Fruit Tree management based on Radiance Fields

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In this project we propose to explore the use of radiance fields for assisting in tasks related with fruit tree management: branch pruning assistance and fruit counting. Some computer systems have been proposed for these tasks, based on analysing video sequences. In this work we propose to first estimate a radiance field from a video sequence of a fruit tree, and then use it to solve the pruning and fruit counting tasks with a performance higher than processing the video sequence.

A radiance field maintains a 3D representation of a scene estimated from a set of two-dimensional images, also capturing the reflectance properties of the scene. This enables the rendering of photorealistic views from novel viewpoints. This has great potential to improve the robustness of fruit tree management tasks. If elements of interest are occluded in acquired images, additional images can be synthetized from viewpoints in which the occlusion is reduced, thus improving the condition in which detectors are applied. In this way we expect to obtain a more robust and precise characterization of fruit trees than the state of the art.

In this project the task to be performed by the student are the following ones:

• Study the techniques required to transform a video sequence in a radiance field.
• Implement a workflow to transform a video sequence in a radiance field, based on Gaussian splatting..
• Asses the quality of the workflow in recovering the 3D structure of the scene.
• Design and implement novel methods to use the generated radiance field in branch pruning and/or fruit counting tasks.