Automatic speech recognition and speech output as a means of reducing maritime information overload

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IALA
e-navigation underway
International
2018 Conference
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**linkage to IALA e-nav targets:**

"The overall goal is to improve safety of navigation and to reduce errors by equipping users, on ship and ashore, with modern, proven tools, optimized for good decision-making, to make maritime navigation and communication more reliable, and user-friendly."

*(IMO document NAV 54/25 Annex 12)*
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5 solutions prioritised by IMO (Strategy Implementation Plan, SIP):

S1 harmonized, user-friendly bridge design
S2 standardized and automated reporting
S3 reliability, resilience, integrity of equipment
S4 presentation of information in displays
S5 provision of information to maritime services

(Hagen: Implementing e-Navigation, 2017, pp. 5-6)
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**non-maritime speech output:**

- **S2** standardized and automated
- **S4** presentation of information in displays
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*non-maritime speech output:*

Yeah, *right.*

Did she say *right?*
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**non-maritime speech output:**

Did she say *right*?

Yeah, *right*.

**maritime perspective:**

- closed-loop communication
- information synchronicity
- S2 standardized, automated reporting
- S4 presentation in displays *and verbally*
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**maritime (bridge team) communication:**

- Why doesn’t he answer?
- What was the call sign again?
- Chief, can you come up?
- Is this North-up?
- Where is the target now?
- Why cross-tack error?
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**maritime (bridge team) communication:**

Information:
- Our heading 135°.
- Our speed 1-5 knots.

Warning:
- Ship on starboard bow, distance 2 cables.

I better call later.

Information acknowledged.
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maritime (bridge team) communication:

- man-machine interface
- improved close-loop communication
- better information synchronicity
- increased situational awareness


Information acknowledged.

I better call later.
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**Speech input and output:**

- provides an additional information channel for human-machine communication
- reduces distraction caused by visual information overload
- ‘intelligent’ human-machine interface provides decision-making support
- improves information synchronicity of bridge team members
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application areas on board:

- information for bridge team  
  (interface to Aids to Navigation, AtoN)
- VTS and ship-to-ship communication
- alarm management
- BNWAS
- automated status reporting
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**challenges:**

- integration into existing equipment
- S2 standardization and automation
- S4 presentation of information *in displays*
- acceptance by the industry
Fraunhofer IDMT: solutions for the maritime industry

Maritime Education & Training:
- automatic transcription of ship-to-shore communication
- voice control for interaction with existing on-board systems
- corpora of own speech-data for maritime communication
- chatbots for simulating verbal communication
- offline / Privacy by design
- no online connection required
Fraunhofer IDMT: solutions for the maritime industry

Product portfolio:
- Acoustic condition monitoring – listening, analyzing and secure processing for Industry 4.0
- Adaptive media for education and entertainment
- Personalized speech and sound reproduction in media and communication systems
- Audio technology and communication systems for people with normal and impaired hearing
- Modeling and prediction of sound perception
- Acoustic speech and event recognition
- Audio signal optimization
Fraunhofer IDMT: solutions for the maritime industry

SMM Hamburg 2018:

**FRAUNHOFER WATERBORNE AT THE SMM 2016**

**Hamburg, September 6-9**
**Hall B6, Booth 319**

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**Automatic Speech Recognition in Maritime Communication**

Maritime communication is a key factor for the safe operation of ships. Innovative speech technologies can significantly improve the effectiveness of communication on board, from ship to ship and ashore.

**Fraunhofer IDMT offers**

- Training systems for maritime communication based on speech recognition
- Automatic speech recognition, transcription and data processing e.g. for voyage data recorders, VTS or marine simulators
- Microphoning and signal processing for enhancement of speech quality

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**ChatBot: Training of Standard Marine Communication Phrases**

Project in co-operation with Jade University of Applied Sciences