TECHNOLOGY COLLABORATION CENTER

Wearable Technologies Workshop
Challenge Request
April 29 & 30, 2019

hosted by NASA at the Johnson Space Center

Challenge Title: VIVE VR Sweat Protection

Organization Name: NASA Johnson Space Center

Team Assignments Available: 3

Summary of the Challenge and Team Project

Background:

NASA Johnson Space Center's ER3 group hosts the countermeasures systems for crew on-orbit exercise including ARED (Advanced Resistive Exercise Device), T2 (Treadmill 2), CEVIS (Cycle Ergometer with Vibration Isolation and Stabilization), and MED-2 (Miniature Exercise Device – 2). The group also supports development of the next generation of advanced exercise architecture and systems. As part of this advanced work, we are examining the addition of VR (current gen HTC VIVE Pro) for gamification to increase the immersive properties of the system. In our early testing, we have faced significant issue with sweat accumulation resulting in failure to units. This will only be exacerbated with microgravity conditions and impacts of surface tension of water that is not overcome by gravitational loads.

Problem Statement:

Develop a solution set for the HTC VIVE Pro headset that:

a) Mitigates sweat accumulated during exercise efforts to prevent interaction with unprotected internal circuitry/electronics of headset and wifi connection attachment.

Important Design Considerations (These can be discussed, and possibly negotiated, in more detail after the Team has been assigned):

a) Does not require destructive modification to the hardware that would otherwise void any warranty scenarios for other failure modes not related to sweat
b) Any sort of fan solution should consider the impacts of microgravity affects to water and its physical properties
c) Should not interfere with any of the current adjustment mechanisms for the headset or any other moving surface of interest such as the lift function of the earphones (may limit the upper Velcro strap if this can be set before installation easily for a new user)
d) Solution should be machine washable or developed with solutions with antimicrobial capabilities to prevent mold and bacteria development in extended life

e) Installation should require ideally no tooling or limited tooling if necessary
***further clarification and redefinition of these requirements is possible and will be actively discussed with selected teams, we are only providing these requirements as a starting point for discussion and want to keep the solution possibilities open to innovative approaches*

What funding and/or resources can be provided to each Team? (The details of the payment arrangements must be negotiated with the Team.)

No extraneous funding will be provided but access to support and lab space for testing is available through the NASA JSC ER3 PSION (Physiology-Sensing, Intelligent Optimization Nucleus) Lab located at the Johnson Space Center in Houston, TX.

Deliverables (the final product the Team is to provide – such as a report, garment, user evaluation, …):

A sweat mitigation hardware or softgoods system *(See below for further specifics)*

How Will the Results Be Used?

This solution will be immediately applied to our VR head units for testing in the PSION Lab and may also result in a request for more quantities for the other VR groups in NASA JSC's ER (Software, Robotics, and Simulations) Division and other cross-organizational entities. The current exercise VR system is used for our WHTRBT (Wearable Hybrid Training with Reality Blended Technologies) project. As part of this testbed, we perform exercise protocols that include integrated application of our motorized hardware systems to better inform design needs for future technologies and architecture.

What deliverables (if any) are to be transferred to the organization at the end of the project?

Final deliverables will include:

1. Quantity (3) or greater sweat maintenance units and necessary support hardware
2. Users guide for appropriate installation, maintenance, and care practices
3. Report discussing the design process, defining the requirements applied for development, records of testing, and the final specs of the solution set
4. CAD files of the design or other such drawings or models used to develop the hardware for integration into upper level working volume models for vehicle design needs
5. Vendor, part number, and other such important specifications of any COTs elements or applied hardware for future repair or development of more units