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Marine & Environmental Sensing Technology Hub

An Optical Colour Sensor to Monitor the Marine Environment

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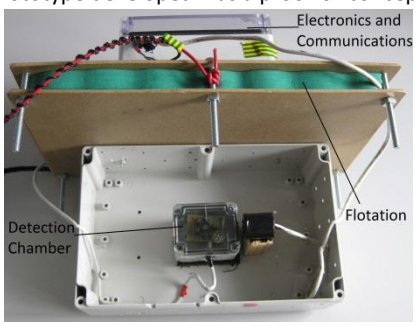
Introduction

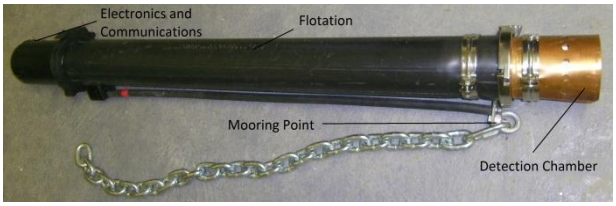
This research aims to develop a flexible, simple, low-cost, robust, deployable sensor with anti-fouling measures to detect colour change in marine environments. Such a sensor could be used to detect events, inform sampling regimes in coastal areas and act as a qualitative decision support tool. This is useful to decision makers in cities, coastal areas and globally and as gathering data can be expensive using commercial instruments a low cost sensor enables more data to be collected with a better spatial range and resolution. Detecting colour change in water could give warning of events like green tides, e.g. (right) in QuingDao, China, often caused by *cyanobacteria.*

Optical Sensor

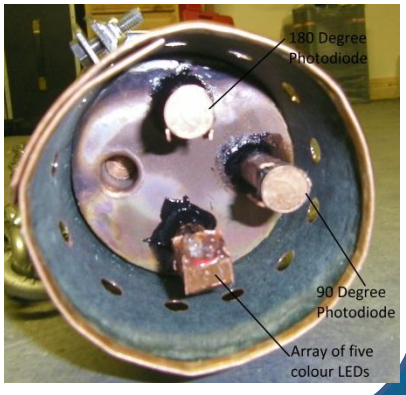
The first prototype developed was a proof-of-concept test rig.



It has since been scaled up to a field deployable second prototype, with a robust design, anti-fouling measures, wireless communications and electronic controls in built

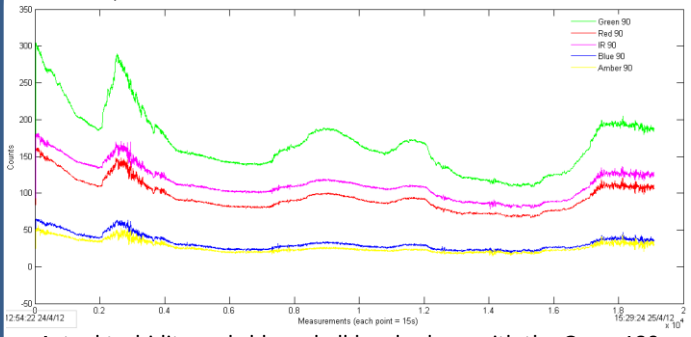


The detection chamber consists of five colour LEDs (Blue, Green, Amber, Red, IR) and two photodiodes (PDs) placed at 180° and 90° to the LEDs. The prototype was deployed alongside a commercial sonde in Malahide estuary for a trial run.

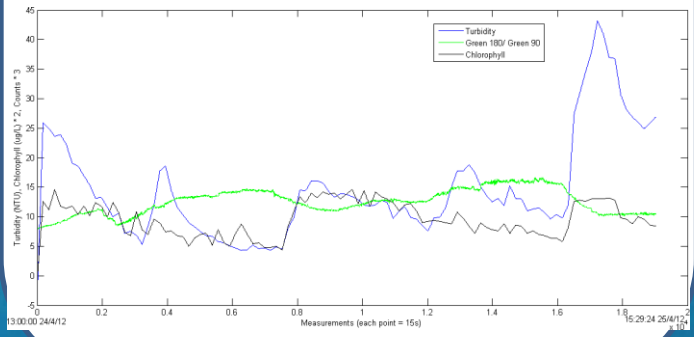


Results

The signal levels recorded for all five LEDs by the 90° PD over a 26.5 hr period is shown below.



Actual turbidity and chlorophyll levels along with the Green180 /Green90 data are shown below; an inverse relationship is evident between the chlorophyll level and the green LEDs data.



Conclusions

The optical sensor is ready for longer duration deployments which can examine it's susceptibility to drift and bio-fouling.

There is a relationship between the colour change and water parameters such as turbidity and chlorophyll content. Future work is necessary to determine it's exact nature.

Data gathered from new deployments, alongside lab work, can develop calibration curves for these relationships.

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NCSR National Centre for Sensor Research · Marine Institute Foras na Mara · SeaChange Casadh na Taoide · SSTI Strategy for Science, Technology and Innovation · NDP National Development Plan · DCU