

Cameras on Boats

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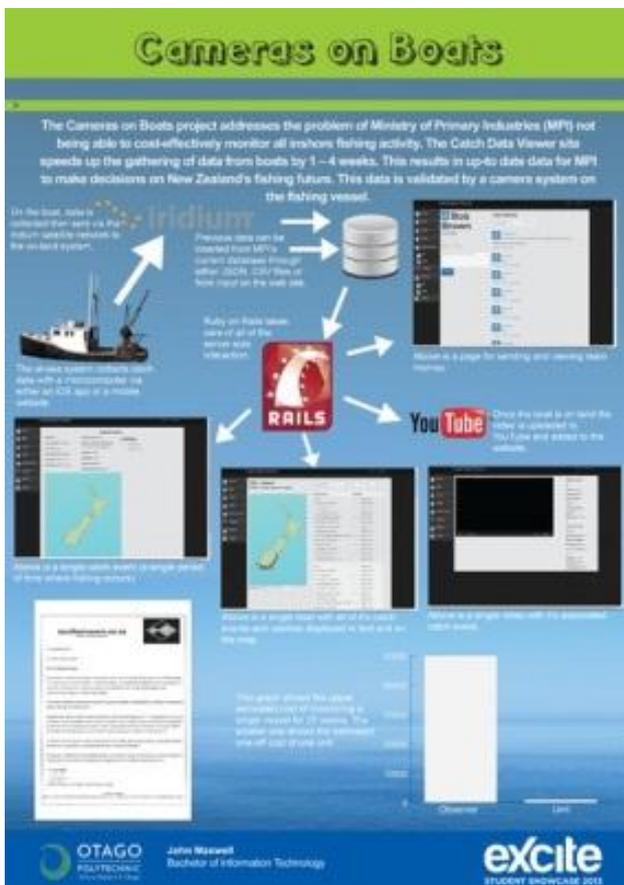
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ABSTRACT

In this paper, I describe the process of creating a data viewer site and on-boat system for the *Cameras on Boats* project. The *Cameras on Boats* project consists of two main areas: the on-land (Catch Data Viewer site) and the at-sea data and video recording system. The goal of these is to bring scientific data together from multiple sources and compile the data in a user-friendly and informative layout which is accessible to staff anywhere with an internet connection. The primary data sources are from sea in close to real-time via satellite communications, catch boat data from existing databases, weather information and video evidence from the boats. The data viewer site is aimed at the Ministry of Primary Industries (MPI).



The *Cameras on Boats* project addresses the problem of Ministry of Primary Industries (MPI) not being able to cost-effectively monitor all inshore fishing vessels.

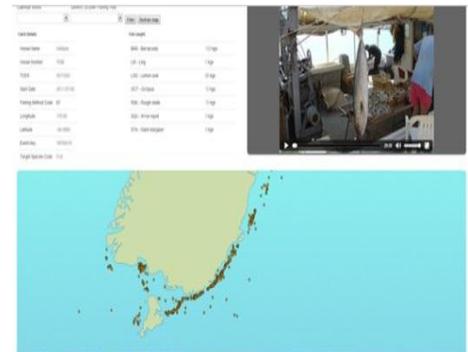
The catch data viewer site speeds up gathering of data from boats by 1-4 weeks; while combining older data into a more visual representation, resulting in up-to-date data for MPI to

make decisions on New Zealand's fishing future.

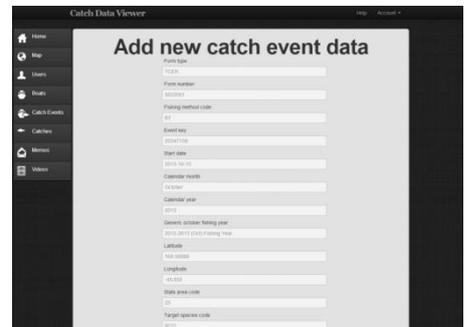
This data is backed up by a camera system. The system is currently in use on one fishing boat where MPI is trialing the system. My client is Southernware, a local IT firm who specialize in the fishing industry and the technology field. They are currently working on a system to record boat and fish data on the inshore fishing fleet while out at sea. The camera system is to be implemented on New Zealand's inshore fishing boat fleet. There is a possibility that all fishing boats operating in New Zealand waters will need a system like this as law may be introduced by the Ministry of Primary Industries (MPI) either later in the year or in the near future.

