BRABANT HACK_26

TRACK PLANT-BASED 2

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DEVELOPMENT OF A REAL-TIME DETECTION SYSTEM FOR QUANTIFYING AND LOCALIZING HARVEST DAMAGE IN POTATOES

Your mission: develop an intelligent monitoring system that directly quantifies mechanical damage during harvesting and links it to specific field zones, enabling us to visually map variability in harvest quality.

CASE CONTEXT

In current potato cultivation, the quality of the harvest during lifting is often a “black box.” The actual level of damage to the potatoes only becomes visible later during storage or upon delivery to the processing plant. At that point, the cause of the damage can no longer be identified or corrected. Stones or hard materials present in the soil can damage potatoes during harvesting, resulting in bruising and quality loss. The causes of this damage can often be traced back to specific zones within a field (high-risk zones).

If a signal indicating a high number of damaged potatoes, clods, and stones is received during harvesting, the harvesting process (such as driving speed, drop height, etc.) can be adjusted immediately. It may also prompt further investigation into other characteristics of that zone, such as soil properties that may be contributing to the damage. For example, a grower may decide to cultivate a different crop on a field with a high stone content in the soil.

In addition, it is valuable for growers to gain more insight into potato quality. On the one hand, this helps prevent unpleasant surprises during storage. Damaged potatoes pose a significant risk in storage, as they provide entry points for storage diseases and bacteria, potentially leading to heating, moisture loss, and a chain reaction of rot that can render an entire batch unmarketable. If it is known that a batch contains a relatively high proportion of damaged potatoes, it could be stored separately. Evidence of good quality also improves the grower’s negotiating position with buyers.

A damage detection system on the potato harvester makes it possible to gain real-time insight into product quality during the harvesting process. The damage detection system to be developed will identify high-risk zones within a field. This enables growers to adjust speed and machine settings during harvesting, carry out targeted soil improvements, or decide to grow a different crop in the future.

The system also provides direct evidence of batch quality. This creates opportunities to optimize the storage process and strengthens the grower’s position within the supply chain. For contractors, the system transforms their service from “providing capacity” to “guaranteeing quality.” It enables a new revenue model in which data analysis and advice on harvest quality become the added value, resulting in reduced rejection rates and higher returns for the entire supply chain.

WHAT DO TEAMS BUILD?

You will develop an advanced vision-based system for real-time object classification that automatically distinguishes between potatoes, clods, and stones on the harvester conveyor belt, while simultaneously quantifying and localizing harvest damage.

WHAT DOES VAN DEN BORNE PROVIDE?

- Camera images captured by cameras mounted on the potato harvester, combined with processed images from a classification algorithm.
- Camera images captured during the washing process; these images can be useful for distinguishing between damaged and undamaged potatoes.

SUCCESS CRITERIA

Core KPI
Detection of damage to potatoes must be accurate. At least 90% of damaged potatoes must be detected.

The detection of stones and soil clods must also achieve an accuracy of 90%.

The damage detection system must operate in locations where no 4G/5G connection is available. Data must be able to synchronize with external management systems and the harvester display using standardized data formats. The results of the detection system must be readable in real time on the display in the harvester, allowing machine settings to be adjusted immediately to prevent damage. No additional screen should be required for this purpose. Data and maps must be automatically imported into the farm management system of the operation. Transferring data via a USB stick should not be necessary.

The damage detection system must be compatible with harvesters of all brands.

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