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Smart Weed Control: Real-Time Inference and On-board Data Processing using Edge-AI

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Overview

- Weed control is critical in agriculture since weeds compete with croplands for nutrients, water, and light, resulting in lower crop yields and quality.
- Uncontrolled weeds can also harbour pests and diseases that can infect crops and cause further damage. Furthermore, some weeds are toxic to livestock and can endanger grazing animals.
- Effective weed management practices are required to maintain healthy and productive agricultural land.
- The field of agriculture is a prime candidate for being revolutionized by computer vision. The use of cameras installed on Unmanned Aerial Vehicles (UAV) may provide a precise view of the fields, and object recognition powered by Deep Neural Networks (DNN) can assist us in better comprehending the condition of the field.
- However, to fully exploit computer vision's capabilities, the processing must first occur directly on the UAVs.
- This would make it possible for UAVs to provide information, which could then be utilised for location-specific actioning that takes place in real-time.
- For instance, a UAV may identify weeds, which a robot operating on the ground could then be eradicated instantly. In agriculture, on-board data processing for real-time weed detection using Edge Artificial Intelligence (AI) can improve weed control efficiency and accuracy [1].
- Edge AI is the use of AI algorithms on network edge devices to enable real-time data processing and decision-making [2].
- The use of Edge AI in weed detection entails taking images of crops and weeds, processing them on the device to detect the presence of weeds, and making a real-time decision on the appropriate action to take.
- Edge AI for weed detection can reduce reliance on manual labour, increase overall productivity, and reduce the use of harmful chemicals in weed control. Regarding the same, a workflow is outlined in Figure 1, and the preliminary results are presented in Figure 2. The on-board processing is carried out with the help of state-of-the-art astrionics, i.e., hardware accelerators.

Methodology

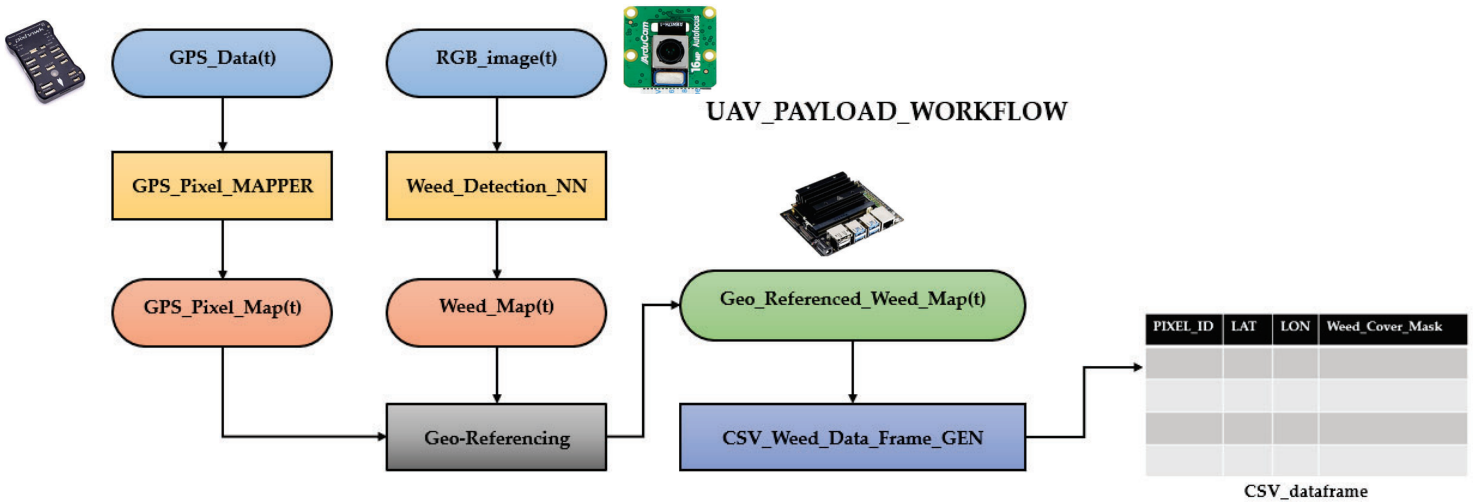

Figure 1: On-board (EDGE-AI) processing workflow.

Results

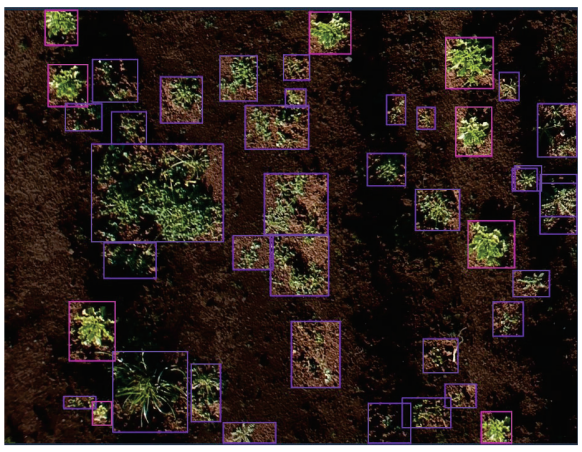

Figure 2: Weed segmentation map.

References

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