

1. RGB-Thermal Imager for water stress assessment in field crops

Thermal imagers are useful tool for crop stress monitoring and real time application of irrigation scheduling. It can be also used for measuring surface temperature of fruits, seeds, vegetables, heating problems in machines and detection of human body surface temperature. The commercially available thermal imagers have limitations for their application in spatial data collection along with location coordinates and real time data processing. In addition, they are costly and cannot be integrated with actuation system for real time communication. To overcome these issues, a RGB-Thermal imager has been developed using Raspberry Pi 3B+ micro-controller board, Raspberry Pi RGB module V2 (8 MP), thermal module AMG8833 (0 to 80 °C), 7 inch HDMI display, GPS module NEO 6M V2 and keypad buttons supported by 20000 mAh power bank. The RGB, Thermal and GPS modules were attached directly with micro-controller board. The Raspberry pi board was driven by NOOBS operating system having 64 GB memory. The software of RGB- Thermal imager module has been developed in Python 3 using its libraries pygame (image display), RPIO (keypad button), AMG8833 (thermal sensor), time (timer library). The developed module has been tested in both laboratory and field conditions. For evaluation, RGB and thermal images of wheat have been captured and stored with their GPS locations. Serial communication protocol is used for transferring of RGB-Thermal sensor pixels to micro-controller board.

Advantages of developed thermal imager over commercial available thermal module

The developed RGB-Thermal imager provides real time data collection, using AMG8833 temperature sensor having FoV (60°) and accuracy 2° C, better than commercially available thermal imagers. GPS module interfaced with RGB-Thermal imager can be used to assess spatial variability. The continuous recording of data helps in real time monitoring and controlling of actuators. Overall, the developed module is user friendly, robust, low cost (<Rs.15000/-) and unaffected by environmental parameters (temperature, rainfall).



Capturing of wheat image by RGB-Thermal imager