

# 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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- ◆ speech output
- ◆ speech input
- ◆ Fraunhofer IDMT



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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:

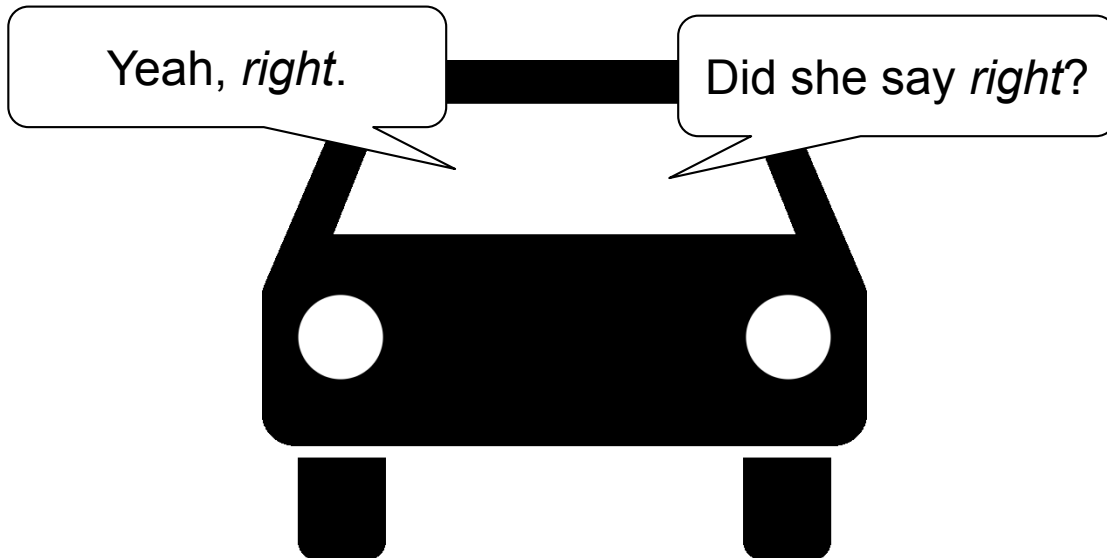
**S2**      **standardized and automated**

**S4**      **presentation of information  
in displays**



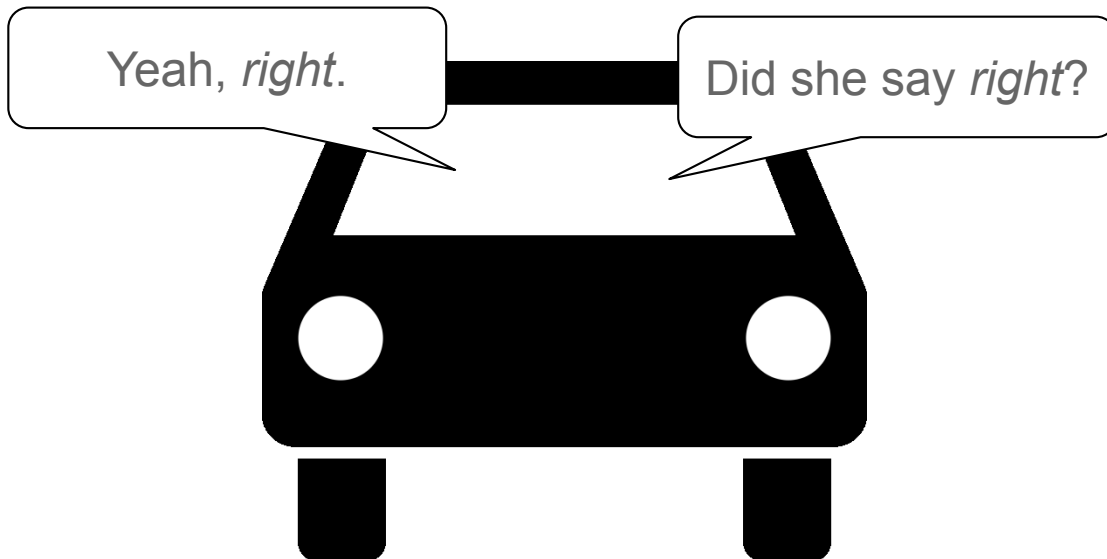
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## non-maritime speech output:



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## non-maritime speech output:



## 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.



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

## maritime (bridge team) communication:

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

### Information:

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

### Warning:

Ship on starboard  
bow, distance 2  
cables.

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



### 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

ChatBot: Training of Standard Marine Communication Phrases. Project in co-operation with Jade University of Applied Sciences

