# On the Ethics of Research in Robotics

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Commission on the Ethics of Research on Digital Sciences

Robotics Research and Applications

- Robotics research has reached a certain stage of maturity capable achieve operational robot functions in perception, motion planning, control, human-robot interaction, …

- Autonomous operation is possible in some situations

- New applications are booming in many sectors: transport, services, defense, manufacturing, agriculture, construction,
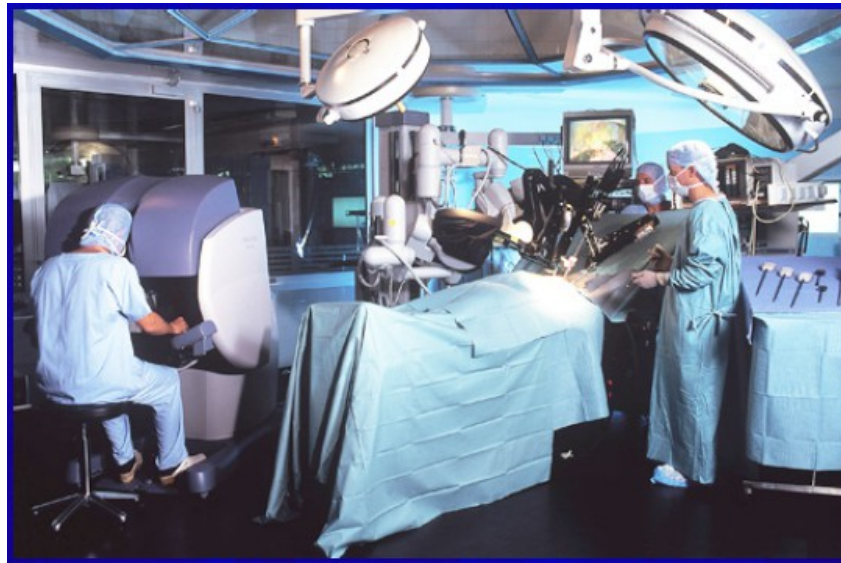
Ethical Awareness

- Questions on ethical and legal issues in the use of robots have emerged and are becoming more and more important to scientists and to the public.

- Discussions and statements about jobs, but also about robots and AI "taking over the world".

- Autonomous robots raise additional questions mainly in military applications (Autonomous Lethal Weapons).

- The general public is often not aware of the actual state of the art in the area and its prospects.

A few ELS Issues

- Jobs

- Autonomous robot decisions,

- Accountability and responsibility,

- Privacy, intimacy, intrusion, surveillance,

- Human dignity,

- Dependence, isolation,

- Cognitive and affective bonds,

- Bio-mimicry,

- Human identity,

- Human augmentation,

"Robot Ethics"
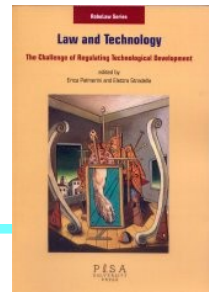
- Moral and legal responsibilities of scientists

- Scientists have started to reflect on the question of the ethical implications of robotic technology and of autonomous robots more than ten years ago.

- Robot Ethics is now an *interdisciplinary* research at the intersection of applied ethics and robotics

- In Europe several projects addressing the topic over several years (lately: Robolaw).

- In some countries ethics committees on robotics have been formed (e.g., CERNA in France) to take into account ethical questions at the early stages of research.

Approach of the CERNA

- 5 case domain examples raising ethical issues:
  - Defense and security
  - Rehabilitation and human augmentation
  - Assistant robots for vulnerable people
  - Robot companions and robots for the general public
  - Autonomous cars
- 4 Robot capacities raising ethical issues, and recommendations:
  - Autonomy
  - Human augmentation
  - Emotions and bonding

Robotic Applications Raising Ethical Issues - 1

- Drones, swarms, autonomous robots, UGVs, in defense and security
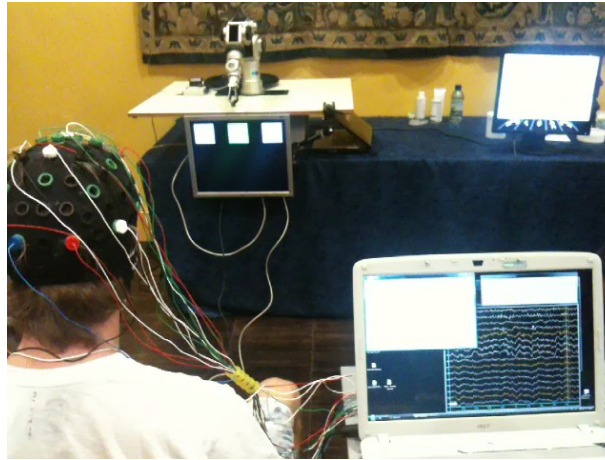

Predator

Crusher CMU

Drones for security monitoring

IRobot Packbot

Robotic Applications Raising Ethical Issues - 2

- Robotic devices for rehabilitation and Human augmentation

U. Saragozza

RIC Institute

Ekso Bionics

RB3D

Robotic Applications Raising Ethical Issues - 3

- Assistive robots for vulnerable and fragile persons (elderly, children, handicapped).

S. Korea

Paro

Aldebaran Romeo

Telenoid - Osaka U.

