Social and Ethic Problems in Search and Rescue Robots:

Questions for discussion

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HELPING ROBOTS

Any social or ethic related problem?

Why?

NO!

No!

No!?

Not sure!

May be!

Yes?

Yes, definitely.

SEARCH AND RESCUE ROBOTS

Any social or ethic related problem?

- HELP BY ROBOTS
  - Whom are they helping?
  - How are they helping ?
  - In which circumstances ?
  - Is society aware of limitations ?
  - Are human rescuers aware of limitations ?
  - Is there over expectation on robot capabilities?

SEARCH & RESCUE ROBOTS

- Goal of rescue robotics
  - develop systems that can serve as helpful tools after disasters and accidents
- Importance
  - After an earthquake or collapse of a built structure the response time to search and locate trapped survivors is crucial
  - Human intervention of Urban Search and Rescue (USAR) teams has to be cautiously:
    - Potential risk of landslide may require propping the structures before human intervention
    - Debris may be so cluttered that prevent human access.

Disaster scenarios

SEARCH & RESCUE ROBOTS

Clear need

Small, cheap and light robots

Released immediately after a disaster when the conditions are too dangerous and too cluttered for people and dogs to begin searching for victims

SEARCH & RESCUE ROBOTS

examples

11.Sept.2001

Robin Murphy and co-workers at CRASAR

Robots were used for

- searching for victims,
- searching for paths through the rubble that would be quicker to excavate,
- structural inspection, and
- detection of hazardous materials

http://crasar.csee.usf.edu/MainFiles/galleryThumbnails.asp?id=1

Packbot
iRobot

RoboProbe Technologies - The VGTV™ was integral to the search and recovery efforts at the World Trade Center collapse

Foster-Miller – demining and bomb-disarming robot - used at Ground Zero in search and recovery efforts after the Sept. 11 attack on the World Trade Center

South Korean Domy and Co.

S&R Robot: RAPOSA (Fox)

Developed in Portugal by
Institute for Systems and Robotics / IST
IdMind

http://raposa.idmind.pt/

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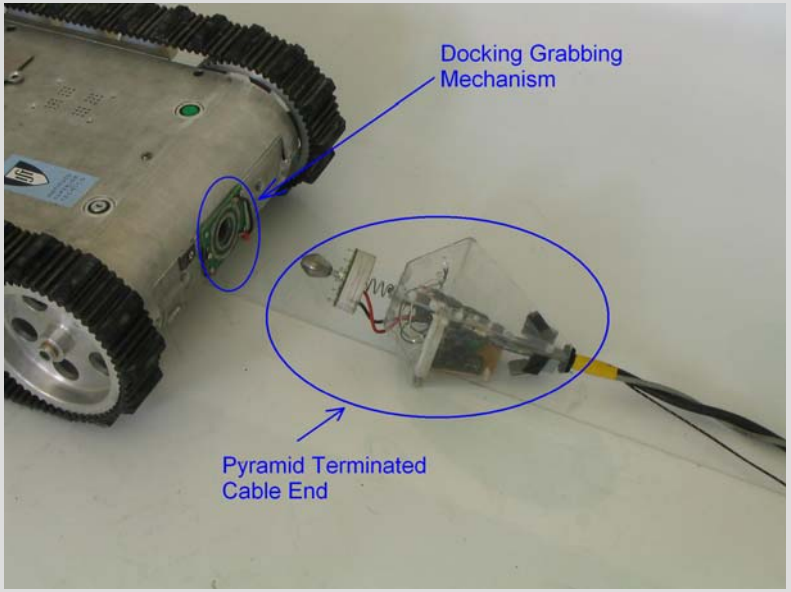
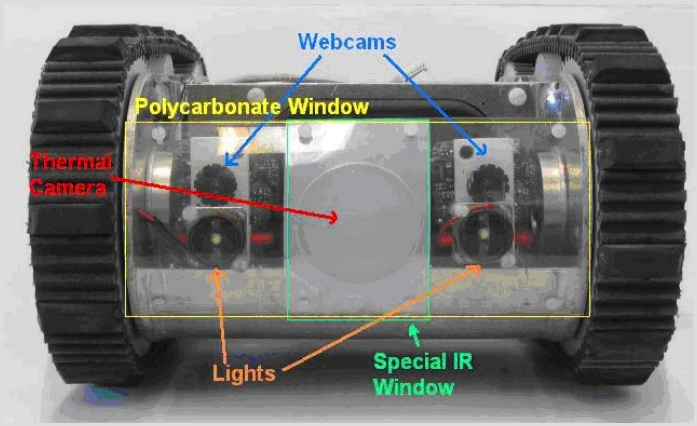


