Final Report
Waterway Expert Traffic System (WETS)
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Abstract

The sponsored research was to develop and test new methods to monitor watercraft usage and Sea State in an urban canal. Waterway Expert Traffic System (WETS) is the boat and wake monitoring system developed in part under this research effort. The data collected is archived in a relational database on CD-ROM. The raw data is from human observations augmented with automated environmental measurements. The survey provides a snapshot in time containing detailed information on how many, what kinds, how and when watercraft are being operated at the research site. The WETS project has reduced to practice a surveillance aspect of boat wave measurements. The project included development and maintenance of the www.wets.net Internet site to display real time waterway activity.

Introduction

Detailed information about waterway use is necessary for planning, education, regulation, maintenance, and enforcement. Knowledge of how many, what kinds, how and when watercraft are being operated is valuable information that is currently not readily available. Competition for a limited resource makes understanding urban waterway use of particular importance. This research resulted in the development of new analysis tools and data acquisition tools. A significant amount of data was collected primarily for use in training and validating the expert system.

WETS Project Description

The WETS system development makes available a low cost, modern, information gathering and analysis system for use in waterway management, regulation, enforcement, and education. The research conducted during the four-month period provided a conceptual system design, fabrication, bench testing, waterway installation, and initial WETS testing in an urban canal. Data collected by a wave staff array and a video camera connected to the WETS software was displayed over the Internet. The WETS made background measurements of the waterway wave climate using a wave staff array coupled to the WETS expert system. The wave staff array (three individual water level sensors) allows continuous water level measurements to be made as a function of time. Simultaneously a remotely operated video camera signal was transmitted to the WETS expert system kernel to keep a record of each watercraft transit.   This provides a continuous monitoring of background level and of individual boat wakes and corresponding images of the watercraft transiting the research site.   The WETS

measures and draws the wakes giving quantitative written information of water level (wake height) produced by watercraft.

The WETS tools provide a means to calculate the boat velocity, direction and distance from the wave staff array. The WETS project proved that precise, continuous, objective data could be collected during all hours (i.e., evening, heavy storms, etc.). Therefore the WETS proved to be a means to reduce arduous human observation and to provide real time data immediately via web links

The survey portion of the monitoring was designed to provide detailed information on how many, what kinds, how, and when watercraft were operated at the research site. A significant amount of data was collected primarily for use in training and validating the expert system. Two graduate students, from Nova Southeastern University Oceanographic Center, worked at the research site as observers. The observers counted the number of watercraft present as a function of time and recorded details of each. All the data collected by the observers at the research site was entered into an ACCESS database. The records include estimates of the boat speed, heading, length of the vessel, and mode of operation. Additional information regarding weather conditions was also included on each data sheet (an excel spreadsheet). The ACCESS database allows the user to search for information related with any of the boats categories at the data sheet. Such categories are type of boat, size, time of the day, heading, mode of operation of the boat (speed), estimated height of produced wake, location on the canal, estimated velocity, observer initials, and other observations.

No data was collected during thunderstorms, hurricane warming periods or any other strong weather condition. The observer's day consisted of 1 hour of travel, four hours of observation, and three hours of data input and review. The observer on duty monitored the research site 4 hours a day 7 days a week, over a 48-day period. The observation period was incremented later 4 hours every day between 8:00 A.M. and 8:00 P.M. (e.g., Day 1: 8 A.M.- 12 noon; Day 2: 12 noon - 4P.M. Day 3: 4 P.M.- 8 P.M.; Day 4: 8 A.M.12 noon; etc.) In addition to the particular information collected (characteristics, behavior, etc.), observations were augment by taking video (from camera on mounted on a tripod). This video is on file at NOVA University. As a result, the observers not only collected data from each boat, but also keep a video record of each watercraft.

The remainder of this final report is uniquely presented in an interactive format on a set of CD's. The first CD, or master CD, contains sufficient data to functionally stand-alone. This CD is intended for unlimited distribution and along with this read me text is considered to be the final report for this project. The files on the master CD provide an overview of the project and contain sufficient information data for a look at the overall project. The tools that are provided on this CD can be used to query additional data on additional DATA CD's.

Following is a list of the key program and data elements contained on the WETS master CD-ROM.

WETS Internet - This is a complete listing of the wets Internet site as it was on October 23, 1998. Double clicking on the default.html or Index.htm file in this folder will launch the Internet site on your computer's Internet browser. This site provides a very good overview of the project along with documentation of the Internet site.

WETS Internet Viewer - This Windows NT, 95, and 98 compatible program allows the user to view the WETS Internet site while connected to the Internet in an automatic and continuously updating fashion. The program provides the user with easy hands off way of viewing the WETS Internet site. After you are connected to the Internet, start the Internet Viewer. This program will automatically update every 10 seconds.

WETS Image Viewer - This Windows NT, 95, and 98 compatible program provides the user with a tool to time lapse view WETS picture files. This viewer will also view picture files contained on additional WETS CD's. From the master WETS CD-ROM the WETS Image Viewer program can be automatically added to your start programs menu. This program works like a VCR. Using the controls you can "play" the pictures or step though them, stopping at pictures of interest.

WETS Wave Player - This Windows NT, 95, and 98 compatible program provides the user with a tool to time lapse view WETS wave data files. This player will also view wave files contained on additional WETS CD's. This program works like a VCR. Using the controls you can "play" the wave data or step though it, stopping at waves of interest. Note you can change the vertical scale to expand the waves to make them easier to view.

Note: The Image Viewer and The Wave Player taken together provide a positive means of correlating a boat with a calibrated, hard copy measurement, of the wake it generated.

WETS FFT Analyzer - This Windows NT, 95, and 98 compatible program is an example of one component of the expert system kernel that demonstrates the use of artificial intelligence to detect a boat wake and to make continuous determination of sea state spectrum in the urban canal. This tool provides additional features that allow the user to interact with the wake data to calculate the speed, heading, and direction of the boat at the time of detection by the expert system.

WETS Detector - This Windows NT, 95, and 98 compatible program is an example of one component of the expert system kernel that demonstrates the use of artificial intelligence to detect a boat wake. This tool provides additional features that allow the user to interact with the wake data to calculate the speed, heading, and direction of the boat at the time of detection by the expert system.

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Note: The WETS FFT Analyzer and the WETS Detector are intellectual property developed specifically for use in this research project, all rights are reserved.

Note: The WETS FFT Analyzer or Expert System Calculator is intellectual property developed specifically for use in this research project, all rights are reserved New Age Systems, Inc.

WETS Data Converter - This Windows NT, 95, and 98 compatible program is provide to convert the raw wake data into processed data in engineering units suitable for a wide variety of applications.

WETS Wave Staff Array Raw Data - This master CD contains a sample of the WETS raw data suitable for use with the additional programs provided on the CD.

WETS Picture Files - This master CD contains a sample of the WETS picture files suitable for use with the additional programs provided on the CD.

WETS Observer Database – This is an read only access data base which includes all data records collected by the student observers.