

Project Falcon

A Wireless Pool-side Multi-Sensor System ELECOMP Capstone Design Project 2017-2018

Sponsoring Company:

Hayward Pool Products

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OmniLogic iPad app controlling water features

The HAYWARD Team won 1st Prize at ELECOMP Summit May 2017

See: [Capstone Summit Event](#) and [Winning Project Overview](#)

Company Overview:

HAYWARD is the world's largest manufacturer of swimming pool equipment. We design and manufacture pumps, filters, gas heaters, heat pumps, cleaners, chemical automation systems, control automation systems, and LED lighting systems.



HAYWARD manufactures the OmniLogic system that controls complex swimming pools. Our sensing is currently limited to wired temperature sensors and flow switches that connect to the controller, and this project will significantly expand capability.

See [OmniLogic Brochure](#) and [Live Demo](#) (username=password= "salesdemo")

Technical Directors:

We are the same technical directors that lead last year's first place team! Most meetings can be on-campus, and specialized lab work at Hayward's facility is in nearby North Kingstown.

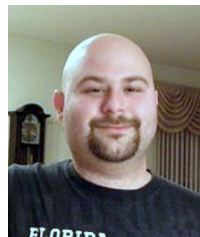


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Project Motivation:

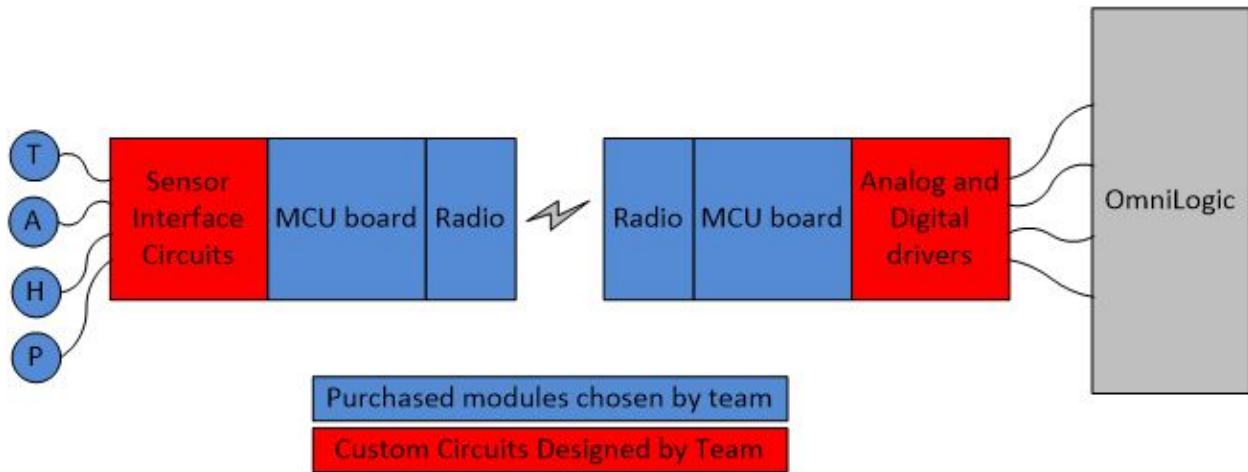
To sense several environmental parameters at the pool side to provide the pool owner information and smart, automated actions to improve user experience and lower operating cost via a wireless battery-operated sensing system.

Anticipated Best Outcome:

By Christmas: Choose a low power radio system, processor and the electronic sensor components. Breadboard some of the sensors with connection connected to the radio and demonstrate end-to-end communication.

By April 2018: Build a complete concept system that fully demonstrates all sensors and wireless link to the receiver. This unit should:

- Transmit multiple telemetry channels to a receiver located 100 feet away
- Employ power-saving schemes at the transmitter to for 12-month battery life
- Operate from freezing to hot temperatures, 5C to 40C
- Transmit signals from temperature, water level, and other purchased sensors.
- Interface to the sensor inputs of the **OmniLogic** system
- Fit in a plastic enclosure to be attached to the pool wall



Project Details:

Hardware Tasks:

- Choose an off-the-shelf radio link system capable of transmitting digital data and supports added software and I/O, that has low-power or sleep capabilities.
- Develop battery management approach and low power sensor interface circuits.
- Choose electronic sensors and measurement methods (Includes temperature, current, voltage, proximity, signal strength, etc. Email me anytime for the complete list) and interface them to ADC processor inputs.
- Assess performance of wireless link and battery life using the chosen circuit and software methods.

Firmware tasks:

- Develop a messaging protocol for transmission of telemetry.
- Write a transmitter application that:
 - samples ADC inputs
 - filters and de-bounces noise
 - determines the need to power the transmitter
- Write an adjustable system for sleeping between needed sensing events.
- Determine battery status, battery life prediction, radio link performance and communicate to receiver
- Write a receiver application that listens and validates telemetry, illuminates status LEDs, and drives OmniLogic Sensor inputs.

Composition of Team:

1 Computer Engineer and 2 Electrical Engineers

Skills Required:

- Curiosity and ability to research sensing methods, radio link systems, processor boards and sensor interface circuits
- Transistor and op-amp circuit theory
- Ability to develop a software architecture concept and document it
- Experience developing apps on a processor platform

Anticipated Best Outcome's Impact on Company's Business:

Get a huge head-start on an anticipated project that is currently on the long-term roadmap.

Broader Implications of the Best Outcome on the Company's Industry:

This will enhance Hayward's flagship OmniLogic product to offer industry-first intelligent control based on direct sensing of controlled parameters, and to offer user pleasing information about the environment they may want to swim in.



Having the Falcon's exceptional powers of vision, your Sensing System will enable a broad array of intelligent and industry-leading product features.