- wireless communication, with an option for tethered operation
- Tether carries power and communications, and has an access point on its end
- Docking and undocking remotely, during mission



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INSTITUTO SUPERIOR TÉCNICO

RAPOSA (Fox) @ EUROSOT2005

International Exercise in Community cooperation as regards civil protection

Proposer: Italian Civil Protection Department
Sicilia, Italy, 13-14 October 2005

Exercise scenario:

a severe earthquake, on 13 October at 1:00 p.m., strikes the area of Eastern Sicily, causing serious damages to the territories of the cities of Catania, Siracusa and Ragusa generating, moreover, a series of accidents in the industrial area of Priolo Gargallo (SR).

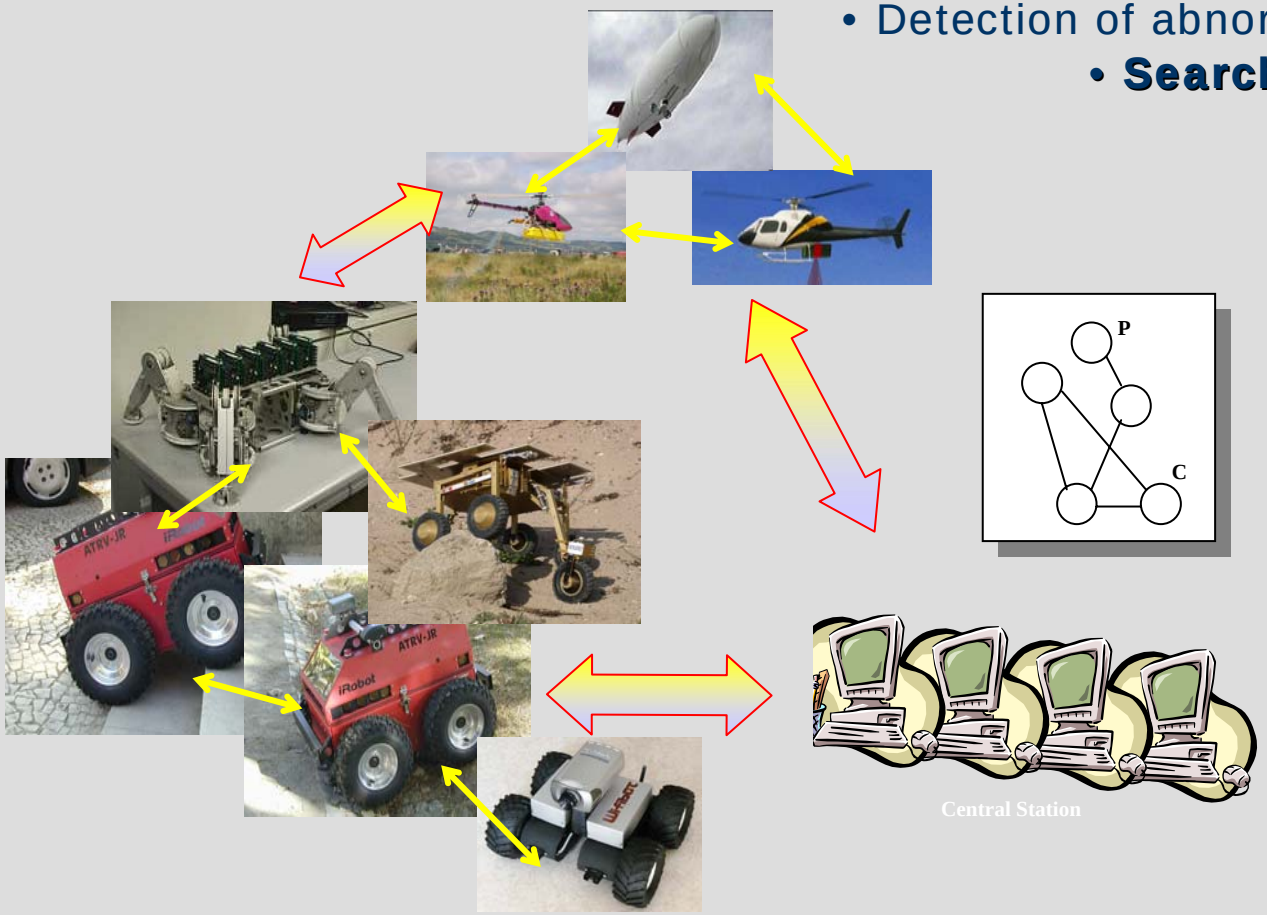
Instituto de Sistemas e Robótica

RAPOSA (Fox) @ EUROSOT2005

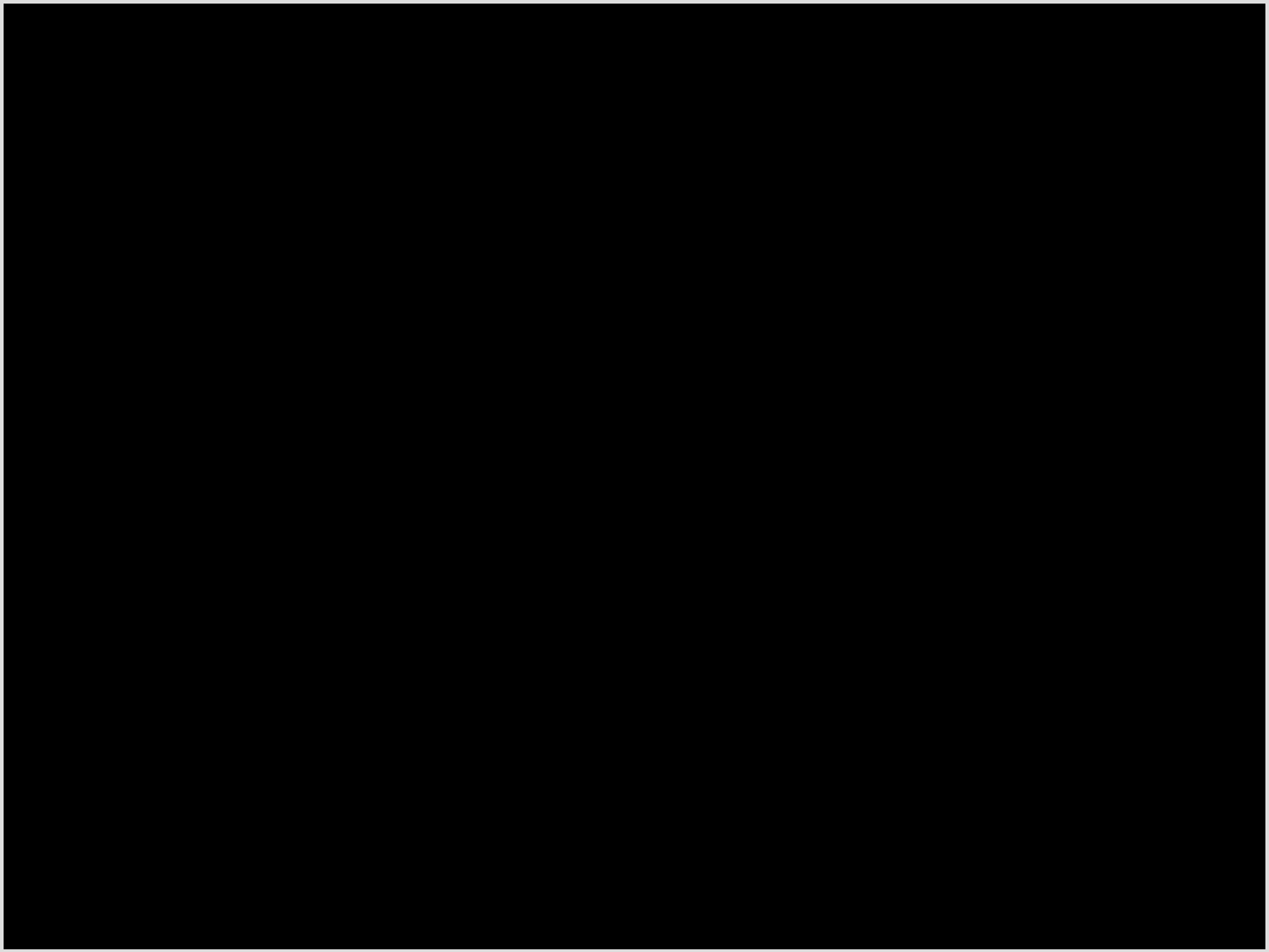
Networks of Autonomous Systems

Aplications:

- Environmental monitoring
- Surveillance
- Detection of abnormal situations
- **Search and Rescue**



Networks of Autonomous Systems



Networks of Autonomous Systems

