By Air or by Land:
How Locomotion Methods Dictate Drone Ethics

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I. INTRODUCTION

Over the last few decades, there has been a dramatic increase in the usage of unmanned drone strikes, and many countries now have fleets of unmanned aerial drones [1]. Proponents of drones claim that these systems have exceptional precision that decreases collateral deaths of innocent civilians [2]. On the other hand, significant moral opposition has been raised against these weapons [3].

Legged robots have been garnering increased attention as military tools. Examples include Boston Dynamics' "Big Dog" robot, designed to be a robotic pack animal for missions [4]. Recently, companies like Ghost Robotics have experimented with weaponizing their legged robots with rifle attachments [5]. The development of weaponized legged robotic platforms beckons consideration of the ethical use of these new technologies. In particular, we propose that legged drones will be deployed in substantially different environments than aerial drones and that this difference necessitates a new set of ethical guidelines. The arguments in this work apply to unmanned ground vehicles in general, but we will focus on legged robots specifically due to the rapid advances occurring in the field.

II. DRONE AND HUMAN INTERACTIONS

"God knows whether they'll strike us again or not. But they're always surveying us, they're always over us, and you never know when they're going to strike and attack." [6]

Beyond just launching missiles, drones are also potent psychological weapons, instilling fear and distress into those under the purview of the drone. Advances in computer vision and data processing have allowed aerial drones to become profound panoptic surveillance tools, observing entire cities around the clock.

While legged robots could similarly operate at a distance, (i.e. as autonomous snipers), it is likely they will be deployed in much closer proximity to their targets. For instance, legged robots may be sent into cities or villages to perform more precise attacks or reconnaissance. However, the human-robot relationship changes significantly when navigating through urban environments, since the robot will now have to interact directly with civilians.

III. ASSESSING THREATS

Consider a hypothetical case where a robot is knocked over by a person walking through the street. While it is possible that person was a hostile enemy intentionally attempting

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to disable or destroy the robot, it is also possible that person was in a rush to get to work and accidentally bumped into the robot. Determining the intentions of this person is crucial and the robot's reaction will vary immensely based on this judgement. Whether done by a remote human operator or a computer algorithm, analyzing the robot's sensor data to make an accurate assessment of the intentions of that potential assailant is a severe challenge and will likely be less accurate than if a human soldier were in that same situation.

IV. ROBOT SELF-DEFENSE

Even if it is confidently determined that the robot was knocked over out of malice, any level of retaliation implies the robot has a right to self-defense. While the human right to life in these active war zones is exceedingly retracted, it is hard to fathom that this machine's desire for self-preservation would outstrip a human's. This issue becomes magnified because robots lack any nuanced ability to resolve conflict. Firing the lethal weapon it carries would be the only real way the robot could retaliate. These scenarios require a broader repertoire of deescalation techniques, which robots are not close to being capable of.

V. CONCLUSION

Considering the potential use of legged robots as armed drones, one major difficulty that arises is the need to quickly make decisions and react to human behavior. This is in contrast with current aerial drones, which have full agency to dictate when they interact with their targets. In these cases, human lives may depend on a robot's ability to quickly analyze situations, and failing to do so could lead to serious humanitarian violations. Technology in this space is still in the early stages, and it is debatable if the risks of legged drones will ever be worth it.

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