling
▶ Easy to use

Firm Contact

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