

Automatic grain classification

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Project Description

This project's goal is by using data supplied by biologists, create a piece of software able to distinguish between 3 different kinds of grain with a very high level of effectiveness, these are wholegrain, groats and broken grain. These grains have different appearances and using computer vision techniques I should be able to create a program to successfully separate this grain. This is to be later expanded to function with live video data to be able to actively detect the types of grain for use within industrial applications.

Proposed Tasks

First, I will research computer vision techniques, read OpenCV documentation and gather a list of techniques and methods I can apply to my work.

My first step is to gather all the necessary data within the supplied images, retrieving all the individual grains as preparation for training data, this can either be done manually, but since there are hundreds of grains to go through this will likely be best done using some basic form of OpenCV program.

I will have to research whether I need to build my one machine learning model or use an existing machine learning model and work out which model is the best for my application through testing and experimentation. Then train the following machine learning model on the images from the last

I will have to research and apply post processing techniques to the image to filter out any noise or duplicate images in the image.

When it works on an image at a high success rate, continue work and testing to maximise this rate.

Convert the existing program to work using a provided video feed so that it has application in real time.

Proposed Deliverables

I will be providing software which when given a video feed, will successfully detect whether it has grain, and then using data it was trained on, detect whether it is either wholegrain, groats or broken grain at a high level of accuracy. My goal for this program is to be able to run constantly without being too resource demanding and actively detect the location of the grain on the video feed. This program will have a close to 100% rate of success.

If I have time, I will deliver an actively tested piece of software using a CNC machine with a camera.

The final report will be one of the things I deliver, containing all the documentation, diagrams and explanations as well as evidence for all my decisions throughout the project.

Bibliography

<https://docs.opencv.org/4.x/index.html>

The complete documentation for OpenCV, it contains in depth explanations of all the functions available with images for visual reference. This will be vital to the project as while working with OpenCV I will constantly reference this source.

Lectures from CS34110 Computer Vision

The lectures from CS34110 have a lot of the initial information I can utilise as a start for more in-depth research of other computer vision techniques. The lectures cover a lot of the base knowledge of computer vision needed for this project.

<https://towardsdatascience.com/exploring-image-processing-techniques-opencv-4860006a243>

An article describing how to perform various image pre-processing techniques.

<https://learnopencv.com/image-recognition-and-object-detection-part1/>

An article showcasing the basics of image recognition and object detection using OpenCV, it covers a few basics tools and methods.