Robotic Applications Raising Ethical Issues - 4

- Robot companions, personal assistant robots, sexual robots.
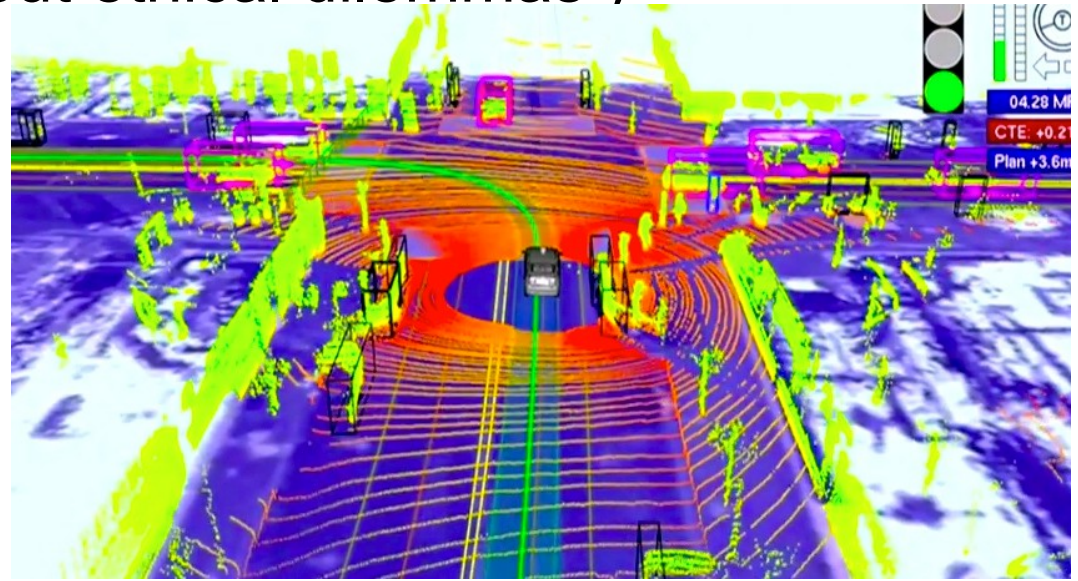

Aldebaran Nao

The Big BangTheory

Robotic Applications Raising Ethical Issues - 5

- Autonomous cars (more focused on the Legal and social issues, but also about ethical dilemmas)

Google

Nissan

Focus 1: Robot Autonomy and Ethics

- Issues
  - Autonomous decision-making vs. Autonomous operation
  - Robot situation awareness and interpretation

  - Generally : Robot+Operator in a shared autonomy
  - Human awareness of robot state; surprises.
  - Human over-confidence in robots
  - Moral buffer
  - Robot responsibility vs. human responsibility.

Recommendations for Research (on Autonomy - 1)

- **Clearly define conditions of human control/robot control**

  - Analyse authority sharing: who controls what? (not fixed during a mission)

  - Robot shouldn't take complex decisions involving judgment.

  - Conditions of robot takeover: a diminished operator is not able to take good decisions (stress, emotions…)

- **Always enable human takeover**

Recommendations for Research (on Autonomy - 2)

- Clearly define limits of robot capacities: decision-making algorithms, perception, … (e.g., possibility of distinction between combatant / non-combatant)

- Qualify uncertainties.

- Design for tracing robot decisions

- Design for resilience ("unpredictable" events)

Focus 2: Human Augmentation and Ethics

- Issues

  - Rehabilitation vs augmentation?

  - Privacy (data).

  - Status of the augmented human

- Recommendations for Research

  - Respect medical ethics

  - Preserve natural human capacities

  - Enable reversibility of augmentation

  - Anticipate psychological and social consequences of augmentation

Focus 3: Emotions, Bonding and Ethics

- Issues

  - Interpretation of robot "emotions" by humans

  - Bonding and Isolation of humans

  - Dependance for vulnerable persons

  - Understanding status and capacities of the robot

- Recommendations for Research:

  - Make explicit that robot emotions are an *illusion*.

  - Take precautions, when young children are involved in interactions with robots, on the impact on the development of their emotional capacities.

  - Take precautions on the consequences of isolation and bonding (e.g., conduct preliminary studies).

Focus 4: Bio-mimicry and Ethics

- **Bio-mimicry of aspect and behaviour**

  - What is a robot vs. a living being?

  - Human identity vs. android

  - Status of the robot in Human Society

AIST

Video courtesy of Osaka University

Osaka U.

Recommendations for Research (Bio-mimicry)

- Motivation of bio-mimicry made clear: research objectives.

- Clarify the limits of imitation to avoid over-attribution of capacities

- Keep a clear distinction between a living being and a machine.

Some General Conclusions

- Define an ethics charter for Robotics research

- Reach an international consensus

- Balance between open research and ethical recommendations

- Set up operational ethics committees for research practice in Robotics.

http://cerna-ethics-allistene.org/digitalAssets/38/38704_Avis_robotique_livret.pdf

ALLISTENE
l'alliance des sciences
et technologies du numérique

Éthique de la recherche en robotique

Rapport n° 1 de la CERNA
Commission de réflexion sur l'Éthique de la Recherche
en sciences et technologies du Numérique d'Allistene

(Will be shortly also available in English)