

# Photodiode monitors avocado with the help of LEDs

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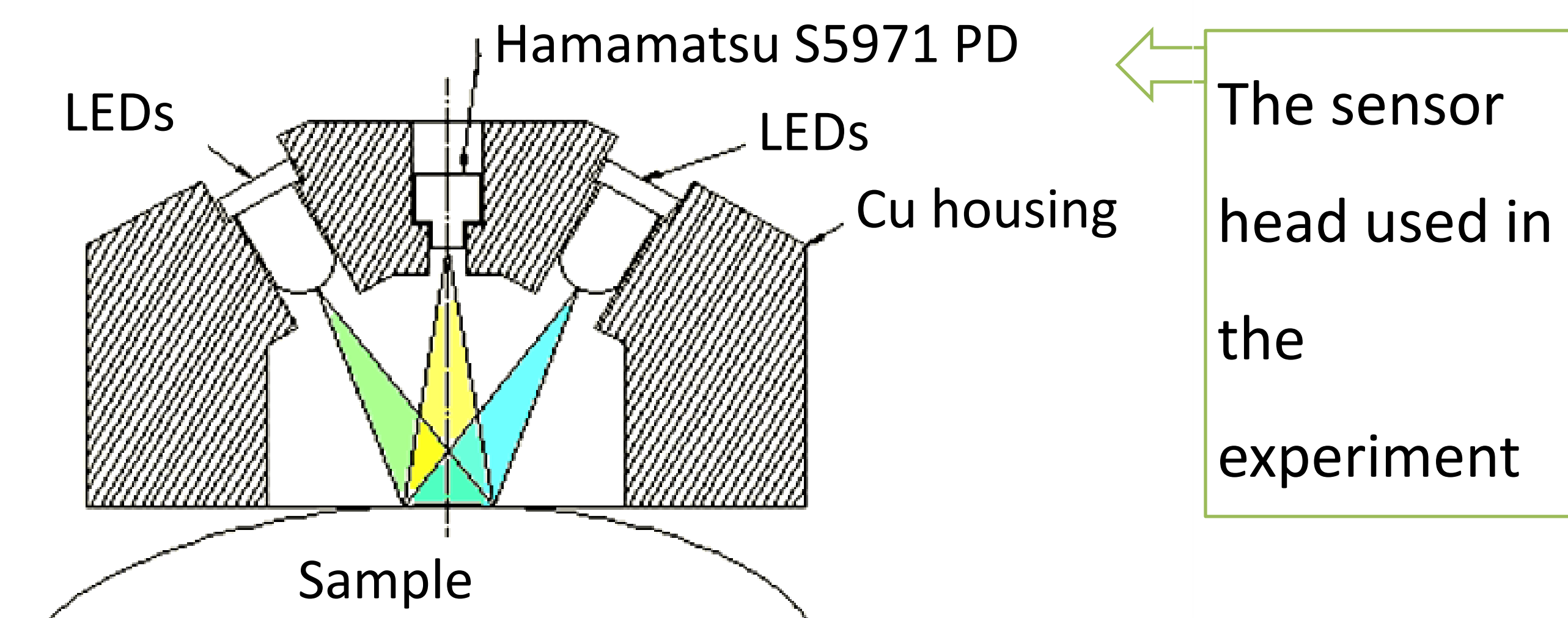
## 1. Introduction

- Studies on agricultural samples require
  - large statistical samples measured *in-natura*
  - Non-destructive testing
- Methodology
  - Light Emitting Diodes coupled with photodiodes based optical spectroscopic investigations

