

Senior Design Project Description for SPRING 2016

Project Title: Quadcopter Design Optimization and Base Station Development (EPRI_QUAD3)

Supporter: EPRI

Supporter Technical Representative: ASSIGNED

Faculty Mentor: ASSIGNED TBD (check one)

Single Team Dual Team (check one)

Personnel (EN/ET): 2 E, 1 Cp, Cv, 3 M, 1 SE

(Complete if the number of students required is known)

Expected person-hours: (250 per student)

Description of Project:

Amid the Fukushima Daiichi nuclear disaster in 2011, the international community and nuclear power industry are trying to improve methods in which utility companies can respond to beyond design basis events in nuclear power plants. The term “beyond design basis” is used to describe accident sequences that are possible but were not fully considered in the design process because they were judged to be too unlikely [1]. As a result, a practical solution is required for the task of collecting pertinent field data in locations that are potentially uninhabitable following a beyond design basis event, or for use in situations where it could be more cost effective or risk averse to use an unmanned technology to collect data.

In 2015, EPRI in collaboration with the University of North Carolina at Charlotte Senior Design Program developed a prototype quadcopter, as a proof of concept, to demonstrate the ability for unmanned technology to monitor environmental conditions within a nuclear power plant containment facility. This project expands upon the 2015 research by developing the requirements for optimization of the quadcopter and development of a base station.

[1] US NRC website, <http://www.nrc.gov/reading-rm/basic-ref/glossary/beyond-design-basis-accidents.html>

Initial Project Requirements (e.g. weight, size, etc.):

The base station should be designed to survive and maintain operability following a beyond design basis event or severe accident. The base station must also be able to charge, store, and communicate with the quadcopter, as well as collect pertinent data from the environment. A proof of concept prototype using a fiber optic connection to an off-site controller station for data collection and quadcopter operation is desired. In addition, a minimum duration of 30 days of quadcopter operation is desired. Topics that are expected to be investigated in this research include: base station geometry and material selection, battery life, radiation susceptibility of instruments, quadcopter automated controls and optimization, radiation detector technology for isotope detection, and communications technology. Existing rover/drone technology could be reviewed and utilized to the extent possible but new technology may also be required to support this research.



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Expected Deliverables/Results:

In addition to the course document submittal requirements a completely functional prototype that has been tested shall be provided. The prototype shall be provided with a user manual. A report shall also be provided that provides a complete description of the research that was conducted during the execution of the project as well as documentation of the testing.

List here any specific skills or knowledge needed or suggested (If none please state none):

- Wireless communication
- Robot control