GSM Buoy

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# Problem Description

Navigation of the seas has been a challenge for centuries and as we come to grips with what technology can bring to ease out journey aross the ocean, however for some people it is only a luxury. Open waters are dangerous, as seen from those who are escapting the conflict in Syria to Greece via the ocean with rubber dinghy’s.

We can attempt to minimize the risk of traveling and even potentially save lives by providing the capability to record and transmit environmental conditions to a centralized network and provide them to vessels in open water. Given the perpensity of ocean conditions to often be hazerdous towards electronic equipment, a network of interconnected devices are needed in order to attain reliable data and mimimize the possibility of total system failure.

# Assumptions

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| **Assumption** | **Explanation** |
| Identical hardware available on each buoy in network. | In order for the network to function as intended, each buoy must contain an identical set of sensors and components. |
| All power consumed by the system is provided by solar cells and stored in a single on-board battery. | In order for the buoys to be low maintenance and require low human interaction on board power generation is needed. |
| The control board is isolated from the environment. | The control board is the main electronic component in the system, and as such, requires better environmental isolation to prevent system failure. |
| In the event that a buoy becomes unresponsive or fails to provide feedback from individual sensors, the entire network remains unaffected. | The buoys are designed as independent systems that are not reliant on each-other. A single failure will not cause total network failure. |
| When communications are available, the buoys will transmit all recorded data since their last communication using an on-board logging system. | A satellite uplink is not available at all times. The buoys are capable of using their on-board logging systems to fill in sensor values when a satellite uplink is not available. During a satellite uplink, the buoys can maintain a constant sensor data transfer. |

# Our Solution

The control board is the main controller for the entire device. On a command from the network, the GSM board processes the command and sends to the controller. The controller interprets the command to perform an array of functions. These commands can be used to set base values to the controller, get the controller’s log files, and get controller system information.

**Power**

Power is controlled by a power board on the device. The device monitors power draw, internal voltage, voltage supplied by solar panels, and is one of the systems that determines whether or not components are functioning correctly (based on power consumption).

**Logging**

The logging controller stores sensor values, error reports, and other critical information which can be accessed at a later point. It also provides critical information in the event of a component or system failure.

**Sensors**

All sensors are controlled by an external sensor board which provides the connection between the individual sensors and the main controller. Sensor values are read from the sensors whenever requested by the control board. The main sensor board takes these values and sends them to the main controller for processing.

**GSM**

This is the main communication component for the system. This takes commands from the network and interfaces with the control board to execute those commands.

**Safety Considerations**

The device maintains a safe run-time by relying an overall view of system status. Each component can check the stats of sub-components and relay this information the control board. On the failure of a specific component, the control board can communicate with the power board to shut down the malfunctioning component and relay this information back through the network. This information can be dealt with accordingly. In the event of a major failure such as failure of the control board or power board, the system can go into full shut-down safe mode which can be picked up by the network during a status-check for the system.

# References

\*\*All references contained within source code\*\*

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