Robot Roomba

The “IRobot Roomba” is a technology gadget that has helped us clean our homes, while it may have not cleaned everything for us, it made our cleaning tasks quicker and a lot easier for us. The “IRobot Roomba” is an AI Powered Robot. The “IRobot Roomba” is programmed in the Python programming language[1]. There needs to be ethical analysis in this gadget because this gadget can leak out private information, which some people may not like. There are also some privacy concerns related to the IRobot Roomba. There are also concerns related to automation, in which it can cause concerns among human labor workers. There are many security vulnerabilities and concerns in which if the Roomba Robot gets hacked then it’ll lead to negative effects. There is also some bias in AI. I personally think that this gadget is good, I think it does more good than harm for me at least.

There are many concerns about the user's privacy when using the IOT Device which is the IRobot Roomba. In Science Direct it states, “For example, the Amazon iRobot Roomba collects data to create a 3D home layout (Bugeja et al., 2021; Bettini et al., 2018) including furniture location and obstacles. An inadvertent leak of this data could reveal private aspects of the user's lifestyle and habits (Bettini et al., 2018) or enable behavioral profiling and object identification by law enforcement (McAmis and Kohno 2023)”[1] . This quote explains that the robot could leak data about a user's eating habits, how filthy their home is, and the behaviors of this person and as a result of this it can lead to the user having a bad reputation with other people who have his or her data. There are also privacy concerns in which the Robot vacuum cleaner can expose other people’s private life, like what they eat, if they have proper hygiene or not, or their dietary lifestyle because there are crumbs and food on the floor the robot will pick up and

because of this the robot will document the data and they could leak the data out, which could make other people more concerned, but they are less likely to leak out a person's social security number, birth date, and other demographics. But they could leak out the users home address based on the current location they are at due to having it's IP Address and Port Number in which it tells the location of this gadget, similar to where the phone and computer is located via GPS. The IRobot Roomba may share personal information when something is made public or when other companies are used to power their service. In "mozilla", it states "That's a lot of info about your and your home that Amazon could potentially use to know more about you, target you with ads, and sell you more stuff."[5] This quote explains that the IRobot Roomba can gather so much information about your home such as your floors, home's floor plan, the objects in your home, where you are located, where your objects are located, etc. They send that information via vacuums and because of that it can lead to a violation of your privacy and you'll be less likely to use the robot again, many people don't know this yet. The IRobot Roomba has also been invasive of other people's privacy and violated their privacy in many ways. In "MIT Technology Review", it states that "The data collected by robot vacuums can be particularly invasive. Because of their powerful sensors, they'll be able to detect every movement of how a person eats, they'll be able to track tracks and footsteps even if they arent seen by humans, and because of this they'll be able to find out where the humans went and every direction, the human went. They have "powerful hardware, powerful sensors,"[11], The IRobot Roomba is also vulnerable to hacking. In "TUVSD", it states "it also opens the gateway to potential cybersecurity threats. Reports of growing numbers of cyber breaches are on the rise as every connected network is only as secure as its least secured device on the system. If a smart device is vulnerable, it may be open to hacking, and private data could be compromised or lost". This quote explains that the IRobot

Roomba is vulnerable to cyber attacks and data breaches like many other smart devices, the data could be stolen. As an internet-connected device, the Roomba is vulnerable to hacking. Ethical issues arise if hackers can access sensitive home data or control the device remotely. Because of its vulnerabilities, the user may not be able to control the robot or give it proper instructions if its data is lost. Because of its security concerns and vulnerability to hacking, they also may be worried about unauthorized access to home networks. IRobot roomba must ensure robust security measures to prevent unauthorized access and protect users' data from breaches. AI systems of the robot are designed without sufficient consideration of diverse user environments, they may have a hard time struggling in many environments, which can lead to dissatisfaction with the customers. In “Medium”, it states that “the Roomba gets stuck often in the exact same spot and under things such as furniture" due to "the lack of efficiency in software" and "little certainty of where it is."[4] This quote explains that the Roomba due to the lack of strong algorithms in the code and programming language being used to power the robot’s AI, are more likely to make mistakes and get stuck. There are many ethical questions that are raised related to the robot’s performance when cleaning the house. There may be debates on whether it is a good idea to use the robot or not. The IRobot Rombo may not 100% replace sweepers and moppers, but it'll make their jobs easier and more quicker,while they may not be able to completely clean the trash off the floor, they’ll take some of the trash and stains in which the humans will take the remaining trash.