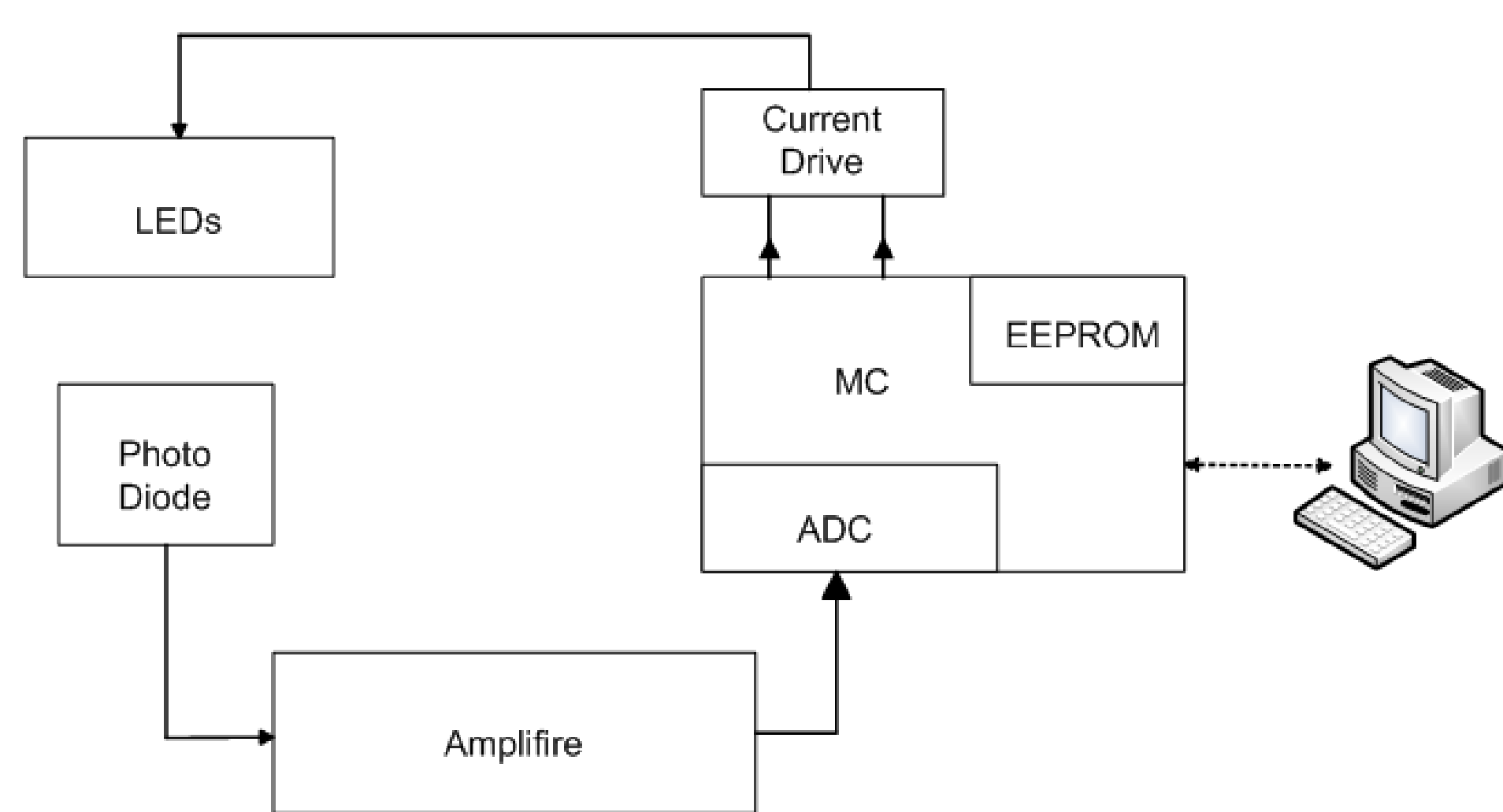
## 2. Objective

Can photodiode monitor LED induced **diffused reflectance** spectra of agricultural samples ?

## 3. Instrument



- 10 LEDs from 375 nm to 1060 nm were used as light sources
- Hamamatsu S5971 Si photodiode was used as the detector
- Current driven LEDs were controlled using Microchip PIC16F877A microcontroller



