

Sep 2020



Project
News letter

SEDNA



Welcome to the September 2020 edition of the SEDNA newsletter. Despite the impacts of Covid-19, the SEDNA consortium continues in its efforts to develop research innovations and technologies designed to address waterborne challenges in extreme environments. Within this issue we present our work in key areas such as the safe Arctic bridge, sea ice forecasting and voyage optimisation. We also outline some of the research published by individual consortium members within the international scientific community.



This issue

- Safe Arctic Bridge
- Sea Ice Forecasting
- Voyage Optimisation
- Research publications

Safe Arctic Bridge

The safe arctic bridge has developed a user interface architecture for augmented reality and applications concepts supporting arctic operations. Currently we are testing the architecture and concepts using a two stage process. Firstly, we have identified three arctic operation scenarios that are useful to test our AR concepts. The scenarios have been recreated in a simulator and tested with users in order to identify potential error chains in each scenario. Secondly, the data from the simulation has been recreated in a virtual reality simulator capable of demonstrating the AR architecture and application concepts embedded in each scenario. The new demonstrator has been used to test the new concepts and compare them to the previous simulator trials. The results are used to improve the AR user interface architecture and applications.



Moving further we use the knowledge generated through the SEDNA project to develop a risk assessment of using AR in maritime context. Further, we plan to use the deliverable from SENDA to publish an open source user interface architecture for maritime AR through the OpenBridge platform.



Research

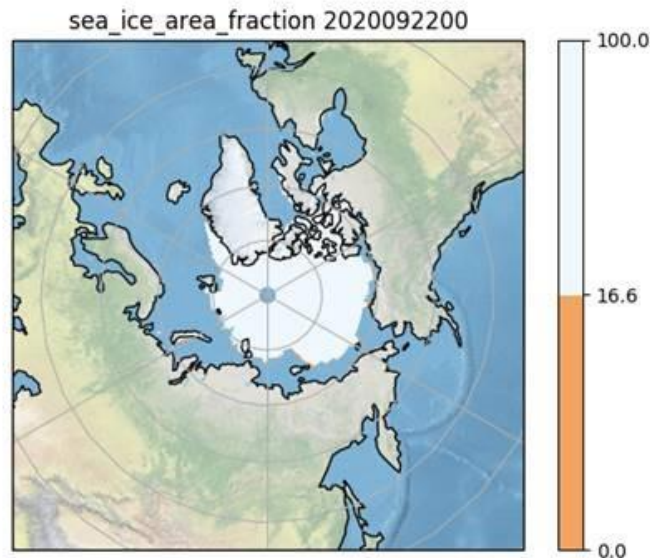
Dissemination

AALTO: Prof Pentti Kujala from the AALTO University School of Engineering has won the Transportation Award 2020 in the field of waterborne transport. Prof Kujala received this award in recognition of his extensive and continuous contribution in delivering research outputs, which are designed to improve safety for shipping in ice-affected regions such as the Arctic, Baltic and Antarctic waters. [Read more.](#)

UCL: Huang et al. (2020) Ship resistance when operating in floating ice floes: A combined CFD & DEM approach, *Marine Structures*, 74, [link](#).

AALTO: Shamaei et al. (2020) Local pressures for ships in ice: Probabilistic analysis of full scale line load data, *Marine Structures*, 74, [link](#).

AHO: Augmented reality for ship navigation: Check out this [video](#) from Prof Kjetil Nordby and his team from the Ocean Industries Concept lab, which describes how AR technology and SEDNA research innovations can impact on safe Arctic navigation.



Voyage Optimisation and Sea Ice Forecasting.

Voyage planning tools and sea ice forecasting research and innovation continues

The UK Met Office is currently providing advice to SEDNA's industry partners on the sea ice conditions for the summer of 2020. To achieve this, it makes use of a prototype seasonal forecast model optimized during the project. The Global Seasonal Forecast System (GloSea) is an ensemble prediction system providing monthly and seasonal ice edge forecasts as shown below for September 2020. This uses a coupled model to make daily global 28-member probability forecasts for the next 7 months using the very latest observations. The horizontal resolution is circa 110 km by 20 km at 80 degrees North and the associated reanalysis data can be found on the Copernicus Marine Environment Monitoring Service (CMEMS).



