

A Code of Ethics For Robotics Engineers

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Abstract—The future of robotics engineering is in the hands of engineers and must be handled to ensure the safety of all people and the reputation of the field. We are in the process of developing a code of ethics for professional robotics engineers to serve as a guideline for the ethical development of the field. This document contains the current version of this code and describes the methodology used in developing it.

Keywords: *Robotics Engineering, Ethics, Code*

I. INTRODUCTION

Professional engineers in disciplines such as electrical engineering, mechanical engineering and computer science have professional codes of ethics to provide guidance in their decision making. Robotics engineers are often able to find guidance from existing ethical codes, but also face unique ethical challenges, largely due to the combination of the autonomy of their creations and their creation's ability to interact directly with their environment, especially with humans. For this reason, we are in the process of developing a code of ethics for robotics engineers to help address their unique issues.

II. METHODOLOGY

Our first step in creating a code of ethics for robotics engineers was to research the fields of ethics and morality. Existing codes of ethics from the IEEE, ASME, and ACM were examined and used as guidelines for both format and content.

We discovered that although existing professional codes could provide some guidance to robotics engineers, none of these codes are sufficient on their own. The IEEE code of ethics, for example, is aimed at a very broad range of engineers and is therefore not specific enough for some of the issues in robotics engineering, particularly in addressing the additional forethought required by the autonomy of the engineer's creations. None of the existing codes we examined call upon engineers to take responsibility for the actions of their creations, i.e. robots.

One of the primary purposes of a code of ethics is to minimize the harm to all parties affected by the engineer's decisions and actions. To ensure that our code protects these parties, we created a list of communities to help engineers make ethical decisions. If a conflict arises between two communities in the list, decisions should be weighted in favor of the larger community.

We used an iterative approach to develop this code. We initially drafted some key points which we believed to be important for robotics engineers, and through discussions, added clarifications for these as well as other points as it became

apparent that they were needed. We have continued to revise the code in this manner to improve clarity and to address additional situations and ethical problems. As one part of this iterative process, we created a list of situations with ethical implications which a robotics engineer may be expected to encounter, and evaluated each item in the list in terms of the draft code to make sure that the code covered them.

In order to encourage broad acceptance of the final product, many points of view need to be taken into consideration. We organized several focus groups concerning topics related to ethics in robotics engineering. For these focus groups we prepared questions in advance for the participants to discuss, with an emphasis on areas of responsibility, surgical robots, and military robots, both armed and unarmed.

We also distributed a survey concerning robots and the responsibilities of robotics engineers at the Robotics Innovation Competition and Conference (RICC) held at Worcester Polytechnic Institute in October of 2009. Insights from this survey and the discussion groups have been used to further refine the draft code of ethics.

The code will continue to be reviewed and refined until the completion of the project in February of 2010. More discussion groups will be held with groups both on and off campus so as to gather as much feedback as possible.

III. THE CURRENT CODE OF ETHICS

A. Preamble

As an ethical robotics engineer, I understand that I have the responsibility to keep in mind at all times the well-being of the following communities:

Global – the good of as many people as possible and known environmental concerns

National – the good of the people and government of my nation and its allies

Local – the good of the people and environment of the community that is affected

Robotics Engineers – the reputation of the profession and colleagues

Customers – the expectations and the safety of the customer

Employers – the financial and reputational well-being of the company

B. Principles

To this end and to the best of my ability I will...

1- Recognize that I may be held responsible for the actions and uses of all creations in which I have a part.

It is the responsibility of a robotics engineer to consider the possible unethical uses of the engineer's creations to the extent that it is practical and to limit the possibilities of unethical use. An ethical robotics engineer cannot prevent all potential hazards and undesired uses of the engineer's creations, but should do as much as possible to minimize them. This may include adding safety features, making others aware of a danger, or refusing dangerous projects altogether. A robotics engineer must also consider the consequences of a creation's interaction with its environment. Concerns about potential hazards or unethical behaviors of a creation must be disclosed, whether or not the robotics engineer is directly involved. If unethical use of a creation becomes apparent after it is released, a robotics engineer should do all that is feasible to fix it.

2- Consider and respect not only peoples' physical well-being, but their rights as well.

A robotics engineer must preserve human well-being while also respecting human rights. The United Nations' Universal Declaration of Human Rights (<http://www.un.org/en/documents/udhr/index.shtml>) outlines the most fundamental of these rights. Privacy rights are especially of concern to a robotics engineer. A robotics engineer should ensure that private information is kept secure and only used appropriately. There are circumstances when honoring privacy rights or other rights conflict with preserving the well-being of an individual or group. In these cases, a robotics engineer must decide the ethical course of action, making sure the least harm is done.

3- Not knowingly misinform, and if misinformation is spread do my best to correct it.

A robotics engineer must always remain trustworthy by not misinforming customers, employers, colleagues or the public in any way. A robotics engineer must disclose when the engineer feels unqualified to safely or fully complete a required task. When others spread misinformation, a robotics engineer must do as much as possible to correct the misinformation.

4- Respect and follow local, national and international laws wherever applicable.

A robotics engineer must follow the laws of the applicable communities. This includes where the robotics engineer is working and the communities targeted by the outcome of the engineer's work.

5- Recognize and disclose any conflicts of interest.

A robotics engineer must disclose the existence of any conflicts of interest to employers. It is up to the robotics engineer to decide how to react to any such conflict, either by attempting to ignore personal feelings or by avoiding the source of conflict.

An employer must be aware of conflicts and that these conflicts of interest may affect the robotics engineer's decisions. Bribery inherently creates conflicts of interest and is unethical.

6- Accept and offer constructive criticism.

A robotics engineer should always strive to produce the best work possible and to help others to do the same. For this reason, a robotics engineer must both give and accept constructive criticism. This allows for robotics engineers to help improve each other's work, benefiting each other and those affected by the robotics engineer's work. A robotics engineer who refuses to consider criticism risks making avoidable mistakes.

7- Help and assist colleagues in their professional development and in following this code.

This code of ethics is available as a guideline for all robotics engineers as a means of uniting them with a common basis for ethical behavior. In following this code, a robotics engineer promotes the positive perception of the field by customers and the general public. In helping colleagues develop professionally and ethically, a robotics engineer makes sure that the field of robotics will continue to grow.

C. Conclusion

This code was written to address the current state of robotics engineering and cannot be expected to account for all possible future developments in such a rapidly developing field. It will be necessary to review and revise this code as situations not anticipated by this code need to be addressed.

IV. FUTURE DEVELOPMENT

We are continuing to host discussions and to modify the draft of the code as we discover omissions, problems or inconsistencies. We intend to continue to develop this code to increase its ability to be widely accepted as providing clear principles to encourage ethical behavior while not being too prohibitive to prevent wide adoption. We hope some version of this code will eventually be adopted by a professional organization of robotics engineers.

The most recent version of the code is available at <http://users.wpi.edu/~dtjones/CodeofEthicsforRoboticsEngineer.s.pdf>. If you have any questions or comments, please do not hesitate to contact us.

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