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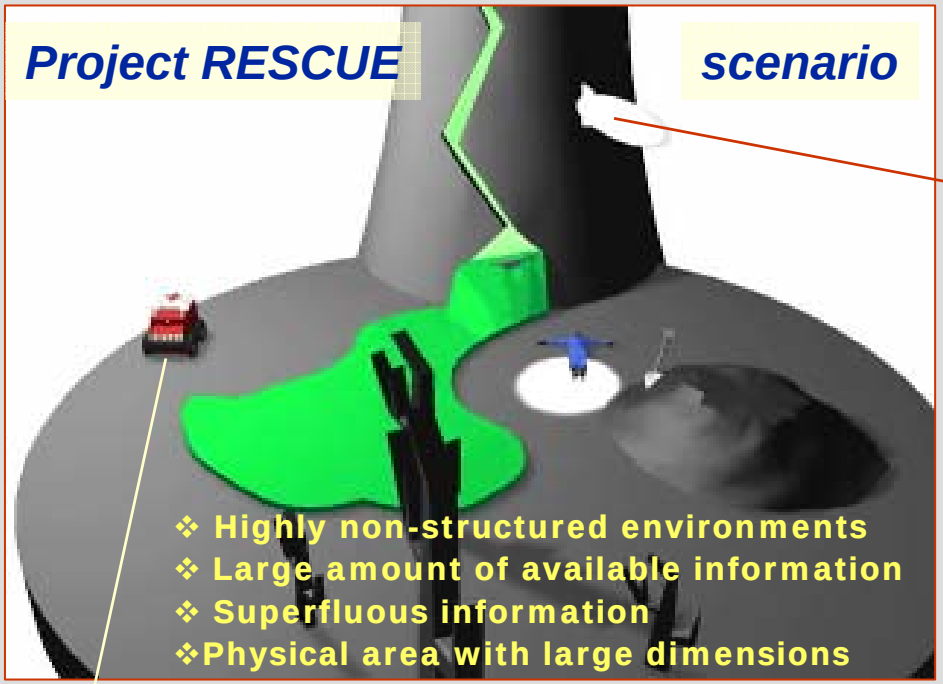
Short Term Goal

Project RESCUE ***scenario***

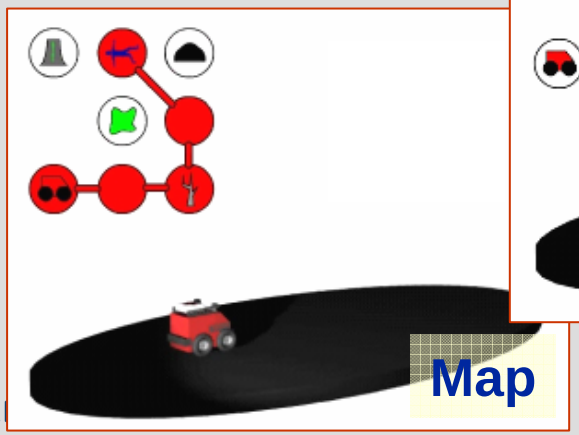


- Highly non-structured environments
- Large amount of available information
- Superfluous information
- Physical area with large dimensions

Blimp

Cooperation

Atrv-Jr



Map

A map that allows a robot to perceive / localize / navigate in the real world and accomplish its mission

Search & Rescue situations

- **Philippines landslide (Feb.2006)**

  "It's very difficult," he said.

