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Aspects of optical and inductive displacement sensors for industrial applications

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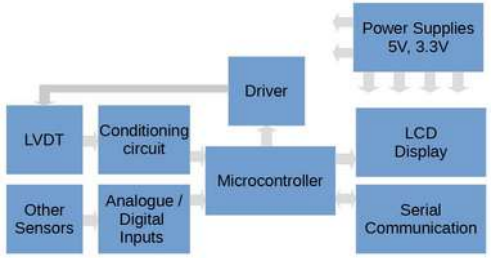
Typical industrial application with displacement measurement.

Measurement setup for inductive sensors

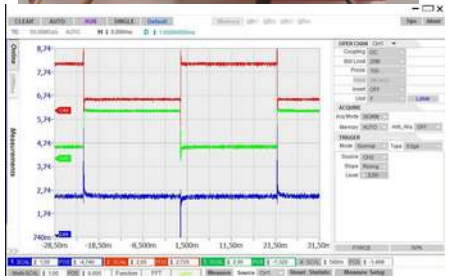
The paper focuses on analysis of inductive and optical displacement sensors and their use in industrial applications. Differential inductive displacement sensors, usually in the form of linear variable differential transformer LVDT, are widely used in hydraulic applications because they have excellent accuracy, robust construction and are able to measure large displacements (in hundreds of millimeters range). However, they are large, heavy and offer slow measurements. For fast measurements, in millisecond range, optical sensors like time-of-flight ranging sensor could be a better choice, and present paper investigates their performances and compares them in this regard with inductive sensors.



Structure of developed module for displacement sensors readout.

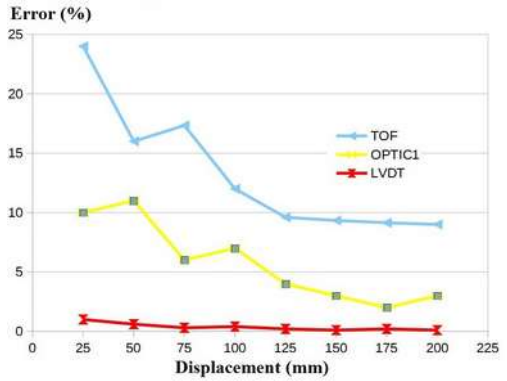
Testing setup with electronic ruler for optical sensors for displacement measurement.

Inductive sensor and its associated control module.



Voltages on inductive sensor, one period

Relative error of analyzed



Conclusions

Differential inductive sensors offer good accuracy, are robust and immune to dust and dirt, so they meet the requirements that make them a good option for industrial applications. They have also disadvantages, like price, bulkiness, lower speed or requirement for complex electronics for signal processing. Optical sensors for displacement measurement have not these disadvantages, but practical tests show that they fail to meet the requirements for industrial application - their poor accuracy being the main problem.