There are many ethical theories that can apply to the evaluation of our gadget. The two ethical theories are Rule Utilitarianism and Kantianism. Rule Utilitarianism is the ethical belief in which it focuses on following rules that, when generally adhered to, lead to the greatest overall happiness or utility. Kantianism is the belief in which there are morals and duties that are

applied to this technology and gadget to properly apply in the use of this gadget. The IRobot Roomba along with any other type of robot, can be understood with utilitarianism. In “There is no ‘I’ in ‘Robot’: Robots & Utilitarianism” it states, ”Possibly relevant criteria could include the capacity for self awareness and self-governance, the ability to recognize and respond to reasons, and/or the capacity for free and responsible choice. (Clearly more would be required than the simple ability for a machine to operate independently of other machines. My Roomba can do that, and so in a very minimal sense is an “individual,” but this is not the sort of strong individuality relevant for the attribution of rights.)”. This quote explains that Rule Utilitarianism can be applicable to the IRobot Roomba, in which the roomba follow the rules in which they are also trying to do the right thing and bring more benefits than risks. The IRobot Roomba is also trying to make more happiness by focusing on the rules and fulfilling other people's wishes, while they may not be able to express joy and happiness, they are still self aware, and are responsible enough to make the right decisions. The Roombas are also considered utilitarian. In “There is no ‘I’ in ‘Robot’: Robots & Utilitarianism” it states ”I have suggested that, when considering robot ethics, this objection can be avoided due to the plasticity of robot agents – created in the right way, utilitarian robots simply won’t face the sort of conflicts that threaten human integrity”[7] . This quote explains that a robot including a Roomba who is considered a utilitarian would assess whether the vacuum cleaner leads to greater overall happiness for users by making household cleaning easier and more efficient. This belief also assesses what benefits the roombas have to our society and what risks there are and given that many people believe that there are more benefits than risks of using these roombas, it is safe to assume these robots are helping society with more benefits than risks. Utilitarianism also considers the long term benefits of the IRobot Roomba. In Forbes it talks about how there are so many long term benefits of

using the irobot roomba such as it's scheduled cleaning and because of its scheduled cleaning you'll have a more organized schedule, utilitarianism shows that more long term benefits would lead to more happiness among individuals if everything is in a scheduled fashion, then there would be more benefits. Another ethical theory is Kantianism, in which it is the belief it emphasizes the morality of actions based on adherence to rules or duties, rather than outcomes. Currently there is no law or rule which prohibits the user of an IRobot Roomba to use it when cleaning. Based on a Kantian perspective, it can still be ethical as long as the user's reliance on the Roomba does not reduce their own sense of responsibility or dignity in maintaining a clean living space. In "Kantian Ethics in the Age of Artificial Intelligence and Robotics", it states " Humans determine which rules are programmed into the technology to ensure ethical use and moral conduct. For these rules to be capable of universalisation they must be 'public and shareable"[12]. This quote is explaining that many of the rules are human based, and from a Kantian perspective as long as humans follow these rules when using the robot. It is ok for the robot to be used. Based on a Kantian perspective, the humans must be at the forefront of the robotics, they need to design and make all the rules.In "Kantian Ethics in the Age of Artificial Intelligence and Robotics", it states "Such human attributes and capabilities are non-existent in artificial intelligence and robotics so that human agency must be at the forefront of designing and taking responsibility for their ultimate conduct and action"[12]. This quote is explaining that humans must make good rules, good designs, good patterns, and take full responsibility for their robot, which could be the IRobot Roomba. Kantian ethics shows that the robots will be used as tools rather than complete replacements for humans. Kantian ethics might also cause concerns about the impact of robots like Roomba on labor markets, particularly if they displace cleaning jobs. For Kant, it would be unethical to treat workers as mere means to an end by replacing them

without consideration for their dignity and livelihood. Another ethical theory we can use to analyze the IRobot Roomba is Virtue Ethics. Virtue Ethics is the belief that should guide us in the distribution of this technology, how we should use this technology, and the use of this technology, does this promote fairness among humans and other non-human individuals. In "Springer Link", it states "Where and when a robot is "abused", virtuous habituation has been lacking and/or a vicious habituation has taken place in a particular *praxis*"[13]. This quote explains that whenever a robot is being mistreated, there are less virtues being applied to the robot, and given that many people treat the IRobot Roomba properly with good care, and let them do its duties. The designers of the IRobot Roomba also ensure that there are equal employment opportunities for all the human employees and its robot employees as stated in "Code of Business Conduct and Ethics". It also talks about how the robots always follow the rules of a company. The company also designs all of its gadgets so that it respects everyone and follows all the rules. Based on the ethical analysis conducted, the IRobot Roomba is considered safe to use overall, it follows all the rules, it doesn't take away anyone job completely, but there needs to be some changes to this gadget, such as providing more secure code, more security, more firewalls, or any other security adjustments.

