PLANT DISEASE DETECTION SYSTEM

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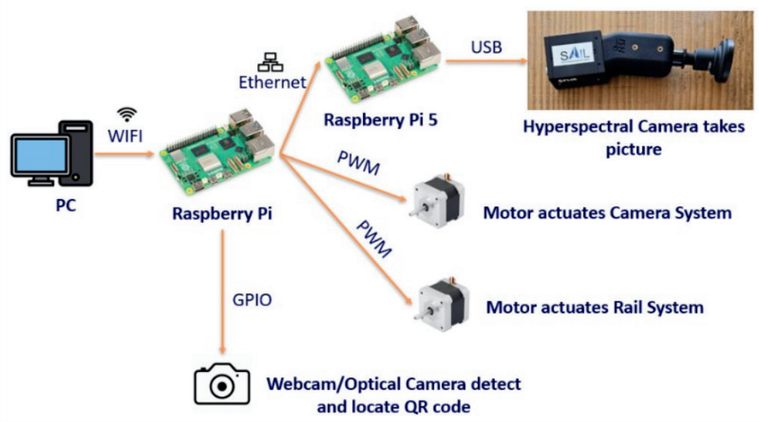
BACKGROUND AND MOTIVATION

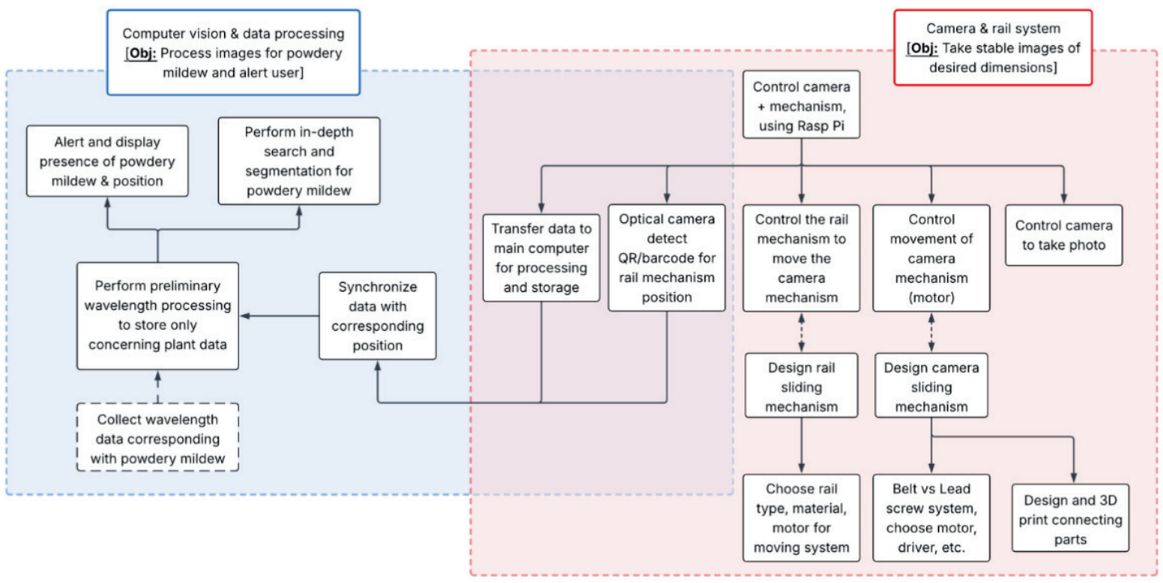
Crop losses caused by plant diseases remain a major challenge for agriculture. **Powdery mildew**, for example, lowers both yield and quality if not managed early. Conventional detection methods often depend on manual checks, which are slow and sometimes inaccurate. **Hyperspectral imaging (HSI)** provides a way to spot changes in leaf reflectance that are invisible to the naked eye, making it possible to identify problems earlier. By combining HSI with automation, farmers can take quicker and more sustainable actions, reducing chemical use and improving crop health.

OBJECTIVE

A system that can automatically monitor plant health in glasshouse using hyperspectral camera, rail-based moving system, and computer vision.

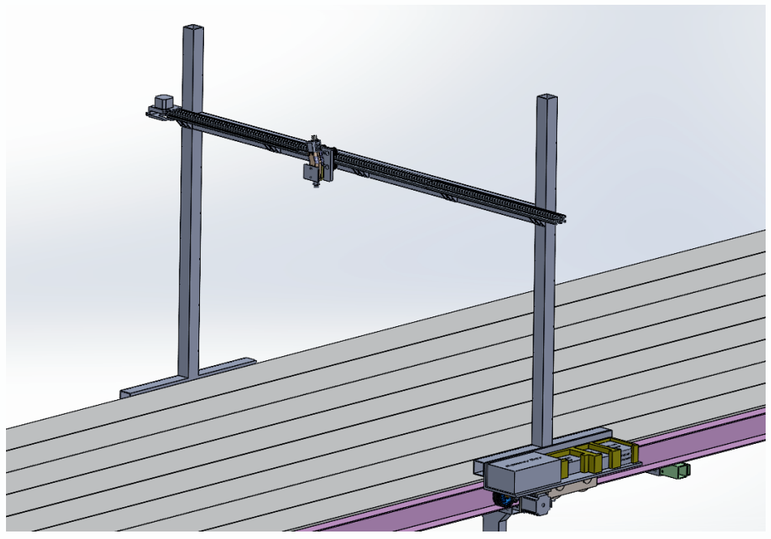


METHODOLOGIES



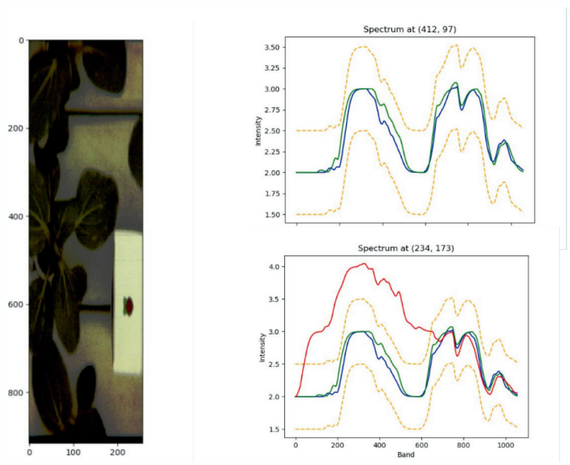
- **System Development** – Designed a rail-based mechanism with a moving hyperspectral camera controlled by a Raspberry Pi.
- **Positioning** – Used QR codes as landmarks to stop the camera at the right scanning points.
- **Processing and Analysis** – Applied leaf segmentation, blob detection, and spectral feature extraction to highlight differences between healthy and diseased plants.
- **Software Integration** – Created a simple user interface to manage camera control, movement, and data transfer.

RAIL-BASED SYSTEM



PROTOTYPE AND RESULTS

- **Spectral data** clearly separated healthy leaves from infected or stressed ones.
- **Segmentation method**s were able to isolate leaves from the background effectively.
- Smooth control of **rail-based system**, with minimum noise and clear spectral data.
- The **rail system and QR detection** worked reliably during tests.
- Results showed distinct **spectral signatures** for healthy versus diseased plants, confirming the method's potential.



CONCLUSION

The project delivered a **functional prototype** for early plant disease detection. By combining **hyperspectral imaging, automated positioning**, and **spectral analysis**, the system demonstrates how **technology can support smarter farming practices**. It reduces the need for manual inspection, enables earlier disease management, and provides a foundation for future large-scale applications. Next steps include expanding the dataset, training advanced machine learning models, and field testing in real farm environments.