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Determination of Ultrasonic Sensor Ability for Use as Guidance Sensors of Mobile Robots

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In this study, we have evaluated the ability of ultrasonic sensors to produce guidance signals for greenhouse application robots. First, one high-quality ultrasonic sensor was selected and some basic experiments were carried out. Experimental results showed that with predetermined internal parameters, the accuracy of the selected sensor was good for distances between 15 and 215 cm and angles between 0 and 30°. The maximum width of view of each sensor was 17.15 cm for flat surfaces and 33.20 cm for round surfaces. From these results, the final configuration of sensors around the robot was determined. With a designed averaging algorithm, it was possible to calculate the averages of orientation and position with high accuracy from ultrasonic sensor outputs. Also, from comparison with data from reference sensors, the maximum error and root mean square error (RMSE) for orientation and position were 11.23°, 4.036° and 3 cm, 0.714 cm, respectively.

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