

NASA SBIR/STTR Technologies

X11.01-8378 - ESPRIT: Exercise Sensing and Pose Recovery Inference Tool

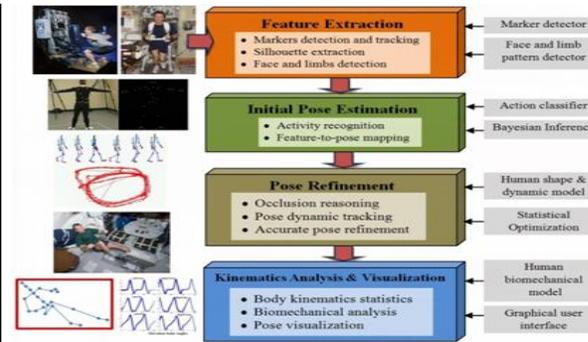


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Identification and Significance of Innovation

Crew exercise is important for maintaining the health and fitness of astronauts, and to prevent adverse health problems, such as bone density losses. We developed algorithms for ESPRIT: an Exercise Sensing and Pose Recovery Inference Tool, in support of NASA's Exercise Countermeasure Program. ESPRIT is a stereo camera system that monitors exercise activities, detects markers placed on the body and other image features and recovers 3D kinematic body pose. ESPRIT relies on strong prior knowledge and modeling of human body, pose, dynamics, and appearance. It also relies on advanced statistical inference techniques to achieve robust and accurate motion capture. Phase I result has been promising and has demonstrated motion capture of several exercises, including walking, curling and dead lifting. Phase II effort will focus on enhancement of algorithms, development of an ESPRIT prototype, detailed performance evaluation, and delivery of prototype for testing and demonstration.



Estimated TRL at beginning and end of contract: (Begin: 4 End: 6)

Technical Objectives and Work Plan

The technical objectives are.
Develop an ESPRIT prototype to perform 3D motion capture from stereo.
Conduct detailed performance evaluation with comparison of joint location estimation from commercial multi-camera motion capture system.
Conduct technical demonstration in a representative environment

The work plan includes the following tasks.
Task 1: Perform requirement capturing and prototype system design.
Task 2: Perform algorithm enhancement for 3D motion capture.
Task 3: Develop ESPRIT software application.
Task 4: Conduct performance evaluation and enhancement.
Task 5: Prototype integration and testing in a representative environment.

NASA Applications

ESPRIT system will support NASA's Exercise Countermeasure Project for observing crew's exercise activities, performing 3D motion capture and kinematic analysis.

Non-NASA Applications

Non-NASA applications include uses in medicine and rehabilitation, such as gait analysis, orthopedics, and other applications for monitoring skeletal movement. Other applications include simulation, immersive reality, video games, personal fitness, human-robotics and human-computer interaction.

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NON-PROPRIETARY DATA