THESES OF THE DISSERTATION

Dissertation title:

Low Resolution Infrared Proximity Array Based 3D Object and Force Reconstruction, and Modular Oscillatory Arrays

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Thesis I.:

Object outline and surface trace detection using 3D imaging based a low resolution proximity array containing infra LEDs - photodiodes.

A. I have designed and implemented a low resolution infra LED – photodiode based proximity array. Using several photodiodes to detect the reected light from each infra LED, an iterative method was developed to calculate the angle of incidence in case of at objects with known α_i parameters, to achieve more precise distance measurement.
B. A new method has been given to decrease the smoothing effect at object edges during the sensor array motion.
C. I have demonstrated in mobile robot experiments that the sensor array is capable of detecting on road localization landmarks and obstacles before crossing.

Thesis II.:

Design of a low cost 3D optical compliant tactile sensor that is capable of measuring three-axial directional force components and the location of the contact point.

A. I have designed a robust layered structured elastic cover which supports the realization of small sized sensors (<1cm).
B. I have designed a calibration process to measure the sensor characteristics. I have shown a method to measure the location point position on the sensor surface.

Thesis III.:

Design and implementation of an architecture for interconnecting single cell chaotic oscillators with any active or passive two pole components.

A. I have designed a modular hardware architecture for connecting any kind of (even chaotic) oscillator in di_erent kinds of topology (practically limited to 4x4xn) with any active or passive two pole component. I have observed a new phase lag synchronization phenomenon in weakly coupled chaotic oscillators during the transition from de-synchronization to synchronization in case of 1D, 2D and 3D CNN like topology.