

Munching machines

Robots that forage for fuel and run on steam power.

A ROBOT with dietary requirements might appear to be a bit far fetched, but a team of American researchers is developing a machine to power a vehicle that will fend for itself by gathering material like wood, leaves and grass to be used as a biofuel to run its steam-driven engine. Who might want such a device? The American military.



The Energetically Autonomous Tactical Robot is known, of course, by its acronym: EATR. It is the brainchild of Robotic Technology of Washington, DC. So far it is only a concept, but a working prototype is in the works. The research, in part funded by America's Defence Advanced Research Projects Agency, is seen as a way to help soldiers reduce their dependence on fuel supplies. The robot could, for instance, forage for biofuel while a unit on a long-endurance mission rested. It could then be used to recharge their electrical devices, carry some of their equipment or transport the soldiers as well.

The EATR uses a robotic arm to gather and prepare vegetation, which it feeds through a shredder into a centrifugal combustion chamber, where it is ignited and then heats a series of coils. The coils contain deionised water (to stop them from furring up like a kettle). As the water inside the coils is superheated the steam is piped to a radial steam engine, which consists of six pistons. The steam rotates the pistons, driving a generator which produces electricity. This is stored in batteries that power the electric motors which drive the EATR along.

The steam engine is designed to be a "closed-loop" system, in which water escaping from the cylinders through the exhaust ports is captured and cooled in a condensing unit. This turns the steam back into water, which is then returned to the combustion chamber. As well as using biomass, EATR's engine could also run on petrol, diesel, kerosene, cooking oil or anything similar than could be scavenged. The ability to consume a wide range of fuels would be important if the vehicle travels through areas like deserts, where vegetation may not be available and alternative fuel has to be provided.

Image-recognition software linked to a laser and camera would allow EATR to recognise plants, leaves and wood. Robert Finkelstein, Robotic Technology's president, estimates that about 68 kilograms (150 pounds) of vegetation would provide enough electricity for the machine to travel around 160km (100 miles). The company recently received EATR's engine, which has been developed by Cyclone Power Technology of Florida. The next stage is to integrate the EATR technology into a military vehicle to prove that the idea works. The type of vehicle that will be used has not yet been decided, although it could be a High Mobility Multipurpose Wheeled Vehicle, popularly known as a Humvee, modified to drive itself under robotic control. After a period of testing, Dr Finkelstein is confident that a fully working EATR prototype vehicle that acts autonomously could be scurrying around woodland by around 2013.

Such a machine would be extremely useful for the military. Being no longer dependent on external fuel supplies, an EATR would be able to perform long reconnaissance missions in areas which might be deemed too dangerous for soldiers to venture. Such missions are now carried out from the air using remote-control drones, although scouting around on the ground could provide even greater intelligence.

There are also potential civilian applications, such as a forestry patrol over large swathes of territory where traditional fuel supplies may be hard to find, but where there is plenty of wood, leaves and grass to provide the EATR with biomass. An agricultural version might also navigate around farmland, checking for weed and insect infestations, and feeding itself as it went. It would be a return, in a way, to a time when older steam engines once worked in the fields.

Fonte: The Economist, May 10th 2010. Disponível em: <www.economist.com>. Acesso em: 11 maio 2010.

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