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Mike Gunson
Surfbreak Protection Society

Dear Mike

Re: Cost Estimate to Supply a Coast-Cam for Whangamata Bar

The purpose of the cameras is to record shape of the Whangamata Bar via frame grabs and/or video clips, by rectification of oblique images and analysis/comparison of wave breaking patterns. These data will form the basis of a bar monitoring plan, which can be correlated against physical events such as storms, marina channel dredging, etc.

I've taken the approach of providing the most cost-effective solution, which would be to supply the system for the SPS to install and operate. Once set-up, the system can run autonomously, automatically rectifying the images and sending all images (rectified and non-rectified) to a dropbox via an internet connection. Alternatively, the images can be stored to a hard-drive next to the computer operating the system as a back-up. The dropbox/internet system is preferred since it can be checked daily via remote access from the internet (e.g. through LogMeIn). Figure 2 below shows the images captured this morning from the Wooli Beach Cams, which consists of 3 cameras and a control computer, powered by a solar system and fitting on top of a 30 m water tower (Figure 1) – rectified images can be seen in Figure 3.

Figure1. The Wooli Beach Cams remote system incorporates 3 cameras and is solar-powered.

Figure 2. Morning images from the Wooli Beach Cams remote system.

I understand that a location/property at Whangamata has been identified for setting up a system, and that power may be available and that only the single camera needs to be housed (i.e. the laptop running the system will be inside and not require housing).

The following provides a breakdown for the fabrication of a HD-cam monitoring system run by and stored to a laptop.

Component	Cost
Laptop	$1,800.00
HD cam	$180.00
Camera housings	$90.00
Surge-protector	$90.00
Camera mounting	$200.00
Cabling and miscellaneous pieces/software	$800.00
System fabrication and set-up (including software)	$2,500.00
Installation and training	$2,500.00
Expenses	$500.00
Total (excl. GST)	$8,660.00

The above costs are for the provision of a system ready to go, that will sit inside a house, and will require a mounting bracket for the camera outside, which has not been costed (note, 1.2 m of cable is available between the camera and the computer, further distances of cable could be purchased). Additional costs include internet connection or piggy-back hard-drive. The camera could be inside (looking through a window), however, whatever the set-up it is important that the camera is not moved once it has been surveyed in. The largest cost is for the specific software, which would be undertaken by a French expert. A selected operator will require training on how the system works.

Once installed, an RTK GPS survey system will be required, with a surveyor taking a position of the system, and then going out in a boat on a calm day and taking a dozen or so positions within the field of view of the camera – images of each position taken by the surveyor need to be captured. These positions are then related to the pixel position of the surveyor in the image, and incorporated into the software for automatic rectification. Note, this can be done at any time following installation; images taken prior to surveying can be post-processed.

A completely autonomous set-up, i.e. with power supply and housings, would include the following costs. However, if the system is to be inside a house and power is available, this would not be required.

Component	Cost
laptop housing	$600.00
Solar system (270W panels, reg., alternator)	$2,000.00
2x 104Ah gel-cell batteries	$800.00
Custom built mounting	$1,200.00
Fabrication and system testing	$1,600.00
Total (excl. GST)	$6,200.00

A person on-site to ensure that the system is working ok, clean the camera regularly, etc, will be required, which would be good to be the person that learns to operate the system.

As above, data transfer via an internet connection is by far the preferred option to ensure that it is working on a daily basis – note, this requires the additional cost of internet fees.

While the images are automatically rectified, analysis/comparison of images would be required. One option would be to involve a graduate student or intern to develop a system to develop an image processing system to undertake time stacking, etc, automatically. Another would be to pay to have this done (I would estimate $4-5K). In the first instance, it may be just as useful to simply "eye-ball" rectified images that match with dates of physical activity (storms, dredging, etc) to determine visual evidence of change. Quantification of changes can then be undertaken.

