Handling and Analyzing Marine Traffic Data

Master thesis proposal

2015-09-30

Background

Nowadays, all merchant vessels use an Automatic Information System (AIS) transponder to broadcast their position, course, speed, and navigational status as an “AIS message”. Originally, AIS data was meant to be used by other vessels and vessel traffic services solely for collision avoidance. However, since its deployment, new and exciting applications have been found for AIS data. For example, vessels performing illegal activities (such as fishing in prohibited areas and dumping oil at high seas) have been identified by their movements and location. Overall, AIS data is routinely used in risk, market, supply-chain, and environmental impact analyses.

AIS data is without a doubt a very valuable resource for companies, researchers, and governmental agencies. Unfortunately, it is difficult to handle. For example, one year of AIS data in the Baltic Sea, sampled at a rate useful for marine traffic analyses, consists of around 6,000,000,000 AIS messages.

Chalmers’ department of Shipping and Marine Technology is performing research on marine traffic with AIS data in close cooperation with the Swedish Maritime Administration (Sjöfartsverket). Currently, the research faces two challenges:

1. Software for analyzing AIS data has been developed at the department; however, the software is incapable of handling AIS data of a large scale.

2. Vessels can easily manipulate their AIS data. Dishonest crews or owners may use a false international vessel identification number, turn-off the transponder, and lie on the statement of their destinations.

Project objectives

The master students willing to pursue this project will have two tasks:

1. Develop a solution for handling AIS data of a large scale that can be coupled to existing and future software developed by the department of Shipping and Marine Technology.

2. Develop a possible algorithm to identify dishonest or fake AIS messages.
Benefits for the students

The students who perform this master thesis will familiarize themselves with the shipping industry and its needs and challenges with respect to information technology. Information technology in shipping is a growing market, and AIS data is one of its cornerstones. Knowing what can be done with AIS data and how to do it are attractive skills for academia, research institutes, classification societies, and governmental agencies.

Ship tracking data, in general, is emerging as a platform for many new services. Service providers range from mobile ship finder apps, intended for the general public, to more professional services aimed towards the maritime industry. Examples of such applications could include continuous monitoring of emissions from shipping, and real-time monitoring of accident and emergency response risks (oil recovery, tug preparedness, pilot schemes etc.). Operational and navigational risk monitoring is one of the problems addressed in the European Maritime Safety Agency (EMSA) EU initiative. We believe that there are clear business opportunities for actors that can combine in depth knowledge of continuous advanced analysis of ship traffic with other data such as weather, ship parameters, ship equipment, cargo, safety condition etc.

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AIS data handling and analysis is a real world Big Data problem.

Additional information

- Start date: Early January 2016
- Work location: Lindholmen or Johanneberg Campus
- Examiner: Professor Devdatt Dubhashi (dubhashi@chalmers.se)
- Supervisor: PhD Luis Sánchez-Heres (luis.sanchez@chalmers.se)
- Co-supervisor: PhD student Frederik Olindersson