Call for Planning Letter

The US DOD and ROK MOTIE have been exploring avenues of joint research collaboration, and recently signed a Terms of Reference (TOR) to pursue common goals of developing robotics technology in support of humanitarian assistance and disaster relief. Planning letters are solicited for novel and innovative approaches of solving some fundamental issues associated with robotics in support of humanitarian assistance and disaster relief. It is a requirement that the team be formed from a partnership between the US and the South Korean researchers. One of the key evaluation elements is the degree of symbiosis and complementarity of the international partnership. Exchange of students between the two countries is highly encouraged.

The Planning Letter Process

Planning Letter (also known as pre-proposal or white paper) process is designed to solicit the science and technology community at large of novel concepts and innovative approaches to solve key challenges. Submissions are desired that offer new and innovative investigations relevant to the specific research topics listed below.

What to Submit
Proposers are asked to submit a short description (not to exceed four typed pages including figures) of the research proposed to undertake. The planning letter should describe the scientific and/or technical development to be pursued; the approach to be taken; connections to the topic of Humanitarian Assistance and Disaster Relief; and an estimate of the time and funds required to accomplish the objectives. The proposed projects should be nominally for three year efforts. The planning letter should be accompanied by up-to-date curriculum vitae of the principal investigator (PI), which does not count toward the four-page limit.

Where to Submit
Planning letters received via email are highly preferred. Submit the planning letter email to david.k.han@navy.mil. Please include full contact information, including email addresses with all submissions.

The Evaluation Process
The planning letter is the first phase of the process to research award selection. The review of the planning letter will result in a reply of either encouragement or discouragement of formal submission of a full proposal. Decisions to encourage or discourage a full proposal will be based on the general relevance to the theme of humanitarian assistance and disaster relief, innovativeness of proposed effort, potential impact of successful effort, and available funding.

A. Evaluation Criteria

Planning letters will be evaluated on the basis of the evaluation criteria listed below, and program balance to provide overall value to the joint US-ROK robotics research collaboration. The primary basis for selecting planning letters for encouragement of proposal submittal shall be technical, importance to the joint collaboration, and fund availability. Cost realism and reasonableness shall also be considered to the extent appropriate. Therefore, the following criteria will be used for evaluation:

1) Overall scientific and technical merits of the proposal.
2) Relevance and contributions of the effort to the theme of robotics in humanitarian assistance and disaster relief.
3) Degree of collaboration between the US and the ROK researchers including the degree of symbiosis and complementarity of the two teams and the extent of student/post-doc exchange between the two teams.
4) The offeror's capabilities, related experience, facilities, techniques or unique combinations of these which are integral factors for achieving the proposal objectives.
5) The qualifications, capabilities and experience of the proposed Principal Investigator (PI), team leader and key personnel who are critical in achieving the proposal objects, and

6) The realism of the proposed costs and availability of funds.
Criteria 1 through 5 are significantly more important than Criterion 6.

The recommendation for moving forward with solicitation of proposal will be made by an evaluation panel composed of the US DOD and ROK MOTIE representatives. PI of the recommended planning letters will be invited to submit full proposal for further review and selection process. Invitation to submit proposal would allow the PI to further elaborate the proposed idea, however it does not guarantee funding.

Research Topics in support of Humanitarian Assistance and Disaster Relief

Background

Robotic technologies are expected to raise the efficacy of humanitarian assistance and disaster relief to a new level beyond the current practice. This is especially so for the first responders to carry out time critical missions, such as search, rescue, hazard warning and first-hand damage control, under the severe deficiency in accessibility, in-situ information, infrastructural support and safety assessment. However, the application of robotic technologies to humanitarian assistance and disaster relief tasks has not been as successful as anticipated to date. On the contrary, a large gap has been found to exist between what current robotic technologies can offer and the harsh demands of real disaster environments. A breakthrough is seen imperative to have robotic technologies being effectively integrated into real-world relief operations. It includes, but not limited to, a radical improvement in the effectiveness, robustness, endurance and survivability of disaster response robots, a drastic upgrade in the capability of human-robot interaction, especially, for enabling not only immersive situational awareness but also mobile and power tele-manipulation with a full cognitive capacity of human operators, and a major enhancement in the performance of sensing, recognition and modeling for real-time assessment of, spatiotemporally varying, theater-wide and location-specific disaster situations.

These challenges can be broadly categorized into three key areas of investigation: 1) novel platforms for search and rescue, 2) advanced human-robot interaction (HRI) for command and control, and 3) sensing, recognition and modeling for monitoring and planning. Planning letters are solicited to address the following key issues/topics of these three areas.

A. Novel Platforms for Search and Rescue

Robot platforms need to flexible enough to perform broadly, endure, and survive in the face of uncertainty. Fundamental research and designs for robotic platforms to serve increased roles in disaster response and recovery are mandatory. Envisioned missions include, but not limited to: breaching, shoring, and extraction for tasks like protection, patrolling, building entry and/or room clearing; reconnaissance for tasks like damage assessment, inspection, searching and/or mapping; and unit support for tasks like supply distribution, communication relays, clearing and sorting debris, and/or damage control. Some of the potential topics are as follows:

1. Platforms with reconfigurable architectures, to adapt to widely varying and uncertain task environments in a highly unstructured disaster site, as well as to cope with many unexpected situations that could rise in disaster scenarios
2. Platforms with the capability of recovering from failures and faults toward maximizing operational dependability
3. A robot system that utilizes found materials (e.g. rubble) to shore damaged buildings, or create shelters and other useful structures. Hardware must include sensors to scan materials with ability to determine the important material properties of found materials.

B. Advanced Human--Robot Interaction for Command and Control

One major issue is the need to enhance the dynamic mobile manipulation capability of robotic agents in disasters utilizing the full cognitive capabilities of their human teammates. These situations require mobile and power manipulation under agile locomotion and environmental contact that is essential for rapid and reliable disaster response. Further improvements are required for ensuring stability under contact and balance under dynamic and power interaction, including whole body teleoperation. The establishment of multi--modal perceptual immersion with visual, auditory, olfactory and kinesthetic feedbacks as well as enhancing efficiency in control and training under high--level of command complexity is also critical.

C. Sensing, Recognition and Modeling for Monitoring and Planning

It is essential for site commanders, relief workers and/or assistive robots to be able to assess in real-time the theater-wide intelligence and the location-specific information whenever necessary for their monitoring, planning and executing of relief operations, while coping with a large scale of spatiotemporally varying disaster situations. To this end, one fundamental issue to solve is how to collect a large scale of multi-resolution and multi-modal, spatiotemporally varying, data on disaster sites in real-time under extreme disturbance and ill-conditioned accessibility. The other fundamental issue to address is how to effectively integrate and model the collected data into the theater-wide intelligence and the location-specific information in such a way that they can be provided to site commanders, relief workers and/or assistive robots whenever necessary for their locating and rescuing victims, evaluating infrastructural damages, identifying geological changes, monitoring the release of hazardous chemical, biological and nuclear materials, delivering relief supplies, etc.