

Participating Institutions

Tohoku University, Sendai, Japan

Tohoku University was established as Tohoku Imperial University in 1907, as the third National university in Japan. Currently Tohoku University has 10 faculties, 16 graduate schools, three professional graduate schools and 7 research institutions. Approximately 11,000 undergraduate students, 4,400 graduate students in master course and 2,700 doctoral course students are studying at the Tohoku University.

Federal Administration of Civil Protection in Federation of Bosnia and Herzegovina (FACP BiH)

FACP was established as an autonomous administrative body on the Federal level in 2000. Its given mission is: protection and rescue of people, flora and fauna, material, cultural, historical goods and environment from the natural disasters, technical and technological accidents and war aftermaths and dangers. FACP conducts its work through 9 organizational units, including a unit for the organization of demining and explosive ordnance disposal. Among operational staff, including 10 manual demining teams, two mechanical ground preparation teams and Mine detection dog team, this unit has also trainers and instructors conducting basic demining training, cluster munition clearance training and EOD up to IMAS L3 training.

Netherlands Organization for Applied Scientific Research (TNO)

TNO was established by law in 1930 and is a legal entity under public law. The organizational objective of TNO is to contribute to the effective and efficient use of applied technical and scientific research for the general interest and parts thereof, including the Defence interest. TNO aims to accomplish this by conducting research for the national government, by cooperating with other research facilities and by contributing to the coordination of research in the Netherlands and in the international arena.



The NATO Science for Peace and Security Programme

The NATO Science for Peace and Security (SPS) Programme is an integral part of the NATO Emerging Security Challenges (ESC) Division. The SPS Programme develops and implements practical cooperation and enhances dialogue between NATO nations and Partner countries through capacity-building and security-related civil science, technology and innovation. All SPS activities contribute towards the Alliance's Strategic Objectives, have a clear link to security and respond to at least one of the SPS Key Priorities.

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www.nato.int/science

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Emerging Security Challenges Division



Accelerating mine clearance in humanitarian demining operations

Context

Many countries all over the world are still facing the threat of landmines as a result of past conflicts. This threat causes innocent victims, such as playing children and farmers, but results also in economic loss, since mine-contaminated areas are not accessible and cannot be economically developed.

Twenty years after the war, landmines, cluster munitions and other explosive and toxic remnants of war still have serious social, economic, environmental and security impact in Bosnia and Herzegovina (BiH). One quarter of all communities are affected by mines and cluster munitions. Globally, BiH belongs to the countries with the highest density of contamination by mines and explosive remnants of war.

Manual demining is the basic method for mine clearance in Bosnia and Herzegovina. Through manual demining, all landmines are removed, as well as all metal fragments identified by a metal detector, up to a depth of 20 centimeters. The process of inspection and excavation of all detected metal fragments has a major impact on the progress of manual demining.

Goals

Through this SPS project, the new dual sensor “ALIS”, combining a metal detector and a ground penetrating radar, will be evaluated for application in humanitarian demining activities in Bosnia and Herzegovina. ALIS can visualize buried landmines on a tablet PC screen, so that an operator can easily understand the shape of buried objects and can discriminate mines from other metal fragments. In this project, the sensor’s performance will be evaluated and a new SOP (Standard Operation Procedure) for this new sensor will be established. The efficiency improvement of mine clearance resulting from the introduction of ALIS in other mine-affected countries will also be evaluated.

How does it work?

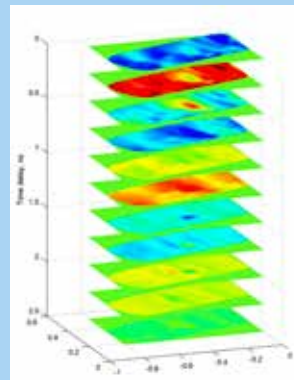
The handheld ALIS dual sensor detector combines two sensors for mine detection:

- A state-of-the-art metal detector. Metal detectors are the standard sensors in manual demining worldwide, but they give detection indications for mines as well as all other metal fragments (e.g. shrapnel, human waste) present in the ground.
- A ground penetrating radar (GPR) with dedicated imaging software. The output of this GPR is visualized on a tablet display to facilitate object recognition for the operator.

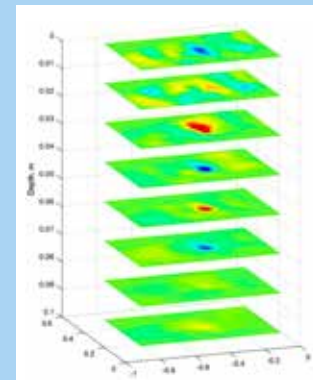
By combining the information of the metal detector and the GPR, the operator can discriminate the threat, i.e. the landmines, from harmless metal fragments, like shrapnel and human waste, before prodding and excavating.

Other ALIS features of high significance to the demining personnel are:

- More lightweight than the standard metal detectors in use at the moment;
- Improved ergonomics compared to existing GPRs;
- Easy interpretation of the sensor output on its tablet display, facilitating training and operation.



C-scan



SAR processed image

Deliverables

- Report on currently applied demining methods in BiH, including soil types and types of landmines.
- Plan for setting up a training and test lane in BiH, together with an operator training plan.
- Implementation of a training for ALIS operators and/or a train-the-trainer program.
- Execution of a small-scale operational assessment in BiH, and report on the analysis of the data of this assessment and identification of lessons learned.
- Establishment of an SOP (Standard Operation Procedure) for the ALIS dual sensor detector.
- Establishment of a procedure for GPR testing and accreditation.
- Report on the analysis of the data from a large-scale operational assessment of the ALIS detector in demining operations in BiH, including conclusions and recommendations on the implementation of ALIS in humanitarian demining.

Impact

Currently, manual demining is a slow process, mostly because a significant amount of an operator’s time and energy must be put into prodding and extracting metal fragments from the ground. The ALIS dual sensor detector, combining a metal detector for standard metal indication search and a GPR (ground penetrating radar) for the inspection of the indication of the metal detector, can reduce labor and shorten time for the inspection of the metal detector indications. It will speed up the demining process on the basic level.