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The Center for Education and Research in Information Assurance and Security

PoachNet: An Embedded System to Detect Theft

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Problem

During most months of the year, oyster farmers are growing thousands of dollars worth of oysters in bay areas. Many oysters are placed into one cage, multiple cages are filled, then the cages are placed many feet underwater, where they are attached to a buoy above. The oysters require months of time spent underwater in order to become fully-grown and ready for sale.

Because the oysters are expensive and cannot be monitored at all times, they are often poached (i.e., stolen), causing the farmer to lose thousands of dollars of oyster seed.

Our device, named PoachNet, resides in the cages with the oysters and monitors for theft. If theft is detected, it alerts the oyster farmer via SMS and a web interface.

Background

Since the device will be underwater for months at a time, it needs a large battery and should consume as little power as possible. We chose the Adafruit Fona Feather Arduino board with the Adafruit GPS FeatherWing hat.

The first version of the device was fitted to a waterproof container and featured tilt switches to detect when the device broke the water's surface:


Underwater, the container will be attached to the bottom of an oyster cage by its rope, and it will naturally float in the upside-down orientation. When it breaks the surface, it will fall on its side, activating the device via the tilt switches.

Subsequent versions of the device added the ability to communicate with the device via SMS, allowing the oyster farmer to control the rate at which alerts were sent, manage multiple phone numbers the device would recognize, and name their devices:
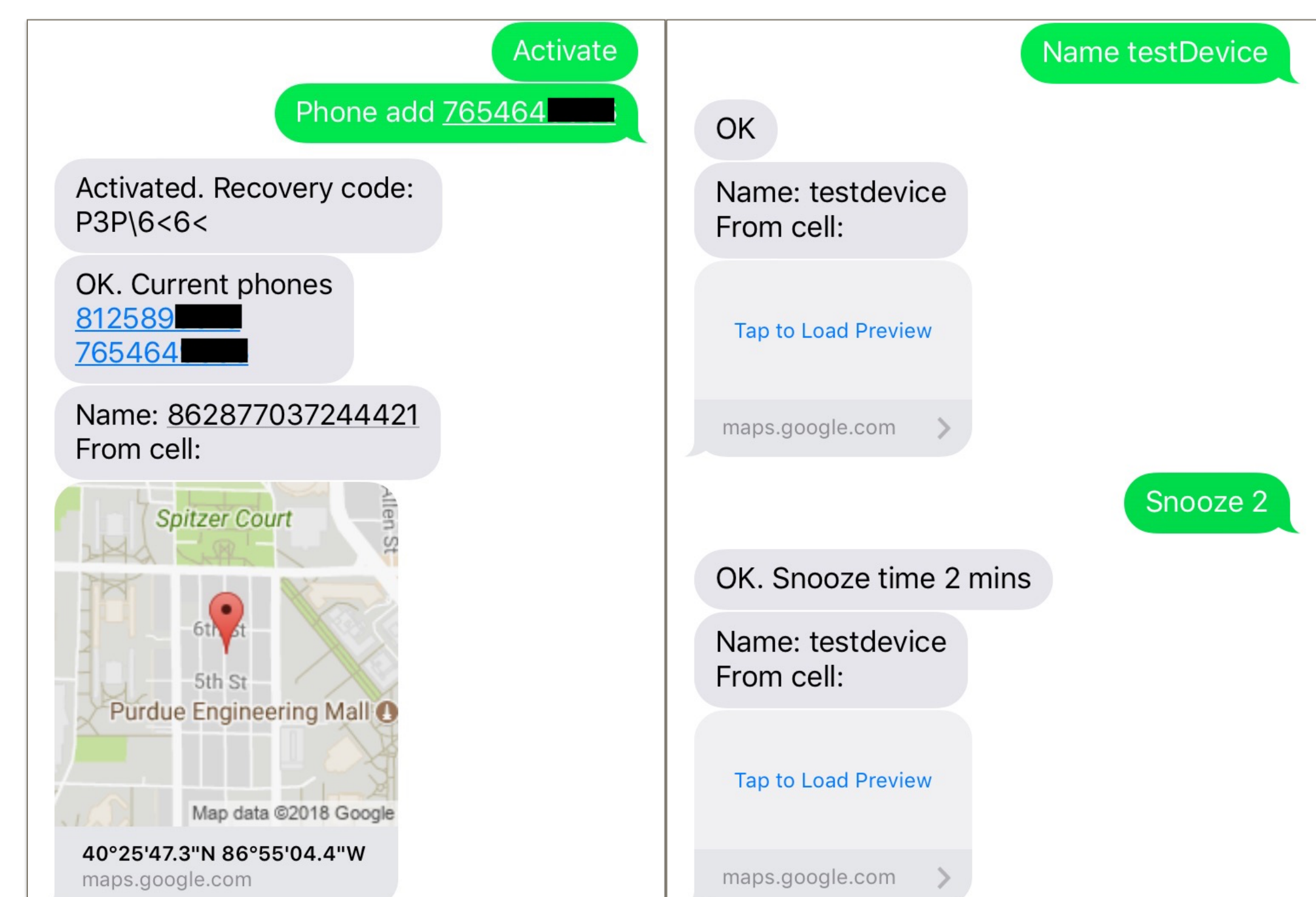
The current version of the PoachNet device improved the reliability of the tilt switches by adding capacitors that smoothed out electric spikes from the battery. Additionally, the tilt switches were upgraded, a reset button was added, and LEDs were added to visually show the farmer the device is working:
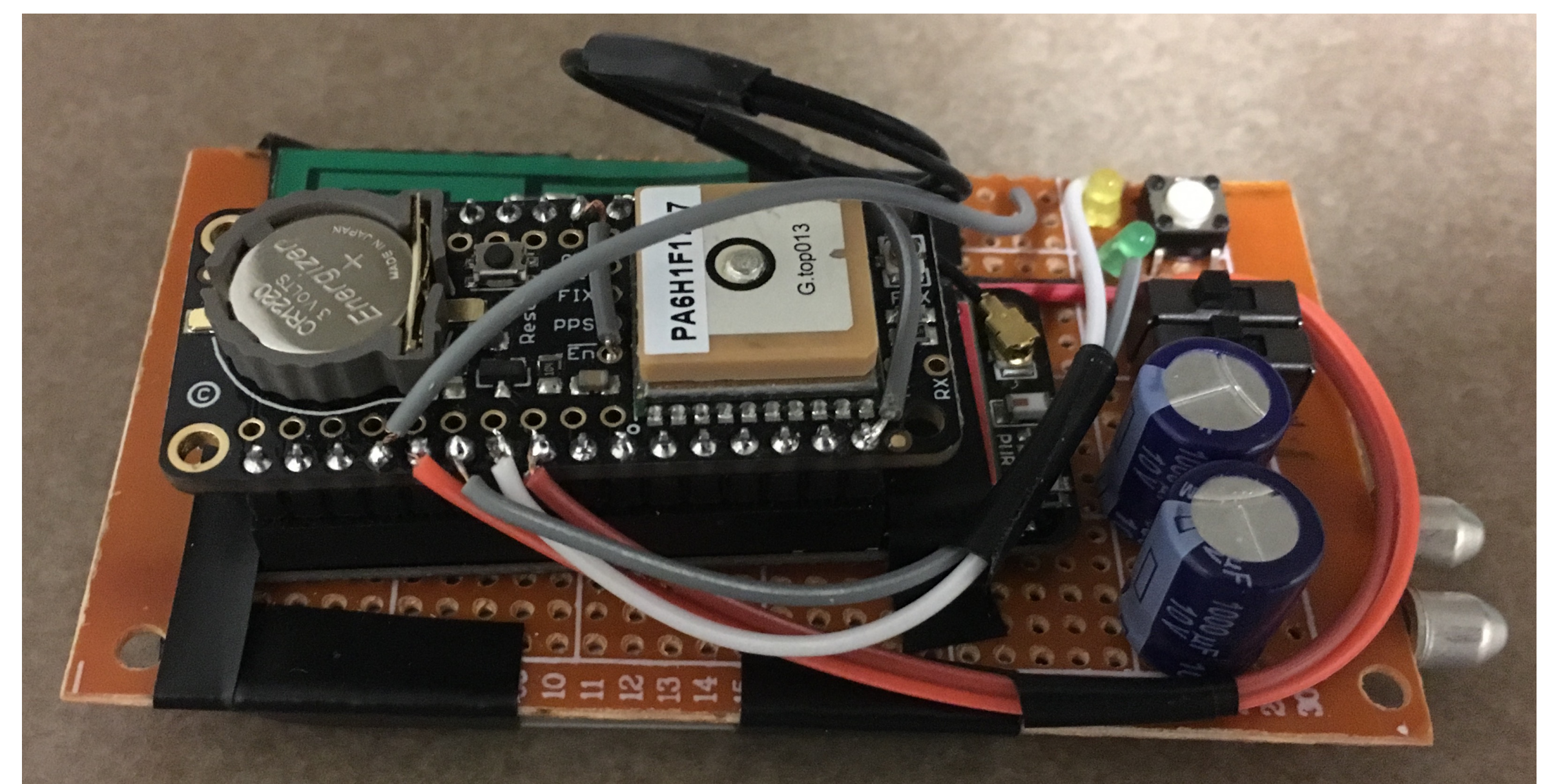
Future Work

PoachNet is in the testing phase now. We are working with an oyster farmer from Virginia to receive feedback about how the device performs in real-world conditions.

In addition to detecting the theft of oysters, we are working to identify additional uses for this device for theft detection in general.

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