Embedded System for Identifying the Quality of Grass Using Colour Patterns for the Sri Lankan Dairy Industry

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Sri Lankan dairy sector operates at its suboptimal level. Efficient and reliable technologies are needed to increase productivity enabling farmers to make farm management decisions based on accurate and current information. Precision farming technologies could be successfully integrated to monitor farm-grown pasture and make real-time decisions to optimize utilization. The present study is aimed to develop an embedded system-based method to efficiently monitor and utilize available pasture in dairy farming. A custom-made drone with F450 frame and Ardu pilot mega 2.6 was used in the study. The drone was tested at Uva Wellassa University and NLDB farm, Melsiripura. Flight controller was automated using the mission planner tool to fly at an automated waypoint flight of a Grid pattern. Drone mounted go-pro camera was used to acquire pre-processed images contained GPS metadata and webODM tool merged images with GPS data to produce a georeferenced output (Orthomosaic image). Developed shadow removal algorithm converted BGR to YCbCr color space and computed average Y channel and intensities. Subsequent process detected shadow regions and saved binary shadow images. Then the algorithm computed average pixel intensities of shadow and non-shadow areas adding difference with Y channel. Furthermore, the color identification algorithm obtained shadow processed image and applied the median filter (blur/Sharpened image) to convert color mode from RGB to HSV format. The image was color filtered based on identified color ranges of high yield grass. To identify overall color identification, an aerial map was marked by an expert in the field, subsequently algorithm processed image and marked image compared. Images were measured by pixels coverage of marked area and results provided a 90% identification rate through the algorithm. Results revealed, developed an embedded system-based method successfully measured field grass coverage compared with a manual method.

Keywords: Embedded system, Pasture, Precision agriculture, Colour identification