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ELECTRONIC CHART DISPLAY INFORMATION
SYSTEM FOR IMPROVING NAVIGATION SAFETY

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ABSTRACT

Navigation charts are one of the very important tools to assure safety of navigation. It has been developed from the conventional paper charts to the Electronic charts display and Information System (ECDIS). Geographical information System (GIS) is an analytical tool to achieve special function in the field of information handling and analysis. It has various applications for Maritime Safety when interfaced with ECDIS and Automatic and Identification System.

The present research examines in depth the ENC as a spatial tool with reference of national and international experiences applications. A review of Electronic Navigational charts (ENC) development and their types are studied. This review includes the technology for efficient mapping. It includes also a discussion on the role of ENC and ECDIS in an integrated navigational system.

A geographical database is designed using multi-layered data. Different data layers are included in the geographical database. This includes the base map, water depths points and contours, the coastline, and the quays. There are also data layers contains the locations of the navigational aids such as buoys and light houses. Data are collected from different sources in different formats. Data collected are entered to the system using Arc-view desktop GIS.

Spatial data analysis of the developed multi-layered GIS include registering the layers to the same coordinate system and geocoding the raster format map layers. Feature selection is used to produce view layers with different features according to the interest of the user. Query analysis is carried out to obtain information on specific features such as buoys, lighthouses and Quays which represent the important tools as navigational aids. A suitability analysis is also carried out to select the best routes for navigation. The necessary criteria are defined for route selection.

The research then evaluates and tests the system during actual applications and proposes feasible solutions for the problems associated with these applications. Relevant conclusion and recommendations for using the developed system are submitted in terms of its usability in navigation.
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<td>AIS</td>
<td>Automatic Identification System.</td>
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<td>ARPA</td>
<td>Auto Radar Plotting Aid.</td>
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<td>CHS</td>
<td>Canadian Hydrographic Services.</td>
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<td>CIS</td>
<td>Canadian Ice Services.</td>
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<tr>
<td>COG</td>
<td>Course-Over-Ground.</td>
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<tr>
<td>CPA</td>
<td>Closest Point of Approach.</td>
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<td>DDS</td>
<td>Data Display System.</td>
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<td>DGPS</td>
<td>Differential Global System.</td>
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<td>DLG</td>
<td>Digital Line Graph.</td>
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<td>ECDIS</td>
<td>Electronic Charts Display and Information System.</td>
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<td>ECS</td>
<td>Electronic Chart System.</td>
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<td>EEZ</td>
<td>Economic Exclusive Zone.</td>
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<td>GIS</td>
<td>Geographical Information System.</td>
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<td>ENC</td>
<td>Electronic Navigation Charts.</td>
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<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System.</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Position System.</td>
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<tr>
<td>GUI</td>
<td>Graphical User Interfaces.</td>
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<td>HACAS</td>
<td>Hazard And Collision Avoidance System.</td>
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<td>HO</td>
<td>Hydrographic Office.</td>
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<td>IEC</td>
<td>International Electrical Commission.</td>
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<td>IHO</td>
<td>International Hydrographic Organization.</td>
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<td>IMO</td>
<td>International Maritime Organization.</td>
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<td>MIO</td>
<td>Marine Information Object.</td>
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<td>MMSI</td>
<td>Maritime Mobile Service Identity.</td>
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<td>North America Datum.</td>
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NCGIA : National Center for Geographic Information and Analysis.
NHO : National Hydrographic Office.
NOAA : National Ocean and Atmospheric Administration.
NOS : National Ocean Service.
OCS : Office of Coast Survey.
PC : Personal Computer.
POB : Person Over Board.
RDBMS : Relational Data Base Management System
RENC : Regional Electronic Navigation Center.
RNC : Raster Navigation Charts.
RTCM : Radio Technical Commission For Maritime.
SA : Selective Availability.
SAR : Search And Rescue.
SOLAS : Safety Of Life At Seas convention.
SOG : Speed-Over-Ground.
STDMA : Self-Organized Time Division Multiple Access.
TCPA : Time to The Closest Point of Approach.
TIGEK : Picture Extension format.
USA : United States of America.
VTS : Vessel Traffic Services.
WMO : World Meteorological Organization.
XUPDMAIL : Expand UP Date Mail.