Based on a 3 year operating life, while all components should last that long, there is the potential for camera or computer failure, which would require replacement. The norm is for 6-monthly reports, which incorporate the analysis of the changes to the bar through that period and correlation to physical events through graphics and discussion. The rate per report is $6K.

The following table summarises the running costs of the system.

Component	**Cost**
Control point survey	$1,000.00
RTK Surveyor	External
Incorporation of control points and auto-rectification	$2,500.00
6-monthly reporting	$6,000.00
On-going technical support (6-monthly estimate)	$2,500.00
Total (excl. GST)	$12,000.00

Hopefully there is enough information above for your decision making. Please let me know if you have any further queries.

Yours sincerely

Dr. Shaw Mead
(Managing Director)

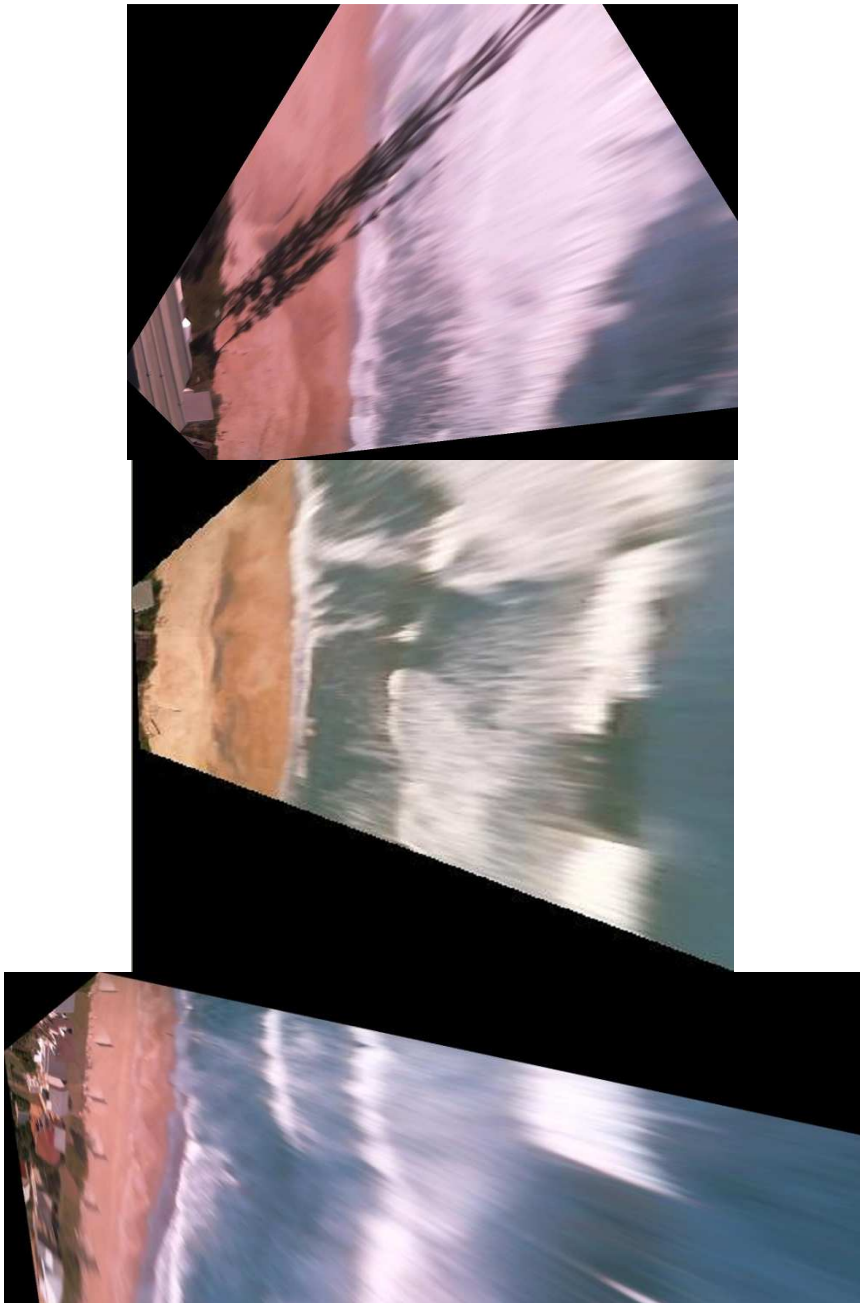

Figure 3. Rectified images from the Wooli camera system. Note, the tree will always be visible in the northern image even when rectified, since it is in the middle of the shot; i.e. those pixels colour can't be changed. The distant extents of the southern images begin to distort with increasing distance and so beach position data loses confidence.

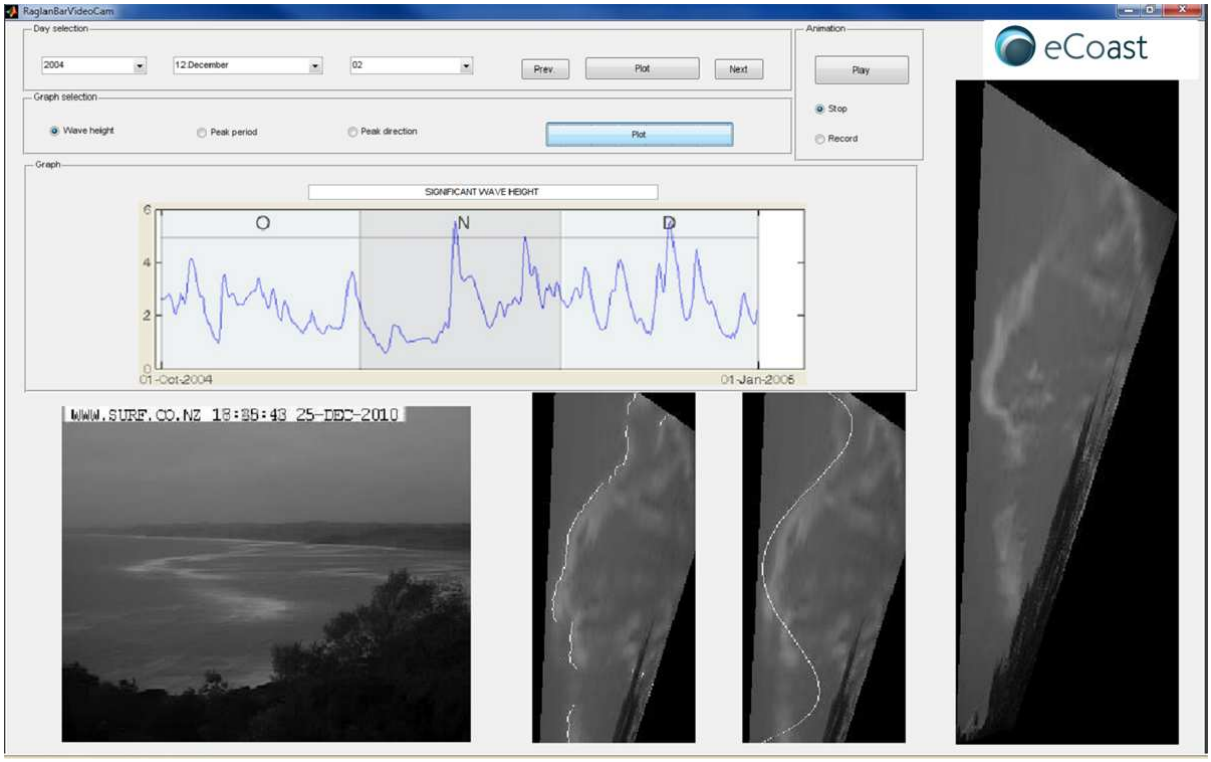

Figure 4. The Raglan Bar-cam matching images to wave-climate data.