An Intelligent System for Automated Detection and Monitoring of Phloeotribus scarabaeoides in Olive Orchards Using High-Resolution Cameras and Image Analysis

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Olive trees are a vital part of the economy in Mediterranean countries. However, these trees suffer annually from the olive bark beetle (Phloeotribus scarabaeoides), which has been increasing in recent years without any control over the number of infestations. This has led to losses ranging from 50% to 70% of olive orchards in various countries. The primary problem for farmers lies in their inability to detect the pest due to its small size and the small number of trees in the field. In the summer, the pest begins its journey of burrowing to lay its eggs, which turn into larvae that complete the burrowing process and suck the olive bark, causing dehydration and death. Traditional manual detection methods have proven ineffective. This project aims to assist farmers with an early detection system based on deep learning, and motion technologies. The solution includes a camera trained on a wide range of the (Phloeotribus scarabaeoides) images, integrated into an off-the-shelf robotic vehicle equipped with a LiDAR sensor. The vehicle stops at each tree, circles around it, and captures real-time images that are analyzed and compared with the trained model. Upon detection of a pest, the system sends an alert to the farmer, along with the x-y coordinates of the infested tree. The results demonstrate the system's promise. The system's accuracy in identifying the insect reached 94 percent. Experiments also demonstrated the system's ability to reduce insect losses caused by Phloeotribus scarabaeoides by more than 65 percent. The project also reduces farmers' reliance on the large quantities of insecticides used to combat this pest. This demonstrates the success of the integrated system, which relies on artificial intelligence for training, analysis, motion, and sensing.

Awards Won: