

Participatory Exploration for Inspiration and Education (12)  
Educating the Next Generation (2)

Author: Mr. Gregorio Drayer  
Georgia Institute of Technology, United States, drayer@ieee.org

Prof. Ayanna Howard  
Georgia Institute of Technology, United States, ayanna.howard@ece.gatech.edu

EDUCATIONAL POTENTIAL OF EXPERIMENTS ON LIFE SUPPORT SYSTEMS WITH  
GROUND-BASED AQUATIC HABITATS

**Abstract**

On April 10th 2010, at the Kennedy Space Center, President Barack Obama pronounced his “Remarks on Space Exploration in the 21st Century.” In his speech, the President included life support systems as a technology that “can help improve daily lives of people here on Earth, as well as testing and improving upon capabilities in space.” One of challenges to enable students to conduct research on life support system is the need for educational capabilities that may open up opportunities for them to learn and experiment with small-scale versions of these systems. Such is the case in higher-education institutions with programs that include courses in control systems and automation. These institutions may have educational platforms in their labs to study attributes of robustness or optimality of controllers driving servomechanisms and electric motors, but there is not one that may allow the study of ecophysiological performance of higher plants in closed-loop life support systems, for example. This paper presents aquatic habitats as educational platforms for experiments in life support systems, and the lessons learned while working with undergraduate students at the Human-Automation Systems Lab of the Georgia Institute of Technology. It presents the challenges that these systems pose to students in engineering and sciences, and proposes a program to assist with the active learning of concepts relevant to other bioengineering systems. The program is intended for junior and senior students in sciences and engineering, and offers recommendations about possible approaches to the computational tools and techniques that may help support their research efforts. These approaches may be useful in other areas in engineering involving the combination of multiple sensors, and in the assessment and automation of slow-changing systems.