

**ESDA2008-59397**

## **ROBOT REMOTE CONTROL AND MINE SWEEPING**

**Vittorio Belotti**

**Manjula U. Hemapala**

**Rinaldo C. Michelini**

**Roberto P. Razzoli**

University of Genova

PMARlab – Laboratory of Design and Measurement for Automation and Robotics

DIMEC – Department of Mechanics and Machines Design

Via all'Opera Pia 15 A - 16145 Genova, Italy

### **ABSTRACT**

Humanitarian demining is calamity of third world countries. The clearing is ceaseless, more expensive than the spreading, and terrorist return is obtained by weakening of the antagonistic population. The mines are cheapest weapon, built to make horrible injuries, affecting active people, with major falls-off into economic growth.

The disaster is notably cruel in Sri Lanka, with anti-person mines spread in the northeast region. After the ceasefire, the international organisations started the mine sweeping, with poor issues, due to politico-economical motivations in direct bond with wants in the technical effectiveness. The pitiable situation is worsened, as most rich lands are removed from farming exploitation, with increasing of the internally displaced persons. Now, clearing is engineering duty, and the humanitarian goal comes to be technical challenge. The advanced robotics fulfils clean and reliable tasks, on condition to upgrade sophistication and cost and to loose third-world appropriateness. The challenge is to turn local machines and awareness into effective robotic aids, willingly used by the local people, and to enhance the on-going outcomes. The analysis, mainly, addresses the following points:

- the engaged technologies need to provide special purpose outfits and to involve operators having adapted uniformity;
- the work-flow pre-setting ought to detail the duty-cycles and to establish the standard achievements;
- the planning has to specify the on-process warning/emergency management and the failure protection rules;
- the operators' instruction and training shall aim at off-process optimised work-flows to circumvent risky issues;
- the effectiveness comes from organised routine agendas, in conformity with allotted tasks and emergency events.

This is a mix of organisational and technologic demands, calling for responsible commitment of the involved people, so that the local Civil Service is entitled to do the clearing operations, and the all engaged community is solidly concerned.

The winning solution shall look at low-cost robotic outfits, to be obtained with resort to nearby available resources and competences (e.g., drawn on from the local agricultural machinery and know-how), and full account of the cost limits, while aiming at the process effectiveness by the mix of enabling cues, principally deferred to enhancing the regional awareness and the factual dedication.

The paper stresses on fairly unorthodox robots, addressing unmanned effectors facilities joined with intelligent remote-command abilities, not as advanced achievements, rather as cheapest productivity upgrading, assembled from standard farming devices, through the shared know-how and commitment of locally involved operators.

### **1. INTRODUCTION**

Humanitarian demining is calamity of third world countries, induced by local reprisals and retaliations due to ethnic/religious struggles and lack of socio-economic hopes. All the technology-driven issues result unsuited, with endless reiteration of limited accomplishments, when the clearing is more expensive than the spreading, and terrorist return is obtained by the further weakening of the antagonistic population [1].

The endless demining is deemed to never stop, whether the warfare reasons are not eradicated (after proper political and social settlements), either the sweeping becomes cheap, safe and standard accomplishment, so that the mining shrinks to almost useless deterrent, and the terrorist value disappears [2].

The duty is engineering concern, and the humanitarian clearing comes to be technical challenge [13]. The safety is robotic business and proper equipment fulfil clean and reliable tasks. If the environment worsens, cost and sophistication rise, while effectiveness and appropriateness decrease. When the price-to-performance ratio is too high, the robots are expensive military options (or academic toys), not widespread anti-terrorist remedy.