

## **Ethics and the structure of robotic research programs**

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### **ABSTRACT**

Ambitious research programs in robotics point to scenarios in which robots flawlessly fulfil roles of proficient helpers and care-givers at home, competent tutors and guides in edutainment settings, dexterous assistants in workshops and factories, dependable surveillance operators in both indoor and external environments. These visionary goals, in spite of their remote and possibly unattainable character, play useful functions in technological inquiry – by suggesting unified research horizons for various research communities in robotics, encouraging multidisciplinary interactions, and facilitating exchanges and compositions of models and technologies. In successful research programs, however, visionary goals come with the identification and pursuit of more feasible subgoals, which afford adequate pay-offs in the near term and feed the pipeline between robotic research labs and industrial applications.

The main asynchronous processes and temporal scales that are involved in the development of robotic research programs must be carefully taken into account in order to identify and address the mosaic of ethical challenges arising from robotics.

To begin with, analyses of ethical novelty and ethical desirability must go with the continuing processes of formation and revision of long-term visionary goals. Moreover, suitable action recommendations are needed to offset ethically questionable consequences of disproportionate expectations and fears that current visionary goals are often found to stimulate – most notably in connection with democratic deliberations about the use of robotic systems and the funding of robotic research programs.

Ethical analyses which zero in on visionary goals unduly neglect the actual course of research activities on feasible subgoals of robotic research programs. Thus, an ethical triage is needed to select potential outcomes of feasible subgoals which urgently require ethical review in the light of their combined technological imminence and ethical novelty.

Focusing on acknowledged feasible subgoals of individual robotic research programs is not enough to anticipate and cope with imminent ethical challenges – especially insofar as interactions and confluences with other research programs characterized by high rates of technological innovation, such as ICT research programs, are a major source of unexpected turns and developments in robotics. Accordingly, an ethical monitoring of these “exogenous” influences is additionally needed to put in place an effective scheme of ethical early warning.

This ramified organization and division of ethical labor – induced by structural and dynamic properties of robotic research programs – is illustrated here by reference to current research programs in industrial robotics (towards robotic taskmasters on the factory floor), in military robotics (towards autonomous robotic weapons), and in service robotics (towards robot companions and nannies for children).