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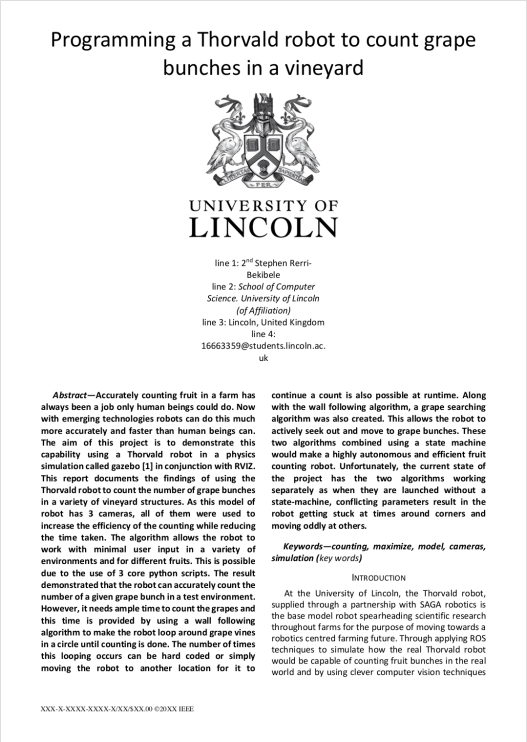

Programming a Thorvald robot to count grape bunches in a vineyard

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***Abstract*—Accurately counting fruit in a farm has always been a job only human beings could do. Now with emerging technologies robots can do this much more accurately and faster than human beings can. The aim of this project is to demonstrate this capability using a Thorvald robot in a physics simulation called gazebo [1] in conjunction with RVIZ. This report documents the findings of using the Thorvald robot to count the number of grape bunches in a variety of vineyard structures. As this model of robot has 3 cameras, all of them were used to increase the efficiency of the counting while reducing the time taken. The algorithm allows the robot to work with minimal user input in a variety of environments and for different fruits. This is possible due to the use of 3 core python scripts. The result demonstrated that the robot can accurately count the number of a given grape bunch in a test environment. However, it needs ample time to count the grapes and this time is provided by using a wall following algorithm to make the robot loop around grape vines in a circle until counting is done. The number of times this looping occurs can be hard coded or simply moving the robot to another location for it to continue a count is also possible at runtime. Along with the wall following algorithm, a grape searching algorithm was also created. This allows the robot to actively seek out and move to grape bunches. These two algorithms combined using a state machine would make a highly autonomous and efficient fruit counting robot. Unfortunately, the current state of the project has the two algorithms working separately as when they are launched without a state-machine, conflicting parameters result in the robot getting stuck at times around corners and moving oddly at others.**

Keywords—counting, maximize, model, cameras, simulation (key words)

Introduction

At the University of Lincoln, the Thorvald robot, supplied through a partnership with SAGA robotics is the base model robot spearheading scientific research throughout farms for the purpose of moving towards a robotics centred farming future. Through applying ROS techniques to simulate how the real Thorvald robot would be capable of counting fruit bunches in the real world and by using clever computer vision techniques