QR-based Intelligent Prodder for Demining Operations

Blaž Zupančič
The KCL NQR Group is engaged in an 18-month project to develop a confirmation sensor for humanitarian demining on behalf of charity “Find a Better Way”. The project is called “AQUAREOS” – Advanced Quadrupole Resonance-based Explosives Ordnance Sensing.
Why Nuclear Quadrupole Resonance?

- direct detection of compounds
- non-destructive
- remote
NQR issues

- low signals
- susceptible to environmental noise (RFI)
- difficult to use
Proposed solution: intelligent prodder

- part of current operations
- confirmation sensor
- already demonstrated with other technologies
NQR prodder

- fixed sensor-object distance
- less RFI

A. N. Garroway et al., IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 39, NO. 6, JUNE 2001
NQR prodder

- smaller sample volume detected
Non-resonant transceiver

- no complex electro-mechanical tuning
- easy to use

Non-resonant transceiver

- sequential excitation, sequential acquisition
- no retuning
Non-resonant transceiver

- sequential excitation, simultaneous acquisition
- no retuning, 2 different materials
Advanced signal processing

- discriminates between signal and RF interference
- overcomes the need for sensor shielding
Proof of concept built

- detector integrated with existing prodder handle
- non-resonant transceiver
- using Tecmag LapNMR spectrometer
- automatic acquisition/processing scripts
Outlook

- miniaturization of components
- FPGA-based spectrometer
- improved signal processing
THANK YOU

QR Sensors Team
Department of Informatics
Centre for Robotics Research
Centre for Telecoms Research

blaz.zupancic@kcl.ac.uk
weihang.shao@kcl.ac.uk
jamie.barras@kcl.ac.uk
panagiotis.kosmas@kcl.ac.uk
k.althoefer@kcl.ac.uk