  "We're digging by hand, the place is so vast and the mud is so thick. When we try to walk, we get stuck in the mud."

  New York Times

No available robots currently able to act in this scenario

But relatives are still waiting for a miracle

Why not using robots?

- **Coal mining rescue (USA)**

  Incorrect use of information

  False expectations to the public

How to use information gathered by rescue robots?

What information can be released to the public?

Search & Rescue: Over-expectation

- Collapse of Hintze Ribeiro Bridge
  - River Douro, Portugal, March 2001
- 1 tourism bus and 3 cars fall down when the bridge platform collapsed. Bus and cars disappeared
  - 59 people died. 36 bodies still missing

- Rescue Mission
  - search for the bus and cars, underwater, with strong water currents and turbulent water to recover the bodies
- Circumstances: desperate families

While human divers were searching under very hard conditions

Society: why not use the underwater robots that the Portuguese Science Foundation has been funding ?

How is the message conveyed to the media?

Lisbon protected by a Fox (RAPOSA)

Lisboa protegida por uma "raposa"

Tecnologia. Os Sapadores Bombeiros de Lisboa já têm à sua disposição o RAPOSA, um **robô telecomandando** com capacidade para operar **em ambientes hostis à presença humana**.

JOÃO MONIZ
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Foi ontem apresentado em Lisboa o projecto RAPOSA, um robô desenhado pelo Instituto Superior Técnico para se mover em áreas hostis, nomeadamente estruturas afectadas por terramotos, atentados ou desabamento de edifícios. Em declarações ao Destak, a directora do projecto classifica o RAPOSA como um «sistema de detecção que capta o ambiente e uma série de dados que depois transmite aos bombeiros, que o podem operar de um local seguro». Segundo Maria Isabel Ribeiro, este robô pesa 27 kg e tem um braço articulado que lhe permite adaptar-se às irregularidades do terreno, subir e descer escadas e mover-se em condutas de 40 cm de diâmetro, as medidas normais de uma conduta de esgoto. Entre os 20 sensores que equipam o RAPOSA, o segundo comandante do Regimento de Sapadores Bombeiros de Lisboa – que colaborou no desenvolvimento deste projecto – destaca a câmara térmica, bem como o microfone e altifalante, ainda por instalar no actual protótipo. No entanto, o tenente-coronel António Pato alerta que o RAPOSA «não vem substituir os bombeiros, é mais uma ferramenta que nos impede de correr riscos desnecessários». Nesse sentido, este robô conta com quatro câmaras de visão, comunicações sem fio e sensores de gás, de temperatura e de humidade, dispondo de autonomia para duas horas. ■

O RAPOSA está equipado com cerca de 20 sensores

Robô desenvolvido em Portugal vai ajudar em operações de salvamento

Lusa

O novo robô português

Um robô, desenvolvido em Portugal que permite detectar a presença de pessoas entre os escombros em caso de terramotos, atentados e desabamentos de edifícios vai estar ao serviço do Sapadores de Bombeiros de Lisboa.

New in popular newspaper after a presentation of the RAPOSA (Fox) robot

ETHICS and SOCIAL issues (1)

- What are the limitations of S&R robots?
  - Can they be autonomous?
- S&R robots are used in extreme situations where “miracles” are expected
  - Are civil rescuers teams/firefighters aware of the limitations ?
  - Are they willing to use robots?
  - Is people aware of the limitations of robots ?
  - Are there over expectations on robots capabilities ?
- How to use information from S&R robots ?
  - How to avoid false expectations ?
- Can we use a S&R robots in situations where they might, with its presence, lead to increase the number of casualties?

ETHICS and SOCIAL issues (2)

- How to take options in case of many victims ?
- How do roboticists convey the message of robots capabilities and limitations to the media?
- Are there liability issues related with the use of robots in S&R situations?

More questions?