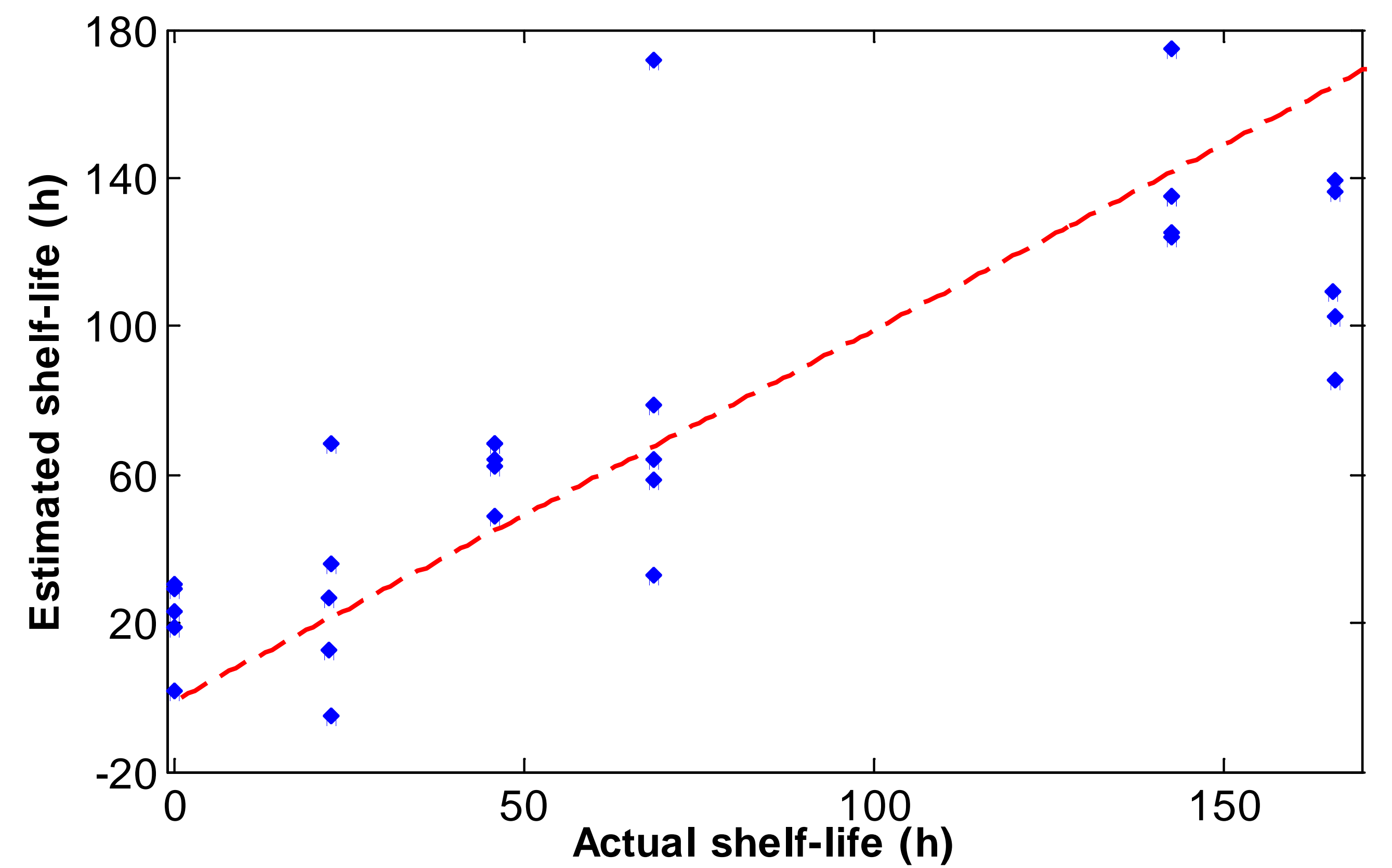
## 4. Experiment

- Avocado fruits were used as samples
- Measurements were taken twice a day
- Reflectance from Opal diffuser was used as the reference
- Reflection of the sample was calculated according to

