USCHC47-15B

Proposal to USCHC47:

Pressure on traditionl products – Challenges and Opportunities of Big Data

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Executive Summary: Growing volumes of data derived from a myriad of external sources including Earth Observations Imagery and Data and third party or "crowd source" data are putting pressure on Hydrographic Offices. Are their opportunities to improve how Hydrographic Offices access and automatically assess these data sources to identify changes that may impact safety of navigation? Recent Canadian events in Canada including the Big Bar Land Slide and Bute Inlet events in British Columbia or the coastal erosion and infrastructure damage from Hurricane Fiona on the Atlantic Coast are recent and relevant examples where automated assessment and change detection from remote sensing may offer opportunities for more proactive and targeted responses from Hydrographic Offices when there are important changes to the marine environment.

Related Documents: No additional document or deck.

Related Projects:

Introduction/Background

The past few years have seen a number or geological or meteorological events that have had the potential to impact marine navigation in Canada. These have included large landslide and debris slides as well as strong storms impacting coastal areas. These events have the potential to change shoreline in coastal areas, and also reduce depths in navigable waters. In the past, Hydrographic Offices such as the CHS have reacted to these types of events, normally assessing changes after the fact with a mix of remote sensing (satellite imagery and data) together with revisory surveys, which often cannot occur for several days, weeks, or even months depending on location and the time of year.

Automated change detection that can monitor massive volumes of satellite imagery and data, along with crowd source depth measurements may offer opportunities to alert Hydrographic Offices of potential areas of change that may warrant further investigation, and manual intervention. The massive size of the US and Canadian shorelines demand automated solutions that can leverage the power of "big data" and AI.

Analysis/Discussion

Assessments of the potential changes following large physical events such as landslides, tsunami, or strong coastal storms are undertaken on a routine basis by Hydrographic Offices. In the case of CHS, this normally involves a focused and manual assessment of available remote sensing imagery and data to complete a "before/after" assessment to determine change. In addition, the CHS often receives

information from other levels of government, port authorities, Canadian Coast Guard and others which may inform necessary updates of products, or the need for revisory surveys. As noted, these assessments are typically done after fact in a reactive mode, using a wide range of unconnected and non-uniform data sources.

Conclusions

Given the growing number of new Earth Observation Satellites along with easier and more cost-effective access to computing power and AI routines, it may be possible for Hydrographic Offices to design, test, and implement new automated systems with the capabilities to detect and alert of important changes in the coastal or marine environment. It is likely that some of these capabilities are already being leveraged in other government agencies or departments such as Geological Services. There may also be advancements in the academic sector to be explored. The goal will be to develop a system trained on the marine and coastal environment and bring together traditional shoreline and bathymetric data together with Earth observations.

Recommendations

It is recommended that the US and Canada consider engaging their academic networks to identify this opportunity, and determine if there is interest, or already existing capacity to advance work in this area with the eventual goal of operationalizing tools to be used by either CHS or NOAA. In Canada, CHS could engage directly with the Canadian Ocean Mapping Research and Education Network (COMREN), while NOAA could consider doing the same via University of New Hampshire or other schools supporting NOAA Coast Survey actives.

Action Required of USCHC

1) Review and consider this report, and determine if there is interest in advancing automated Earth observation tools/systems for automated change detection and alerting.
2) Engage with their respective national geological or geophysical departments.
3) Engage national academic networks and institutions who may have expertise in this area.