



## ความต้องการงานวิจัยด้านเซนเซอร์เชิงนวัตกรรมสำหรับอุตสาหกรรมของประเทศไทย

### Need of Researches on Innovative Sensors for Thailand's Industry

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ภาควิชาวิศวกรรมไฟฟ้า และคอมพิวเตอร์ คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าพระนครเหนือ

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The 12<sup>th</sup> National Economic and Social Development Plan of Thailand for the years 2017–2021 was launched. The implementation of the plan started on 1 October 2016 and has been continued until 30 September 2021. This plan works out in accordance with the 20-year national strategy, between 2017 and 2036, which consists of six areas, six primary strategies, and four supporting strategies. The six areas include security, competitiveness enhancement, human resource development, social equality, green growth, and rebalancing and public sector development. The primary strategies seek to enhance and develop the potential of human capital, ensure justice and reduce social disparities, strengthen the economy and enhance competitiveness on a sustainable basis, promote green growth for sustainable development, bring about national stability toward prosperity and sustainability, and enhance the efficiency of public sector management and promote good governance. Also, Thailand 4.0 plan was realized for three major changes: changing in production of commodities into innovative products; transforming industry-driven activities

into those driven by technology, creativity, and innovation; and shifting from the focus on making products to providing sustainable services. That means leaving behind traditional farming and embarking a substantial phase of smart farming. The plan also calls for the upgrading of traditional small and medium-sized enterprises into smart enterprises. Also, new SMEs should strive to become start-ups that branch out on their own into potential growth areas. The plan lists five technological and industrial groups that can help boost the country towards a new status: food, agriculture and biotech; health, wellness and biomedical; smart devices, robotics and mechatronics; digital, Internet of Things (IoT), artificial intelligence and embedded technology; and creative, cultural and high-value services.

According to the 12<sup>th</sup> National Economic and Social Development, the 20-year National Strategy, and Thailand 4.0 Plans, innovation is one of the most important concerns. For all manufactures, sensors are key parts of innovation and product design. With advances in micromachinery and easy-to-use microcontroller platforms, the uses of

sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement, for example biomedical sensors. Applications of sensors include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life. However, there are many different types of sensors, depending on properties, measured or sensed parameters, functional principles, and applications. There are many sensor technologies as well. Therefore, a vast variety of different sensors and classes of sensors are being addressed for many applications. One class of sensors is high frequency and microwave sensors, which includes electromagnetic sensing principles as well as wireless sensors. The latter are strongly connected with radio-frequency identification (RFID), used for recognition of individual sensor nodes. The RFID techniques are especially preferred if large operating distances are required. Although high frequency and microwave sensors are generally more expensive than sensors working at low frequency, there is a growing interest in using them due to some feature properties can not be provided by other sensors. The most prominent examples are the radar

sensors that have already made their way into a large number of applications such as air traffic control, buried object observation, and body scanners. These applications use contactless and wireless sensing techniques, being an advantage in harsh or moveable environments as found in many industrial sites. Beside this, the interaction between electromagnetic waves and materials is beneficial for several applications, where the analysis of the structure, composition, and function of a certain component is of interest, such as the study of biological cells and organic tissues, and also for the monitoring of industrial processes. All these features are currently the subject of many research activities.

Because sensors are needed for Thailand's industry development, I therefore encourage all engineers and researchers to focus on the researches of innovative sensors and sensor systems for various applications. Some new materials including metamaterials and nanomaterials should be applied to the sensor structures for performance improvement. Also, the wireless sensor networks should be studied and implemented for some specific applications.



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