

SDE Evaluation of Year 2 Project

(Simulation of Quadruped-robot Locomotion)

Description

This project is a quadruped robot simulation based on the pybullet platform, which is an open-source real-time physical simulation system. The quadruped robot model used is also an open-source model file. It could run on multiple platforms including Mac OS, Windows and Linux. In fact, this simulation is part of a large and complex project. This project studies the action and behaviours patterns of quadruped robots. Includes knowledge of the following disciplines software engineering, robot kinematics, trigonometry, and linear algebra.

Regulatory considerations

Currently, the UK government has not issued legal rules for the management of quadruped robots, only a development proposal document issued by the Artificial Intelligence Office [1]. In order to use automation and robotics safely and ethically, we need to adhere to the basic ethical code of using robots in the right places—tasks that are dull, dirty, dangerous (3D), not in situations that require unique capabilities (such as innovation and imagine) to replace humans in the work. Firstly, for this project, what needs to be considered is the "practical application of quadruped robots", which means that it is necessary to refer to the legal regulations on robots. Therefore, the evaluation of this project should be subordinate to the evaluation of the broader robotics project. Secondly, while complying with all laws in the manufacture of machinery and electronic devices, it is also necessary to consider the impact of robots on society and the economy and determine that the technology can create more economic opportunities and potential benefits [2]. As far as the current industry development is concerned, the application of more robots for "3D" work is clearly in line with current British legal and social interests, and it is beneficial to potential economic interests.

SD/Ethical Implications of large-scale manufacture & sale

Moral and ethical considerations are important, and this project, as a physical simulation through software, obviously has no impact on the environment or health, however, as part of a larger project to build a quadruped robot, this section should be considered in terms of larger projects.

Firstly, as a robot product, it could take over some "3D" jobs, which is of great benefit to the health of workers. In addition, quadruped robots can also replace humans to deal with pollution sources in some seriously polluted areas, which is very useful support for environmental protection work. Secondly, in terms of energy saving and sustainability, quadruped robots also have advantages over traditional wheeled robots.

In 1960s, Bekker proved through experiments that walking systems are more efficient than wheeled or tracked systems on irregular terrain [3]. Thirdly, it is necessary to ensure that the product is not used in ways that may harm the public interest, especially for terrorist purposes, where robots may be used to remotely attack people. Therefore, the sales department needs to do some background research on customers with high demand. Therefore, in the face of concerns and doubts from the public and the media, it is necessary for us to respond positively to these problems. An effective method is to brake remotely, for example, prohibiting it from the motorway with traffic regulations.

SD/Ethical Implications of follow-on products/markets

At present, the development trend of the quadruped robot industry is improving, and there are top companies such as Boston Dynamics in the industry. In addition, the theory and technology of robotics are developing rapidly, and other supporting industries including the sensor industry have made great progress, which is of great benefit to the technological update and industrial development of quadruped robots. According to the assessment [2], the demand for robots, especially quadruped robots, in the future economy and industry will increase, especially in sustainable industries. Moreover, the quadruped robot developed based on this project can be used in many fields, especially the treatment of hazardous pollutants and mountain rescue, which are not conducive to human work. For a successful product, it is almost inevitable to obtain sufficient profit, and the growing profit is likely to lead to a compromise on the SED issue. Therefore, this requires the government to have more precise laws to regulate the industry, and the media should pay more attention to environmental protection and ethical issues in this regard.

reference

- [1] K. KWARTENG and N. DORRIES, "National AI Strategy", *GOV.UK*, 2022. [Online]. Available: <https://www.gov.uk/government/publications/national-ai-strategy>. [Accessed: 06- Mar- 2022].
- [2] D. Rothwell and M. Walport, "Robotics, automation and artificial intelligence", *GOV.UK*, 2022. [Online]. Available: <https://www.gov.uk/government/publications/robotics-automation-and-artificial-intelligence>. [Accessed: 07- Mar- 2022].
- [3] J. Estremera, E. Garcia and P. González-de-Santos, *Quadrupedal Locomotion*, 1st ed. [New York]: Springer-Verlag London Limited, 2006.