2018 Wearable Technologies Workshop
Challenge Request

Challenge Title: Non-Invasive Real-Time Muscle Activation Measurement

Organization Name: KBRWyle

How many Teams will you be able to support for this Challenge: 3

Summary of the Challenge and Team Project

Background (brief background on your organization and the problem):
The Human Performance, Physiology, Protection and Operations (H-3PO) group is challenged with understanding how to optimize human performance in 0-g environments during activities such as daily exercise on ISS and during EVA. Motion capture paired with kinematic modeling is used to understand and characterize movements, but is extremely challenging in 0-g. Further, biomechanical modeling does not provide a quantification of muscle activation. The ability to pair biomechanical modeling and measured muscle activation provides an invaluable tool for optimizing human movement and reducing injury. Traditional laboratory based techniques are either invasive or extremely time consuming to set-up for data collection, and to analyze and process the data.

Problem Statement (a few sentences summarizing the problem to be addressed or the task the Team is expected to perform):
This challenge asks teams to provide a method to quantify muscle activation at different muscles and at multiple locations on the same muscle during full-body movements and while wearing a spacesuit.

Important Design Considerations (high level, fundamental or critical requirements for the Team to achieve. These can be discussed, and possibly negotiated, in more detail after the Team has been assigned):
The sensor needs to be easy to set-up, provide real or near real time feedback, and ideally could be used in a spacesuit in a 100% O2 environment. The sensor cannot restrict movements.
What funding and/or resources will you provide to each Team?
H-3PO will provide background information on exercise and EVA needs. We will also provide biomechanics or motion capture hardware if needed for validation or comparison at the end of the project development phase. There are some commercially available hardware that can be used as a starting point or idea platform. This is owned by JSC ER but can be shared with the team.

Deliverables (the final product you expect the Team to provide – such as a report, garment, user evaluation, …):
Report and/or prototype sensor system

How Will the Results Be Used (what you will do with the results and how the results of this project will benefit/complement the work you are doing in your organization):
This sensor development could provide the ability to train exercise form in 1-g and could be used to train crew on how to perform EVA tasks more efficiently and to mitigate overuse injury risk. If the sensor can be used in a 100% O2 environment it could be used during NBL training runs to quantify muscle activation.

What deliverables (if any) do you want transferred to you at the end of the project?:
Project development ideas, summary of work, details of the sensor development effort.