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Designing Agricultural Irrigation Systems Using Drone Technology and Geospatial Analysis

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Abstract : Geospatial technologies have been increasingly used in agriculture for various applications and purposes in recent years. Unmanned aerial vehicles (drones) fit the needs of farmers in farming operations, from field spraying to grow cycles and crop health. In this research, we conducted a practical research project that used drone technology to design and map optimal locations and layouts of irrigation systems for agriculture farms. We flew a DJI Mavic 2 Pro drone to acquire aerial remote sensing images over two agriculture fields in Forest, Mississippi, in 2022. Flight plans were first designed to capture multiple high-resolution images via a 20-megapixel RGB camera mounted on the drone over the agriculture fields. The Drone Deploy web application was then utilized to develop flight plans and subsequent image processing and measurements. The images were orthorectified and processed to estimate the area of the area and measure the locations of the water line and sprinkle heads. Field measurements were conducted to measure the ground targets and validate the aerial measurements. Geospatial analysis and photogrammetric measurements were performed for the study area to determine optimal layout and quantitative estimates for irrigation systems. We created maps and tabular estimates to demonstrate the locations, spacing, amount, and layout of sprinkler heads and water lines to cover the agricultural fields. This research project provides scientific guidance to Mississippi farmers for a precision agricultural irrigation practice.

Keywords : drone images, agriculture, irrigation, geospatial analysis, photogrammetric measurements
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