

A multimodal context aware mobile maintenance terminal for noisy environments

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Overview

- Scenario and challenges
- Noise-robust speech recognition
- System overview
- Multimodal user interface
- Conclusions and future work



Scenario and challenges

Scenario



- Maintenance workers in oil and process industry
- Scheduled inspections and unplanned maintenance

Challenges

- Access to data and procedures
- Improve data quality
- Hands- and eyes-free operation
- Noisy environments
- Improve information flow and work-processes
- Provide access to experts





PARAT - Personal Active Radio/Audio Terminal

- Intelligent hearing protection and two-way radio
- Active, transparent noise reduction
- Facilitates speech interaction in extreme noise
- Developed by NACRE, a SINTEF spin-off





www.nacre.no



PARAT performance





- CV90 military combat vehicle, Factory1 NOISEX database
- H-374(V)5 military close-talking microphone



Maintenance terminal



Implemented on iPAQ 5450

- Built in WLAN and Bluetooth
- PARAT earplug
- Barcode scanner

Maintenance application implemented in J2ME

Integration with native subsystems through C++/JNI



Backoffice server

- Provides work orders, equipment data, etc.
- Receives maintenance reports
- Runs Sprex speech recognition engine



Context awareness



- Provide information and services relevant to current task (Dey 2001)
- Automated equipment identification and verification
 Improved data quality
- Bluetooth tags
- Barcodes

Manual input if all else fails



ICT

Multimodal user interface

- Supports equipment inspections
- Structured dialog
- Suitable for speech input and output
 - Sequential process
 - Limited prompts and replies
- Text and audio comments

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 Speech-mode -> (2/5) Check gear locking mechanism in 2 		
Performed Not performed		
Comment:	Record	
Some corrosion detected.		
NotificationWork orderEquipment dataAmbiLab SINTERFrank Hansen GB-13-407 / A30-20109		



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Multimodal user interface

Distributed Automatic Speech Recognition (ASR)

- Speech recorded on PDA, processed on server
- Higher quality, larger vocabulary

Speech synthesis using pre-recorded prompts
 Limited number of prompts, downloaded on demand
 Higher quality than Text-to-Speech

- Lower processing and power requirements
- Requires constant network connection
- FAMOUS project on adaptive component-based systems



Conclusions and future work

We have developed a mobile system for maintenance work, targeted specifically at noisy environments

Future work

- User field evaluation
- Improve adaptivity, e.g. handle variable network availability
- Investigate client-side speech solutions

Questions? Comments?



ICT

Come get a demonstration at the SINTEF stand!

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