DEVELOPMENT OF AN AUTOMATED PLANTING ROVER USING RASPBERRY PI WITH LORA, GPS, IRRIGATION, AND POSITION CORRECTION

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ABSTRACT

Agriculture is important to food security and environmental sustainability, but traditional corn planting often depends on manual labor and may produce inconsistent seed spacing, longer planting time, and higher operational costs. This study developed a cost-conscious automated planting rover using Raspberry Pi, LoRa communication, GPS navigation, irrigation control, and position correction to support precision agriculture for small- and medium-scale farming. The study used experimental prototyping to design, construct, and evaluate the system. Two- and three-dimensional schematics guided development of the rover and base station. The prototype incorporated a Raspberry Pi controller, LoRa modules for long-range communication, GPS navigation, LiDAR obstacle detection, and automated irrigation. Functional tests assessed navigation precision, communication reliability, and planting performance. Interviews and a five-point Likert-scale questionnaire were administered through purposive sampling to evaluate usability and effectiveness. The prototype achieved seed placement, GPS-guided navigation, obstacle detection, and long-range LoRa communication with the base station. Survey responses indicated high acceptance in terms of efficiency, functionality, and reliability. Testing was described as showing improved planting accuracy, reduced manual labor, and optimized time use. Limitations included terrain adaptability and inconsistent signals under some conditions. The findings demonstrate the potential of robotics and Internet of Things technologies in automated planting. Further development should address durability, terrain adaptability, signal stability, and extended field testing before broader agricultural use.

RECOMMENDED CITATION

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