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SELECTION OF A RANGE FINDER FOR THE TECHNICAL VISION SYSTEM OF AN UNMANNED TRANSPORTATION

Abstract. This thesis presents a comparative analysis of three types of rangefinders: infrared, laser, and ultrasound. The operating principles of each rangefinder are described, and their technical characteristics are provided. An evaluation of the accuracy of each rangefinder was conducted using the ROS system, leading to the selection of one rangefinder that is most suitable for installation on an unmanned vehicle.

Keywords: rangefinder, computer vision, controller, unmanned transportation, device.

For the technical vision system of the unmanned transportation, three types of rangefinders were selected: laser, ultrasound, and infrared. The research was conducted on a laboratory stand equipped with the following rangefinders: Ultrasound - HC-SR04 (Fig. 1 A); Laser - benewake tfmini plus (Fig. 1 B); Infrared - GP2Y0A021 (Fig. 1 C).

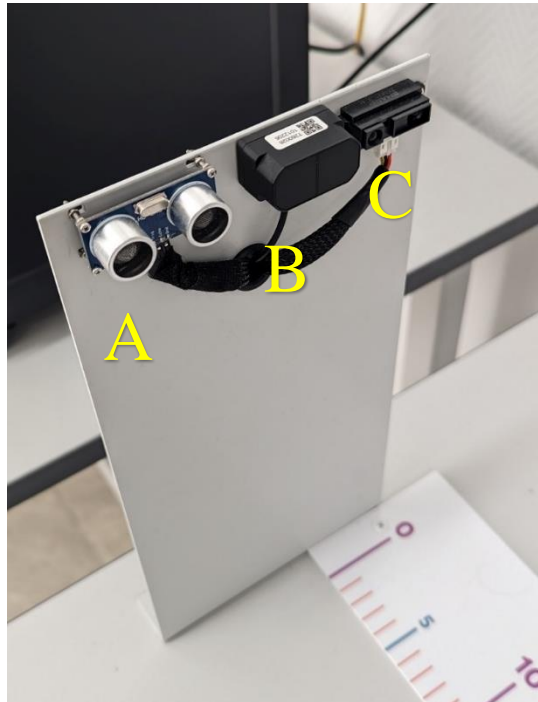


Fig. 1 Rangefinders on the laboratory stand.

The ROS system is used to decode the signals from the rangefinders and transmit them to the computer. This enables us to obtain new data every 50 ms.

The measurement results when the object is initially placed at a distance of 60 cm and then at a distance of 45 cm can be seen in Figure 2.

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Fig. 2. Distance measurement results by different sensors.

Here, lidar - refers to the laser rangefinder, ir - refers to the infrared rangefinder, and us - refers to the ultrasonic rangefinder. By comparing and analyzing the data, we can come to the following conclusion: the most accurate rangefinder is of the laser type. The obtained results are due to the different operating principles of these rangefinders. The laser and ultrasonic rangefinders operate on the following principle: a source generates a signal, a timer is activated, the signal reflects off the object, and the receiver detects the transmitted signal, after which the timer is turned off. By knowing the speed of the signal and the time it takes to travel, the distance is calculated. On the other hand, the infrared rangefinder is equipped with a position-sensitive receiver that outputs varying voltage depending on the angle at which the generated signal reaches it. Following that is the ultrasonic, while the infrared rangefinder exhibited the lowest accuracy. Consequently, the most suitable for installation on unmanned transportation is the laser rangefinder.

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