

Practical Application of Low-Cost Sensors for Static Tests

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1 Experiments

The device was tested against for the same measurement against different materials. In Figure 1, 2 tests with and without extreme ambient light have been done for getting the distance from the big book. For the one with the light bulb, the temperature sensor has been moved a bit far from the source of the light and heat. The other tested objects were a white paper, a black paper, a clear and transparent plastic cover, and some thin tissues. In Table 1, standard deviations driven from the performed tests have been illustrated.

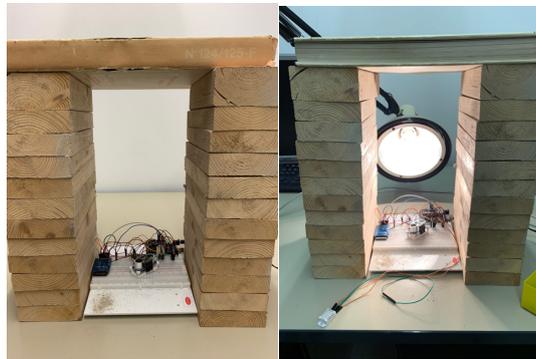


Figure 1. Experiment formation.

In Table 1, the last column has been created to provide filtered data from the first laser sensor due to the extreme environmental light and heat test. The filter has deleted the ranging outputs equal to 8190. When this sensor is not able to read, or the measurement distance is more than its capacity, it declares this number.

Table 1. Ranging result of the same experiment under different circumstances.

Tests Sensors type	a thick book	a white paper	a black paper	a transparent plastic cover	a tissue	Extreme ambient light	Extreme ambient light*
Ultra (Kamal and Hemel, 2019)	0.61	1.87	1	0.7	352	3.23	–
Laser1 (Adafruit, 2016)	2.5	2.67	7.18	5.46	4.66	3607	39.86
Laser2 (Adafruit, 2018)	1.5	1.48	1.87	3.12	1.62	21.94	–

It should be mentioned that the ultrasonic sensor, which was the chipset sensor and the easiest one to install, had shown better performances compared to the laser ones. On the downside, this sensor needs 5v interaction digital ports and needs at least 4 volts for its full functionality. The only problem with this sensor could be its data providing speed. Although the laser has a faster rate (50Hz data production), this sensor has a frequency of only 20Hz. In other words, this sensor can provide up to 20 data each second. The biggest problem with the ultrasonic sensors would be their dependence on ambient temperature and humidity, since the speed of sound changes from an environment to another. This sensor needs an accurate speed of sound for its calculations. The proposition of this paper would be using the ultrasonic sensor with a laser sensor if there was the probability of changing temperature or of extreme ambient light. Using the first laser sensor or the second one is due to what range and circumstances the experiment may experience.

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