US / Europe Workshop on Personal Robotics

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1 Personal Robotics

This workshop identifies a new center of convergence in robotics research. The convergence exists between several areas which are currently rather different, but which are united by the essential role of the "human in the loop". One reason for having this workshop now is that we expect to see rapid and exciting progress in these areas. Secondly, the human-centered theme that these areas share highlights the synergy between them. While great progress has been made in improving the connectivity of large and small computers on the Internet, much less has changed in the way people interact with computers. The explosive growth of the information infrastructure provides new opportunities to leverage it by connecting people and computers to the physical world. Robotics is the right discipline to provide this connection. The core areas are:

1. Service and Personal Robots:
   (a) from professional
   (b) to domestic, human-assistance and public oriented use.
2. Interface Robotics:
   (a) Wearable computing and sensing
   (b) Human Augmentation
   (c) Telepresence
   (d) Intelligent objects and smart rooms

1.1 Service and Personal Robots

One major application field of robotics in the future is service robotics where service tasks are performed autonomously or semi-autonomously by robots. While numerous domains can be listed in the industrial context (i.e. in an environment which has been designed or adapted for robot operation and where only professionals respecting very strict rules are allowed), there is a large number of potential applications where the robot should perform servicing for the public or in the presence of the public. There are also very interesting and very promising applications where the interaction can even be closer and where the robot assists (physically) a human.

This is precisely what is of interest here. We want to focus on all the topics linked to situations where the robot performs its tasks in interaction with humans. The human can be an operator, a user of a service performed by the robot or simply a user (a passer-by) of the same environment.

While substantial advances have been made in robotics resulting in a technology which has already great potentials for real applications, there is still a lot of work to be done to effectively open applications where a robot and a human can co-exist.

Let us give a simple example: when a cleaning robot encounters people during its cleaning task, how should it react and behave? What kind of interaction should it have with these people? How can it distinguish a human from an obstacle? How can it inform of its actions and goals ? how can it ask people to move aside ? How can it understand the situation and the goals of the humans around it ...?
More generally, we would like to tackle problems such as navigation in presence of humans, transporting humans, handing out objects to humans, manipulating and transporting loads in cooperation with humans, assisting handicapped or elderly humans...
Addressing such problems is not an engineering work which involves nice or ad hoc interfaces and more robust and more reliable implementation of existing state-of-the-art results. It is a real scientific and multi-disciplinary challenge which covers numerous aspects: mechanical design, sensors, control, perception, decision, communication interfaces.
We should build “soft robots” which should “comply” and never harm human. We should devise robots able to effectively deal with the variety and dynamics of environment where the public is present. Depending on the applications, such robots should interpret human gestures and movement or even human plans and goals which may interact with the robot goals. In other situations, they should filter and understand the user requests depending on the context. The robots should also be able, when necessary, to inform about their actions and goals and to get relevant information from people.

1.2 Interface Robotics

Recently there has been much attention paid to the explosion of the Internet and applications driven by it. Yet little has changed in the way people interact with computers. The availability of ubiquitous computing infrastructure makes possible many new ways to connect information infrastructure with the physical world and the people in it. Robotics contains the science and tools to do this. The face of computing has changed greatly in the last 10 years and will continue to do so. One of the most important changes in future will be the migration of the computer from the desktop “into the real world”, i.e. into a variety of other workplace tasks. But without the keyboard and screen, computers must rely on their own sensing and actuation to be useful. So this migration will require a concerted effort by robotics researchers to develop the sensing and action “skills” needed for those workplace tasks.
This workshop ties together current and emerging areas of robotics and outside areas which study similar problems. The “personal robotics” themes underlines the importance of understanding human tasks and how they might be supported through robotic and computer technology. Personal robotics tasks are often simplified by the presence of the human-in-the-loop, and the skills needed by the robot are complementary rather than competitive with, human skills.

2 The goals of the workshop

The goals of the workshop are as follows:

1. To expose other members of the robotics community to the exciting opportunities in these areas, and the core research problems.
2. To share results on related problems by researchers in these areas.
3. To explore the synergies possible through cooperation between researchers working on *different* problems in personal robotics.
4. To provide a snapshot of this field at the present time and to propose important future areas for research.
5. To provide industry input on application needs and enabling breakthroughs.

The topics of discussion may involve all aspects:

- where a robot (as a whole entity) has to (or needs to, or is constrained to) interact with human.
- where hardware and/or software components borrowed or derived from robotics technology can provide advanced connection between people and computer systems

Both perspectives militate for advances in robotics technology which take explicitly into account the human in the environment, the human in the control loop. Both perspectives militates for the development of "intelligent" interfaces and new means of communication and exchanges between human and machines.

3 Organizers

John Canny
Computer Science Division
387 Soda Hall
UC Berkeley, CA 94720 (USA)
phone: (1) (510) 642-9955
fax: (1) (510) 643-1534
email: jfc@cs.berkeley.edu

Rachid Alami
LAAS/CNRS
7, Avenue du colonel Roche
31077 TOULOUSE CEDEX 4 (FRANCE)
phone: (33) 05 61 33 63 46
fax: (33) 05 61 33 64 55
email: Rachid.Alami@laas.fr

4 Local arrangements

The workshop will take place at LAAS/CNRS.
It will be last two days.
The presentations will be limited in number in order to give the speakers time to present in detail their views and to leave room to open discussions and panels.
There will be no registration fees. We hope that we will be able to provide free meals and transportation from downtown hotels to the workshop place.
We hope to obtain funding from NSF, LAAS/CNRS and the Région Midi-Pyrénées.

5 Proposed Presenters (not confirmed)

A number of presenters from US and Europe will be invited.
The final list will be available shortly.

6 Primary Audience

Most researchers in robotics, especially those interested in emerging application areas. Including those working in haptics/tactile, control, mobile robotics, robot vision, sensor design, planning, coordination learning etc.