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# Digital Video Studies of Water Waves in Coastal North Carolina: A Project in Teaching Physics (Extended Abstract)

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# Digital Video Studies of Water Waves in Coastal North Carolina: a Project in Teaching Physics

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## 1. Introduction

This paper presents the results of a study to investigate digital video analysis to provide introductory physics students with a better understanding of wave motions than is possible with our present methods of instruction. Water waves are readily available in coastal North Carolina, and provide a visual expression of wave phenomena readily addressed by video imaging, enhancing an intuitive understanding by science and engineering students. Several investigators [e.g., 1] have used video analysis to study the water surface. Our video images, made with an Aiptek Action HD camcorder, were supplemented by direct measurements using simple equipment such as wave poles and drifting floats readily available to any student (Fig.1).

Three environments were used in this study: a conventional ripple tank, creeks and rivers, and ocean surf.

Figure 1. The reference cross for imaging small waves in creeks and rivers. The markings are one foot apart, and the float, to record vertical motions, is one foot behind the cross leg.

## 2. Procedure

Measurements of wavelength and wave speed were made in the laboratory from video images using a plastic grid placed at the bottom of the ripple tank. Simple reference objects were used in natural water bodies to determine scale on the video images, such as wave poles at known separation distances to estimate wavelength. The video images were analyzed with Logger Pro software [2]. Measurement results are compared with simple small- amplitude wave theory. Agreement is good for the ripple tank (Fig. 2) and the river measurements, but large deviations were found in the surf.

Photographs of a rarely occurring soliton in the Neuse River were studied to illustrate the variety of wave forms. Video images from the Field Research Facility at Duck, NC, available on the web, were studied by the students to illustrate the use of optical techniques in the "real world [3,4]."

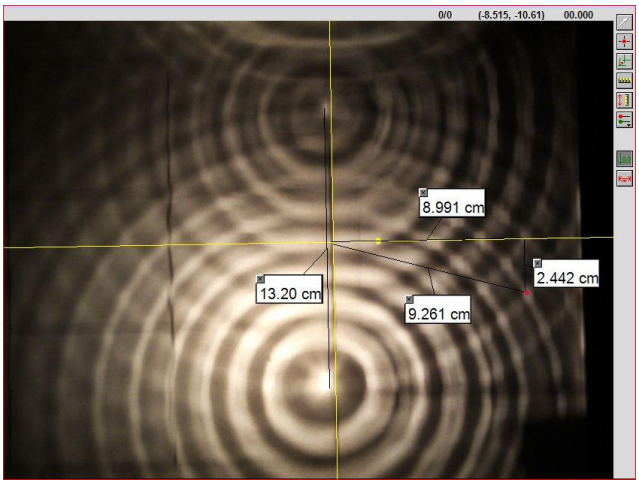


Figure 2. Calculation of average wavelength (1.73 cm) from the interference pattern projected from the ripple tank, and from theory.

## 3. Conclusions

The effectiveness of student learning by digital video analysis is presently being compared with student learning by conventional teaching methods.

## 4. Acknowledgments

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## 5. References

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