MIT
Department of Aeronautics and Astronautics
Qualifying Exam 2018

Humans in Aerospace

Part I [33%]
In your discussion for this problem, describe the human visual system.

a. **Compare and contrast the image seen by the eye and the image obtained by a camera.**
b. **Why can a dark adapted person enter a room lit with red light and remain dark adapted?**

Part II [67%]
NASA has outlined a vision for an upcoming spaceflight pathway to long-duration exploration mission, with near-term plans including the Deep Space Gateway and Deep Space Transport missions. NASA's Human Research Roadmap outlines risks to the human and gaps in knowledge for mitigating these risks. One risk being considered is that of Inadequate Human-Computer Interaction (HCI). Within this risk, NASA has formalized there is a gap that we need to understand how emerging multi-modal display technologies are best applied to the design of HCI for proposed long-duration mission operations. For this problem, consider an astronaut inside a vehicle controlling multiple semi-autonomous agents that are outside of the vehicle (e.g., small satellites or rovers).

c. **Define situation awareness and give examples of potential breakdowns in situation awareness for an astronaut controlling multiple semi-autonomous agents using a visual display.**
d. **Why are multi-modal displays of potential interest for high workload environments? What model of attention aligns with this reasoning? How might a visual display of multiple agents be augmented to have a multi-modal display?**
e. **If you were tasked with assessing a new multi-modal display for NASA, what methods would you suggest for assessing the astronaut's situation awareness and workload when using the display?**