Objectives

- Develop mobile, wireless-enabled sensing system
- Mapping of conductivity, temperature, depth with high temporal and spatial resolution
- Conduct boat-based transects of Kinvarra bay in order to determine quantity of submarine freshwater inputs from north Galway karst system
Background

- Karst system with series of turloughs
- 2 major freshwater inputs to Kinvarra Bay

Problem

- Intertidal freshwater inputs
- Flows cannot be easily gauged
Previous sampling (TCD)

- Fixed point sampling using CTD Diver probes
- Data from two previous deployments

CDT Diver integration

- Communications Protocol
- Management Application
- System Testing
- Hardware purchased
  - CTD Diver
  - Diver Gate & cable
  - Raspberry Pi system
  - €2,400 approx.
Communications protocol

• Protocol determined using Diver Office software

![Diagram showing communication between Diver Office and CTD Diver]

Management Application

• Interface program
  – Written in Java

• CTD-PC
  – Extracts data from CTD Diver
    • Time stamp, conductivity, temperature, & depth
  – Sampling frequency controllable
    • e.g. 1 Hz or greater

• PC-GFT
  – Uploads data to GFT
  – Reporting period controllable
System testing

(1) 
• CTD Diver validated by comparison with Hach Lange HQ40d conductivity probe 
• Conductivity standard, tap water, seawater (Clontarf)

(2) 
• Dynamic test using seawater dilutions 
• Known volumes of tap water added at intervals 
• Upload to Google Fusion Tables

GFT interface

• Data uploaded to Google Fusion Tables 
• Various views for data display / analysis 
  – Data tables 
  – Charts 
  – Select individual parameters or overlay data streams
Kinvarra deployment

- 11 February 2013
- DCU, TCD and NUIM teams
- SmartBay provided hired rib & technical support
- GPS unit and 2 x CTD Diver used to perform longitudinal transects of Kinvarra bay
- Separate CDT Diver also deployed at fixed point
- Divers mounted at side of rib:
  - “Shallow – B” sub-surface (0-50 cm)
  - “Deep – A” approx 100 cm (outward); 200 cm (return)

Photos
gpsvisualizer.com

Data on Google Fusion Tables
Point comparisons

Outward transect

Significant decrease in conductivity of “shallow” probe indicates shift in position of freshwater wedge

Transects
12/06/2013

**Freshwater wedge locations**

- Slight increase in salinity found here
  - blue: outward
  - yellow: return

**Freshwater wedge locations**

- End of wedge inwards
- End of wedge outwards

**Future Work**

- **Kinvarra wireless availability:**
  - Calls and Texts ✓
  - GPRS / 3G ?

- **Device**
  - Encapsulation/packaging
  - Deployment scenario
  - Mounting
Conclusions

• CTD probe enabled with communications capability using Raspberry Pi system

• Transect data collected at Kinvarra Bay and hosted on Google Fusion Tables

• System available for future deployments

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