

Autonomous farming robots – the future of farming

Smarter, more advanced farming methods are needed to stop the rapid increase of herbicide resistant weeds and overuse of herbicides. Autonomous farming robots are the future of farming, and by using machine learning and advanced image analysis a robot is being developed that can target specific weeds and exterminate them in the most optimal way, reducing herbicide usage by up to 90%.

The current farming methods are in a dire need of a revolution. Due to broadacre spraying weeds are starting to become resistant to herbicides at an alarming rate, the run-off from herbicide usage has severe consequences for the environment and heavy machinery is reducing the crop yield for farmers due to soil compaction. In Melbourne, Australia a small team is working on disrupting the industry by creating a lightweight autonomous farming robot that can target the weeds and exterminate them by using the optimal amount and type of herbicide.

The foundation for this robot is the open source CNC farming robot FarmBot that can take care of a garden plot without human interaction. By using the intuitive web-based interface people can set up their plot and control the robot through most devices. It can plant seeds, measure the soil moisture level, exterminate weeds, water the plants and even notify you when they're ripe for picking. It navigates by using a coordinate system, which means it can perform its tasks with millimeter accuracy.

The FarmBot is a stationary robot, but if you strip it of non-essential parts and functions you have an inexpensive and lightweight robot that which can be mounted on a frame capable of autonomously navigating a farm. This is exactly what was envisioned by Hormoz Marzbani, lecturer at Royal Melbourne Institute of Technology when he first set eyes on the FarmBot. By utilizing an already existing product the project got a jumpstart, and a first prototype was quickly built to be able to test out the steering and image analysis. When it was decided that the prototype worked well, it was time for the next phase of the project, the design phase.

Master students Lisa Ralsgård and Simon Axbom, Lund University, were then put in charge of developing a complete design for the robot in a CAD software. Numerous autonomous weeding robots have been developed, but they all have one thing in common, they are all very expensive. The goal of this project was to exploit that business opportunity so it was important that the robot was inexpensive to manufacture. During a 20-week period concepts were continuously generated and evaluated to be able to design a robot that would meet all the project requirements as well as the requirements from the farmers. In the end they managed to come up with a solar powered design that enabled the robot to operate autonomously without needing to be refill herbicide for more than 30 hours. With a slimmed down design it weighs only 154 kg and the total cost for parts is less than \$5500. By only using off the shelf parts, except for the cover, all the parts could essentially be ordered online and assembled by anyone.

The next phase of the project is to order all the parts and assemble them into a working prototype. The design has been tested theoretically, but it's time to see how well it performs in the real, harsh agricultural environment. If the next prototype phase goes smoothly, a new modern way of managing weeds is close on the horizon.