In Conclusion, based on my ethical analysis of this IRobot Roomba, I find that IRobot Roomba is a good tool to use when cleaning, while it may not replace human cleaners, moppers, and sweepers completely it'll make their job less stressful and there'll be less work. There needs to be ethical analysis in this gadget because this gadget could violate other people's privacy in many different ways. Many people may not know that their private information is being leaked out, because they didn't learn about its ability to leak the information. To check to see if this robot was safe to use we used three ethical theories to perform an ethical analysis. The three

ethical theories used in this ethical analysis were Utilitarianism, Kantianism, and Virtue Ethics. Utilitarianism shows that there are more positive factors than negative factors when using the robot. Kantianism shows that the gadget won't replace human tasks completely, it will help them be more productive. Virtue ethics shows that this gadget promotes fairness among humans, and other technologies, both humans and the IRobot Roomba will be able to do tasks equally and fairly, they will both be able to clean the floors of a house. While there may be more benefits than disadvantages, in using this gadget, this gadget is safe to use, and it will help society in the long run. The aspects and things the gadget can improve on is adding more security code and measures. Another concern about this gadget is that it may expose other people's privacy due to it sharing another person's data. To fix this we must give the user's on option to keep their location on or off. The Robots may need to have their code updated in so they won't get stuck. While other people may feel biased about this gadget, I don't feel biased about this gadget and I respect their opinions

Citations

1. *IRobot python apps*. iRobot Education. (n.d.). https://edu.irobot.com/what-we-offer/irobot-python#:~:text=iRobot's%20Installable%20Python%20SDK&text=Leveraging%20the%20same%20syntax%20as,IDE%20using%20Bluetooth%C2%AE%20technology.

2. Code of business conduct and ethics. (n.d.). https://investor.irobot.com/static-files/eca0b2aa-1b67-4e2f-bf84-e9305f63261d

3. Author links open overlay panelAbdur Rahman Onik a b, a, b, & AbstractThe advent of the smart home has been made possible by Internet of Things (IoT) devices that continually collect and transmit private user data. In this paper. (2024, March 15). *So fresh, so clean: Cloud forensic analysis of the Amazon iRobot Roomba Vacuum*. Forensic Science International: Digital Investigation. https://www.sciencedirect.com/science/article/pii/S2666281723002056

4. Yoon, S. (2019, September 18). *Robot vacuum cleaner -ethical analysis*. Medium. https://medium.com/@soeun_yoon/robot-vacuum-cleaner-ethical-analysis-190684948892

5. **privacy not included review: IRobot Roombas*. Mozilla Foundation. (n.d.). https://foundation.mozilla.org/en/privacynotincluded/irobot-roombas/

6. Chan, J., & Morgan, G. (2023, April 19). *Is My Robot VAC spying on Me? Data Privacy, explained*. USA Today. https://reviewed.usatoday.com/robotvacuums/features/data-privacy-concern-robot-vacuum-users

7. Robots & Utilitarianism Christopher Grau. (n.d.-b). https://philarchive.org/archive/GRATIN-2

8. Bradley, T. (2021, December 10). *Pros and cons of using a robot vacuum*. Forbes. https://www.forbes.com/sites/tonybradley/2015/12/22/pros-and-cons-of-using-a-robot-vacuum/

9. *Create 3 robot*. iRobot Education. (n.d.-a). https://edu.irobot.com/what-we-offer/create3

10. Helping irobot achieve internet of things cybersecurity. (n.d.-b). https://www.tuvsud.com/en-us/resource-centre/stories/helping-irobot-achieve-internet-of-things-cybersecurity zzzzz

11. Guo, E. (2024, March 11). *A Roomba recorded a woman on the toilet. how did screenshots end up on Facebook?*. MIT Technology Review. https://www.technologyreview.com/2022/12/19/1065306/roomba-irobot-robot-vacuums-artificial-intelligence-training-data-privacy/#:~:text=The%20data%20collected%20by%20robot,images%20ended%20up%20on%20Facebook

12. Ulgen, O. (2017, November 30). *Kantian ethics in the age of Artificial Intelligence and Robotics*. QIL QDI. https://www.qil-qdi.org/kantian-ethics-age-artificial-intelligence-robotics/

13. Coeckelbergh, M. (2020, October 23). *How to use virtue ethics for thinking about the moral standing of social robots: A relational interpretation in terms of practices, habits, and performance - International Journal of Social Robotics*. SpringerLink. https://link.springer.com/article/10.1007/s12369-020-00707-z