

The Polarimetric experiment with the Equinox camera is ongoing. We are in the process of collecting data. The experiment has two parts--a laboratory wave tank experiment and a field experiment. The laboratory data collection is complete and we have some very preliminary results, which are summarized below. The field experiment from the Lamont-Doherty boat dock is scheduled to start on August 30, 2006.

For the laboratory experiment we setup a 1m x 1m x 0.3m (deep) wave tank, a simple 1-D wave generator, a wire wave gauge, and a bank of unpolarized lights. The purpose of this experiment was to setup ideal laboratory conditions for testing the polarimetric light sensing concept with the Equinox polarimetric camera.

We have several video clips of the experiment. They can be downloaded from <http://vis-www.cs.umass.edu/~hschultz/WaveTank>

The video clip MVI_0018.AVI shows the wave tank setup.

The laboratory study is summarized in the following table. The video clips show the surface elevations derived from the polarimetric image sequences. The elevations were found by first computing the instantaneous surface slopes from the polarimetric data and then integrating once to find the elevations. Because the constant of integration cannot be determined without at least one independent range estimate, the elevation at the lower-left corner is set to 0.0.

Exp/Run	Viewing Condition	Height (cm)	Frequency (Hz)	Video Clip
Exp1Run3a	Camera perpendicular to wave propagation direction	0.143117	5.0293	exp1a_min_seq.avi
Exp1Run3b	Camera perpendicular to wave propagation direction	0.150291	4.9805	exp1b_mid_seq.avi
Exp1Run3c	Camera perpendicular to wave propagation direction	0.163003	4.9805	
Exp2Run3c	Camera parallel to wave propagation direction	0.367454	4.8828	exp2a_min_seq.avi
Exp3Run2a	Camera 45 degrees to wave propagation direction	0.378367	4.8828	
Exp4Run1a	Camera 45 degrees to wave propagation direction	0.218449	4.5898	
Exp5	Camera 45 degrees to wave propagation direction			exp5a_seq.avi
Exp7	Wind generated waves			exp7a_seq.avi
	Wind generated waves			exp7b_seq.avi
	Wind generated waves			exp7c_seq.avi

The slopes computed from the polarimetric data were compared to the waveheight measured by the wave probe by assuming a sinusoidal wave profile. For experiment 1, the wavelength error is 3.5% and the waveheight error is 1.2%. For experiment 2 the wavelength error is 6.4% and the waveheight error is 6.9%. These numbers are impressive when you consider that the wave probe is only a point measurement and you are getting wavelengths for a particular wave at many locations along the wave. Also, experiment 2 is not approximated very well by a sine wave.

The recovered water surface shapes seem remarkable realistic, and we are looking forward to a detailed analysis of the polarimetric light sensing methodology.