Design and Development of Automated Sprayer for Greenhouses

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The chemical uses of nutrients and pesticides are one of the most important agricultural processes and one of the most dangerous agricultural operations in the world. Automated sprayers are being developed for the use of greenhouses to improve the safety and effectiveness of the chemical application process, which results in reducing: chemicals, labor costs, occupational hazards, and harmful environmental damages. Most frequently, sprayers have been controlled by Programmable Logic Controls, Robot Q, Raspberry Pi, and Arduino platforms. This study was intended to develop an affordable Autonomous sprayer equipped with existing technology and adding values in rich path following, multi spraying, best target controlling, and crop identification ability in Sri Lankan Greenhouses content. A four-wheeler differential steering base robot was designed and built to act as a greenhouse sprayer. The overall robot is run by using a drive unit that consists of two brushless direct current motors. The Proportional-Integral-Derivative controller was developed to follow the paths of lines which are located on the floor correctly. Moreover, the crops were identified using image processing. The spraying system also inbuilt to the robot, i.e., pump, reservoir, nozzle, etc. The fully completed autonomous robot was tested on rough terrains and it can be able to navigate on pre-defined paths in greenhouses very high accuracy. Future developments will be focus to add high processing power for digital image processing and artificial intelligence.

Keywords: Programmable logic controls, Brushless direct current motors, Proportional-Integral-Derivative, Artificial intelligence