

Department of the Navy SBIR/STTR Transition Program

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ONR Approval # 43-2203-16

Topic # N09-T021

Self-Contained Performance Monitoring System

PhaseSpace Inc.

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 30

Transition Target: Marine Corps Program Manager for Training Systems (PM TRASYS)

TPOC:

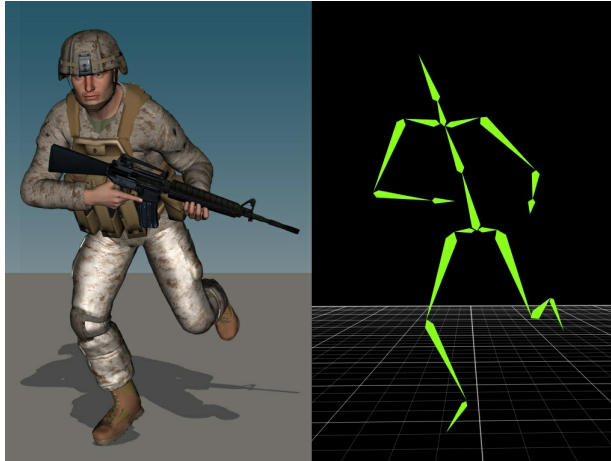
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Other transition opportunities:

Army Program Executive Office for Simulation, Training, & Instrumentation (PEO STRI); Military field operation planning activities; and Military fitness and readiness improvements activities

Notes: Building and improving on the concept of the inertial-sensor-based Fitbit®, PhaseSpace is developing a device to do more than step-counting by providing a physical representation of saved data showing body pose/position for continuous periods of up to 8 hours under actual exercise conditions. Physical representation comparisons with time stamps will allow quantitative and visual analysis of fatigue and/or conditioning effects.



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WHAT

Operational Need and Improvement: Understanding pose and other physiological measurements over the course of field-condition operations allows for the evaluation of readiness, skill assessment, and fatigue. For extended operations (i.e. outside the laboratory), these measurements must be completely autonomous, unobtrusive to subject performance, and use lightweight, non-interfering inconspicuous sensors and data collection mechanisms. Current technologies (inertial, optical, and magnetic tracking) for advanced virtual reality (VR) and augmented reality (AR) training systems used to track the position of the individual and his weapon in real time for a rendered virtual representation of the individual are not low-cost and/or are not robust enough to be deployed and operated by the average (nontechnical) user.

Specifications Required: System must be lightweight, non-interfering, easily calibrated and intuitive (i.e. require little specialized training for the field user). The system must allow for up to 8 hours of data collection without having to recharge or change batteries.

Technology Developed: PhaseSpace is using state-of-the-art inertial sensors, consisting of accelerometer/gyro combinations, with noise-filtering technology and a user-worn, lightweight and self-powered automatic data transmission/collection system to provide a physical representation of body pose and position for continuous periods of up to 8 hours under actual exercise conditions. Unique software capable of transforming the collected data into a representative skeletal animation will allow for data review of pose and pace differences over time. Possible modifications could add capability to monitor physiological data such as heart and breathing rates.

Warfighter Value: PhaseSpace's system provides the ability to represent the body's motions for the analysis of the effects of fatigue over time under a wide range of field conditions. This can aid in determining the overall fitness of a particular individual, as well as help in planning extended operations. With the optional additions of measuring other physiological traits over the course of a real or simulated mission, additional data can indicate the need for specific interventions to inform tactical decisions and improve strategy.

WHEN

Contract Number: N00014-15-C-5076 **Ending on:** December 31, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Sensor Prototype Performance Validation	Med	Similar skeletal animations from Motion Capture data and accelerometer data	5	October 2016
Prototype Eval by Army Research Labs	Med	Same as above	5	November 2016
Prototype Filter Modification. (Option 1)	Low	Data represented by smoother movement in skeletal software	6	September 2017
System Component Hardening for Field Use. (Option 2)	Low	System survives 8 hours of tracking data and download	7/8	September 2018
Prototype Modification to Add Monitoring Capability (Option 2)	Low	Successful additional physiological data measurements	7/8	December 2018

HOW

Projected Business Model: PhaseSpace plans to self-manufacture and deliver the completed systems (i.e. body-worn devices, data collection devices and skeletal display systems) for at least the first year. The production effort per system will be similar to that for the components of PhaseSpace's current motion capture system, so PhaseSpace has experience with the expected range of production issues and controls.

Company Objectives: At the Forum for SBIR/STTR Transition, PhaseSpace hopes to communicate with fitness evaluators and physical training specialists for all military services. PhaseSpace plans to further develop this technology to allow custom data tracking and monitoring for soldier fitness analysis, which will make the system more desirable for sports training and also for specialized medical/physiological/biomechanical analysis applications.

Potential Commercial Applications: Physical rehabilitation specialists and sports trainers can benefit from customized monitoring capabilities. This low-profile, low weight, non-invasive monitoring system can provide useful analytic data, and is highly customizable for specialized monitoring. "Digital Coaching" is already becoming common, with several companies entering the field since this SBIR topic began. PhaseSpace beats the competition by using groups of sensors to measure complex movements, and by allowing the tracking and storing of a wide array of physiological data which can be time-stamped for ease in observing the effects of fatigue over time.

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