Roadmapping workshop short description – UCL

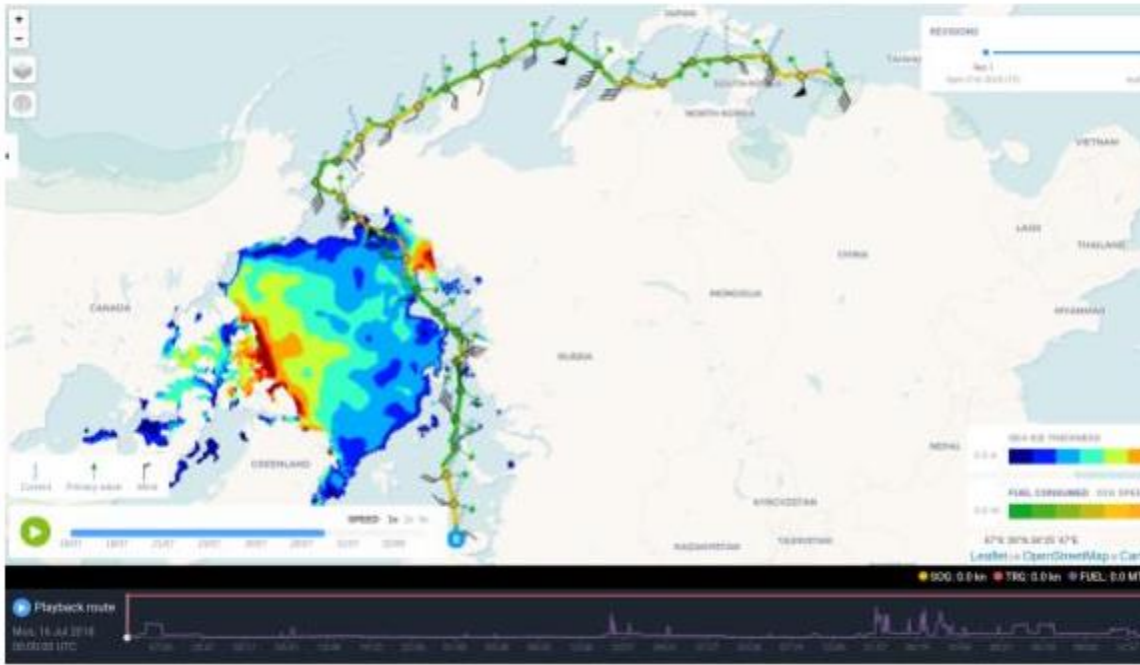
In January 2020, the SEDNA Consortium and subject matter experts from industry and academia gathered for a half day research roadmapping workshop in Gothenburg. Working in groups based on areas of expertise, we identified and highlighted trends and drivers causing rapid change in the Arctic, the expected impact of these changes, and technological solutions to mitigate negative impacts and exploit emerging opportunities. Several novel research topics and knowledge partnership opportunities were identified and prioritised for future work, many of which had not been previously identified within the SEDNA project or in the wider literature.

This workshop was particularly valuable in bringing together all of the SEDNA partners to identify cross-cutting opportunities and providing us a big picture so we can see how individual contributions fit together. The input from industry partners added considerable value, putting an emphasis on emerging challenges.

In the SEDNA project the University of Southampton - IT Innovation Centre are finalising their prototype of a reference platform for the aggregation, fusion and subsequent provision of data and information from multiple sources (including Copernicus and the UK MetOffice).

These innovations can be used by downstream decision support solutions for aiding safe Arctic shipping. The platform comprises of a chain of data centric services for accessing, querying, pre-processing and ultimately integrating data sources, and fusing the data ready for use by downstream data-driven applications.

These data services expose a single access point and a uniform interface to make data and information easily accessible. The reference platform utilises several open standards for supporting the ingest, querying, integration and access of geo-spatial data, like NetCDF4, RDF, OWL and OCG SWE.



GreenSteam Route Optimizer

Chalmers University developed the Voyage Planning Tool for determining the optimal safe passage through the Arctic. The tool consists of an optimization algorithm and vessel performance models used to determine the attained speed and associated fuel consumption for given weather and ice conditions. GreenSteam has commenced the development of the Route Optimizer service based on the Voyage Planning Tool within its GreenSteam Manager Web application.

This service allows a user to select one of the provided SEDNA vessels for which an optimal voyage is required. The Route Optimizer allows the users to set vessel operational conditions, such as draughts, target speed and vessel operational

constraints: wind speed, wave height, sea ice concentration and thickness. The waypoints can be imported using RTZ or CSV format, or manually. After the optimization has finished, the user is able to view the optimal voyage together with estimated fuel consumption, speed, weather conditions and POLARIS risk index along the track.

Weather overlays can be displayed over the chart to illustrate sea ice concentration and thickness to visualize how the ice conditions change during the voyage. A graph is present to inspect time series for speed, fuel consumption, POLARIS risk index, weather and ice conditions below the chart.



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Research Dissemination

Hume-Wright et al. 2020. Sea ice thickness forecast performance in the Barents Sea. Accepted in 39th International Conference on Offshore Mechanics and Arctic Engineering (OMAE) Fortlauderdale, FL, USA. June 28 – July 3 2020

AALTO: Bergstrom et al. (2020) Some new insights towards goal-based risk design for Arctic Ships, Proceeding from the 08th Transport Research Arena, [link](#).

UCL: Huang et al. (2020) Simulation of a ship operating in an open-water ice channel, Ships and offshore structures, [link](#).

Chalmers: Chalmers Technical University, presented and published research at the International Conference on Ships and Offshore Structures. The research focused on voyage planning tool developments for ships sailing between Europe and Asia via the Arctic, and featured inputs from Prof Jonas Ringsberg and Dr Zhiyuan Li.

NMCI, UCL, MET: SEDNA successfully co-hosted a breakout session at the Arctic Circles Assembly, in Reykjavik, Iceland with the ARCSAR project. The Arctic Circles Assembly is a global event which attracts over 2,000 participants from over 60 countries, from research, industry, and broader societal interests. The session was co-hosted on day 1 of the event, and attracted interest from over 150 participants.