Functional Requirements

The on-land system shall be able to display video and data recorded from the boats cameras



The on-land system shall be able to filter down through data from fishing events and videos



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The on-land system shall be able to display all of a boats fishing events on a map



The on-land system shall be able to display the boat data all in one place



Development

Originally Catch Data Viewer was going to be a local website only it wasn't possible to use a service such as Google Maps or Leaflet.js. Because of this I created an algorithm to create a map of New Zealand from GeoJSON data. To create the map I used the D3.js JavaScript library.

Originally the GeoJSON was stored in a JSON file that D3 loaded in from a file path. I then moved the data into the database. A method in the controller is called from the JavaScript file via an AJAX request and the data is converted to JSON before being sent. This is so that maps of other countries or the whole world can be added as necessary.

Similar to the map the mapping of catch events started as a small algorithm in a JavaScript file. This got moved and multiple methods were created to either pull all catch events, all of a single boat's catch events or a single catch event from the data base and render it as JSON. The JSON is then added to the map's SVG element with data from the database added to each circle. Again D3 is used to do much of this work.

Several scripts have been built to take data from either comma separated files (CSV) or JSON files and add them to the database. The scripts take care of data validation and will check and remove leading and trailing spaces. This allows MPI to export catch data from their excel files to a CSV file and then import it into the Catch Data Viewer site with ease.

Getting the data off of the boat and to land was a difficult challenge. To do so a mixture of an Iridium 9602 modem, a Rockblock and a Python script were used to send data over a serial interface to the modem and then on to the satellite.

Throughout the development of the Catch Data Viewer site and the camera system I conducted regular testing. This included creating paper-based prototypes, producing a minimal viable product, as well as the iterative releasing of versions website and camera system to my client and key

stakeholders. This provided me with the chance to make changes based on their feedback.

The process of paper-based prototyping involved giving a group of users a series of tasks to complete, these included getting them to find catch data from certain points in time and then getting them to watch a video from the catch event. I had multiple user testing parties where users with no previous knowledge of the application were given scenarios to complete. The regular meetings with my client provided feedback that was invaluable in shaping the direction of the website and camera system.

I've built and developed multiple information technology based products which together make up the Cameras on Boats project. The system can pull data from a large range of sources and display them in a user friendly environment. The Catch Data Viewer website is planned to be deployed fully to MPI in 2014. It is currently being tested by staff members at MPI.

Future development on the catch data viewer website is a huge opportunity. Boat skippers/owners have indicated their interest in accessing their past catch data while at sea as well as on land. Due to the way in which they site is built the same site could be easily and quickly modified to support them. Future development using code built for the M.V.P. during the middle of 2013 is just starting for viewing onboard factory data on a large New Zealand fishing vessel. This is possible as throughout the year I have built the systems as reusable components which can be configured for separate tasks with ease.

Summary

This paper has described the process I went through in creating the Catch Data Viewer website and an on-boat Camera system. I developed these by using a mix of structured and agile software development. The goal of this project was to cut down on the destruction and dumping of in-shore fishing's bi-catch and to speed up the retrieval of data on catches. My work provides a solid foundation for my client to participate in Citizen Science by displaying organism population trends as a result of Citizen-collected population data.

Creating the Catch Data Viewer site and camera system has been an interesting and challenging experience. During the project I have learnt a number of new languages and techniques that have improved my overall understanding of large information technology projects. Working with a real world client on a project that we are both passionate about and being challenged to overcome large and small problems while learning valuable lessons has been a rewarding experience.