

## **F25.14: Tree Stress Sensor Communication**

### **Overview**

The Arizona Tree Stress Explorer and Alert System will monitor drought- and bark beetle-induced stress across Arizona, on a daily basis, at the individual-tree scale. This is a novel undertaking, and we hope it will expand to include other western states, and perhaps other countries. We are using satellite imagery to monitor trees via optical reflectance of their leaves. However, in order to make sure our satellite based models are detecting stress properly, we need to perform on-the-ground fieldwork to measure the stress of trees, and correlate those measurements with coincident satellite-based measurements.

We are using stem tensiometers (which measure water stress in tree trunks) and point dendrometers (which measure the daily expansion and contraction in the diameter of tree stems) to take our field measurements. While the instruments themselves are rather affordable, the data loggers, and the trips out to the field to collect the data from the loggers, are costly.

This project will aim to build a cellular-based communication add-on for the data loggers we have built. This will enable real time monitoring and data download from these loggers.

### **What the student will DO and LEARN**

You will work on both the hardware and software for the cellular communication module of this system. You will identify candidate companion chips and/or boards, build a decision matrix, work on the integration of this board into the existing custom datalogger board, and will work on the software interface.

You will learn about electronic design and test, particularly with regards to cellular communication interfaces. You will learn about developing interfaces to remote equipment. Furthermore, you will learn about forest ecology, drought and bark beetle stress, and sensors used to measure these effects. You will also learn how satellites are used to monitor tree health across large scales.

### **Additional benefits**

The student will be invited to join our lab meetings, and thus learn more about how academic research is conducted. They will have an excellent project on their CV, which will make them attractive to a number of firms that build remote sensor equipment, among others. I will write them a letter of recommendation for future jobs or academic endeavors.

### **Additional qualifications**

Electrical Engineering or Computer Engineering student

### **Time commitment**

6 hrs/week for 30 weeks