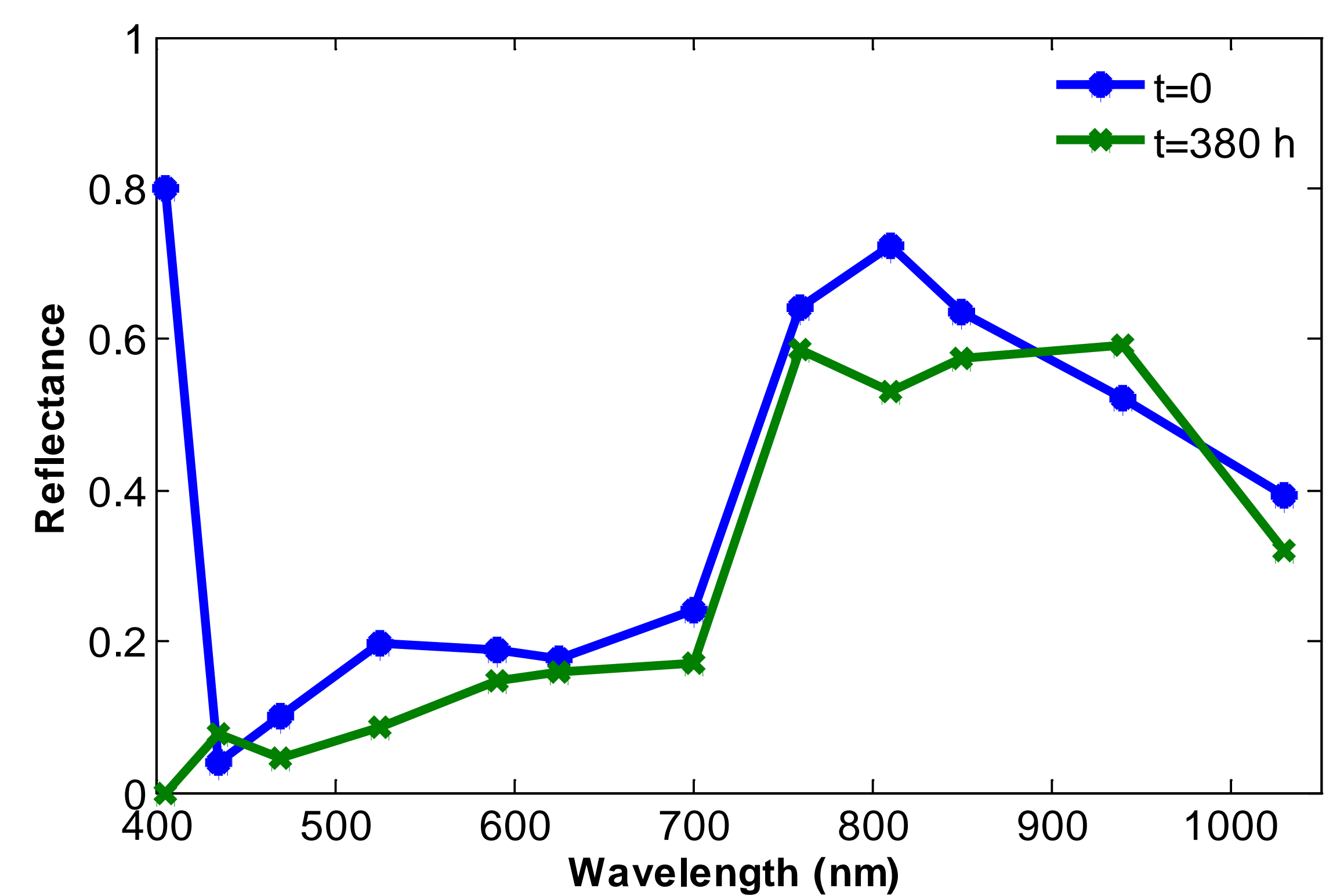
$$R_{\text{Sample}} = \frac{M_{\text{Sample}} - M_{\text{Dark}}}{M_{\text{Opal diff.}} - M_{\text{Dark}}} \times R_{\text{Opal diff.}}$$

## 5. Modeling

- Time series data set was Compressed using SVD and Estimated shelf life was obtained with the help of a liner model  $\hat{t} = [1 u_1 u_2 u_3]\theta$
- $\hat{t}$  is estimated shelf-life,  $u_1 ..u_3$  are coefficients of the principle components and  $\theta$  is the model



## 6. Discussion



- The reflection spectra of the avocado fruit follows that of a green leaf. But, there are certain deviations which need to be discovered with a calibrated spectrometer
- The first data point of the reflection spectra is highly deviated, the reason could be the lack of sensitivity of the photo diode in that region
- There is a potential of using this kind of system for estimating physiological maturity of fruits like avocado

## 7. Acknowledgment

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