Perspective
Volume 7:10, 2022

Advances in Recycling & Waste Management

ISSN: 2475-7675 Open Access

Using Moderate Autonomous Conditions, Agricultural Soil Mapping in a Greenhouse

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Introduction

An Nvidia Jetson Nano is incorporated into the embedded architecture of the proposed robot, which is constructed around an RGB camera for plant detection and a multispectral camera for extracting the various specific bands for processing. Our system uses multi-sensor fusion to control two components of the algorithm. The proposed algorithm was therefore constructed using the CPU-GPU embedded architecture. This enables us to process each image in 1.94 seconds when using a sequential implementation on the embedded architecture. We employed a Hardware/Software Co-Design research in our implementation to suggest an optimal implementation. [1].

Description

In every and every area of technology, autonomous systems have been shown to have major advantages. Depending on the tasks they must complete, these systems' levels of complexity range from high to low. Furthermore, the autonomy and performance of tasks performed by modern robots have experienced a huge revolution. Specifically, an agricultural revolution These robots can complete jobs that are both straightforward and difficult, which calls for reliable algorithms. Multi-sensor fusion techniques using radar, cameras, and light detection and ranging are required for these robots to execute successfully. In this situation, the purpose of these robots is to move across agricultural areas and gather the information that will be valuable for producing high-quality agricultural products. [2].

For applications involving precision agriculture, numerous solutions have been put forth. A soil robot-based study for closed agricultural field monitoring was suggested by R.P. Devanna et al. in 2022. This research uses a semi-supervised deep learning model to identify pomegranates automatically. In comparison to the other technique developed, the constructed robot is a semi-trainer intended to shorten processing time. The proposed system scored 86.42% on the F scale and 97.94% on the IoU scale, according the results. devised methods to avoid both static and moving obstructions in agricultural fields [3].

Greenhouses are an effective way to boost plant output. These enclosed greenhouses assist in the management of various crop varieties to enhance plant performance. According to the farmers' knowledge, monitoring is typically done manually. Due to this, certain poor decisions are made, which lowers crop production and productivity. We will therefore concentrate our efforts on the tomato plant. Tomatoes love nutrient-rich, humus soil that warms up fast. It requires continual fertilisation both during cultivation and before installation because it is very greedy. As a result, tomatoes need crucial signals like water, nitrogen, and vegetation to be monitored. As a result, we looked at the three most often used monitoring indices. The indices are the normalised difference red edge index (NDRE), normalised difference red.

Ground robots are particularly powerful in terms of precision and versatility of applications in open and closed fields, such as greenhouses, because of these limitations. In this study, we will focus on creating a platform with an autonomous soil robot that can track weeds, water, and nitrogen levels as well as perform other tasks like counting plants. Additionally, it has the capacity to make decisions instantly. This study seeks to show how useful and applicable our suggested algorithms are. To address this, we developed the VSSAgri system (vegetation surveillance system for Precision agriculture application). This robot's objective is to verify the proposed monitoring techniques in this research. The proposed prototype is built using electrical motors that are powered by batteries and an embedded architecture. Similar to that, However, the weight will increase and the flying time will be shortened if we want to construct a decision-making system employing a UAV. UAVs cannot be modified to conduct surveillance in enclosed greenhouses, either. Ground robots are particularly powerful in terms of precision and versatility of applications in open and closed fields, such as greenhouses, because of these limitations. In this study, we will focus on creating a platform with an autonomous soil robot that can track weeds, water, and nitrogen levels as well as perform other tasks like counting plants. Additionally, it has the capacity to make decisions instantly. This study seeks to show how useful and applicable our suggested algorithms are. We developed the VSSAgri system to address this issue. [4,5].

Conclusion

A crucial stage in evaluating the algorithm's dependability is the validation of the algorithmic technique. In real-world situations, we can find a wide range of external factors that have an impact on how the algorithm functions. The advancement of autonomous robots aids in the verification and usefulness of the research methodology. In this article, we suggest an automated monitoring system for crops grown in open fields and enclosed greenhouses. This system offers a map with a representation of the vegetation, water, and fertiliser content as well as GPS location data. This method will increase monitoring accuracy, allowing us to enhance decision-making processes and lower the consumption of resources needed by the plant for growth. By using fewer resources, this will boost yield.

Acknowledgement

None.

Conflict of Interest

None.

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Received: 03 October, 2022, Manuscript No. arwm-23-86678; **Editor Assigned**: 07 October, 2022, PreQC No. P-86678; **Reviewed**: 17 October, 2022, QC No. Q-86678; **Revised**: 21 October, 2022, Manuscript No. R-86678; **Published**: 28 October, 2022, DOI: 10.37421/2475-7675.2022.7.255

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How to cite this article: Esmaeli, Abdolreza. "Using Moderate Autonomous Conditions, Agricultural Soil Mapping in a Greenhouse." *Adv Recycling Waste Manag* 7 (2022): 255.