A few uses for an autonomous vehicle

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From the time technology that we have come to know was invented, it has been used to gain an advantage militarily or to make life easier. Military usage seems to be a driving factor, but it is not the only factor.

Guerilla tactics played an even greater part in the US conflict in Iraq and Afghanistan. Using lessons learned fighting the Soviets in the 1980s and training from US backed anti-Soviet forces, the guerilla tactics did increasing damage to US military forces. Insurgents could build an IED from unexploded ordnance they recovered and use a cell phone to remotely detonate the device. These were particularly effective against the flat-bottom of the High Mobility Multipurpose Wheeled Vehicle (HMMWV or Humvee) in use at the time. New vehicle were developed, like the Mine-Resistant Ambush Protected (MRAP) vehicle. It has an angled bottom to help deflect the blast force away from the passengers. (Cougar, n.d.)

The most limiting factor for an airplane is the human pilot. The human body can only withstand so many G-forces before the pilot loses consciousness. A computer is not limited by those same forces.

Currently, research and field trials are being conducted on unmanned and autonomous vehicles. Autonomous vehicles can be programmed to follow a route or make decisions based on data from sensors. There are many reasons to use these vehicles on the battlefield. Unmanned aerial vehicles (UAV) can circle far above an area, unobserved, for as long as their fuel lasts, while sending live video feed back to the command center. Unlike manned aircraft, a UAV doesn't place a human life at risk in the event of detection and counterattack. A small UAV could be carried on a backpack and used with an infrared camera or video camera to gain intelligence in a similar manner to the Civil War balloons. Pilots for larger drones, like the Predator, can fly from the other side of the world using satellites to carry the signal. (How, n.d.)

An unmanned ground vehicle (UGV), like the Recon Robotics ThrowBot could be quietly driven to a spot or even thrown through a window and provide a live feed so a plan could be developed to reduce human casualties. Some Police and Special Weapons and Tactics units are also making use of the Throwbot. Small vehicles like the iRobot PackBot can be carried and deployed to gain intelligence or deactivate Improvised Explosive Devices (IED). Some soldiers have been using radio controlled hobby vehicles to scout for IEDs ahead of their vehicle patrols. One vehicle found its fifth and final IED when "…the little truck was vaporized when it managed to set off a 500 pound IED that might have otherwise been triggered by the Humvee itself…" (Ackerman, 2011, para. 2)

In an effort to remove humans completely from danger, the Defense Advanced Research Projects Agency (DARPA) has sponsored competitions to develop autonomous, self-driving vehicles. The first competition placed vehicles in a desert environment. Another competition place the vehicles in an urban environment with other autonomous vehicles and human traffic. Autonomous convoys could deliver supplies through dangerous areas eliminating that risk to humans and freeing them for other uses.

The field of Search and Rescue (SAR) is a field ready for autonomous vehicles. When a building collapses, there is no room for humans to fit through the wreckage, or it could be too unstable. A small autonomous vehicle could fit through small openings to search for survivors and is expendable if it is lost. Unlike humans, autonomous vehicles don't suffer from long-term health conditions from exposure to asbestos dust or other dust from a collapsed building. Vehicles equipped with sensors could relay information about temperature and possible chemical leaks.

An aerial vehicle could be equipped with a Forward Looking Infrared Camera (FLIR) to help locate a lost person outside, but would be limited by overhead trees. An underwater vehicle could search rivers and lakes at deeper depths and for longer periods of time than a diver could.

An aerial vehicle could fly over flood waters and drop needed supplies to stranded people. They could be used in Third World countries to air-drop medical supplies to remote villages.

At the home, robotic vacuum cleaners could keep the floor clean. Robotic lawn mowers can keep the grass cut and snow plowing vehicles could keep the sidewalk clear.

For all the advantages of unmanned vehicles, there are many disadvantages. Humans still retain the final decision to fire weapons, so how many levels that decision has to travel, could make it a disadvantage. To avoid confusion, a clear chain of command must be established and maintained.

Man-portable devices are limited in size and dependent on how many replacement batteries are carried. Larger systems require more logistical support. UAVs are dependent on fuel to stay in the air.

In Vietnam and other areas of the world, even parts of the US, the jungle canopy provides a barrier that helps to conceal movement from aerial vehicles. This can be mitigated to some extent by infrared cameras that detect differences in heat between an object and the surrounding environment.

Live-feed video is a remarkable surveillance tool when used properly. Improper use can lead to “battlefield micromanagement”. “More and more frequently, generals insert themselves into situations inappropriately, and their command leadership role becomes command interference.” (Singer, n.d., pg. 80)

“While this general was doing a job normally entrusted to junior officers, who was doing his job? New technologies allow him and other senior flags to make tactical decisions as never before. But the captains, majors, colonels, and so forth, whom they cut out of the chain, cannot,

in turn, assume responsibility for the strategic and policy questions that the generals would have wrestled with instead." (Singer, n.d., pg. 81)

Those officers in the field may not gain the decision making experience they will need when they are promoted to higher ranks. This lack of experience could cause a significant problem as senior leadership retires.

One concern with the use of unmanned vehicles is that, without human lives being at stake, more wars will be fought because the machines can be more easily replaced. The only way to prevent this would be adherence to strict international policy.

Another advantage and disadvantage is that the opposing force will not be able to directly attack the stronger force, leading to a rise in asymmetric warfare. Guerilla tactics, like ambushes and IEDs, could become more prevalent. New technologies, like autonomous vehicles, will be developed to counteract this. This could result in an arms and tactics race between the two forces.

With the rise in guerilla warfare and unknown terrorist cells, DARPA's Improv Program has asked industry and skilled hobbyists for submissions for new ways technology could place assets at risk. "In Improv we are reaching out to the full range of technical experts to involve them in a critical national security issue." (Mining, 2016, para. 4)

While a few uses of autonomous vehicles have been covered, there are many more. We may be limited for the moment by how small silicon chips can be fabricated, I think we have only begun to see what they can be used for.

Further Reading

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