SAW Sensor & Actuator Symposium 2020

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SAW Symposium 2020 KEYNOTE talk

Magnetic SAW sensors: State of the art, trends and potential applications

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Interest in the development of sensors for the detection of magnetic field has never stopped growing, given the wide range of applications that can be addressed. Recent developments in the field of the IoT, the industry 4.0 and autonomous vehicles have generated new needs and in particular for wireless magnetic sensors with small size, lightweight, compactness, and lower power consumption or even self-powered (batteryless). Current researches focus on devices that can take advantage from MEMS technology to scale down the sensors.
Surface acoustic wave (SAW) devices, are key components in communication systems and are widely used as filters, delay lines or resonators and are still relevant for the development of 5G compatible technologies or beyond. Because SAW devices are highly sensitive to external physical parameters and to any disturbance that may affect the velocity, distance travel or even the mode of wave propagation, they also offer very promising solutions as sensors in a wide range of applications including magnetic field detection. SAW sensors have the advantage of being robust, small, passive, wireless and even packageless in specific configurations. In reflective delay line (R-DL) configuration, they can integrate the identification code and operate as an RFID which allows simultaneous interrogation of several sensors. Combined with magneto-strictive layer, SAW sensor could exhibits a controlled sensitivity to magnetic field intensity and direction.

In this lecture, an overview of general principle of the Magnetic SAW sensor (MSAW) in wired and wireless configurations and developments needed to implement this technology will be given. A review of recent works including from our group will be presented by positioning them with respect to the state of the art. The sensitivities, detection limits and range of detection will be specified for each structure and configuration considered.
Finally, and depending on MSAW performances, examples of potential applications (exiting or new ones) will be proposed and analyzed together with a future outlook of what MSAW technology can bring.