Vine wood diseases are a major economic issue, but they remain poorly understood because they depend on many factors. In order to enhance their understanding, it is necessary to understand the behavior of the various fungi involved in wood diseases. In this context, some pathogenic fungi are suspected of degrading wood by acidifying it in order to colonize it. Others could, on the contrary, serve as biocontrol agents by degrading the pathogen’s acids.

The measurement of acidity is for now the only indicator of the interaction between pathogens and biocontrol agents. Reproducing all the conditions of acidification in vivo is difficult, so the behavior of pathogens and their possible biocontrol must first be studied in culture, usually in a Petri dish in a controlled environment. To measure acidification, a pH indicator is introduced into the medium to visually identify areas according to their pH, as shown in Fig. 1 below. However, this identification is purely visual, and does not allow the objective study of variations, especially within the transition zones.

The objective of this internship is to answer to this problematic by establishing a method of image segmentation that takes into account:

- the non-linear link between the observed color and the numerical pH values. To do this, it will be necessary to establish an observation model based on a series of reference images with a known pH.
- the mapping of region of interest within the image, in order to automatically classify them regions according to their pH. The main challenge here is to take into account the transition values between the regions. For this, Bayesian methods coupled with fuzzy logic representations, such as Markov fields with fuzzy classes, will be considered.
This internship is part of the "Petricolor/Escalibur" project started in 2019 between the Research Institute for Computer Science, Mathematics, Automation and Signal (IRIMAS) in Mulhouse, the Laboratory of Vine, Biotechnology and Environment (LVBE) in Colmar, and the Austrian Institute of Technology in Vienna. In practice, the trainee will be hosted in the IMTI team of the IRIMAS laboratory in Mulhouse. Regular exchanges with other project members at the LVBE are also planned in order to develop relevant methods for practical application.

Required profile

- M2 or last year of engineering school
- Strong knowledge of signal and image processing,
- Good programming skills, and knowledge of Python, Matlab, or C++.
- Good level in English,
- An interest in plant biology would be a plus (without the need for a priori knowledge).

Application

This internship will be supervised by:
- Jean-Baptiste Courbot, associated professor, IRIMAS, Mulhouse
- Romain Pierron, associated professor, LVBE, Colmar

To apply, send a résumé, a motivation letter and the latest university results by email to firstame.lastname@uha.fr.

References related to the project