



Remote Photonic Sensing of Diseases with an Electronic Ear

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ABSTRACT

I will present a technological platform that can be used for remote sensing of biomedical parameters and as a consequence to assist in remote diagnosis of diseases. The technology is based upon illuminating a surface with a laser and then using an imaging camera to perform temporal and spatial tracking of secondary speckle patterns in order to have nano metric accurate estimation of the movement of the back reflecting surface. If the back reflecting surface is a skin located close to main blood arteries then biomedical monitoring of various parameters can be realized. The main feature of this technology is that the same single sensor is used for sensing of many biomedical parameters simultaneously. The proposed technology was already applied for remote and continuous estimation of heart beats, respiration, blood pulse pressure, intra ocular pressure, blood coagulation, oximetry, remote estimation of alcohol and glucose concentrations in the blood stream, detection of fractions in bones and sensing of melanoma.

Since many of the movements are related to various sound signals generated in the body (e.g. vibration of our skull is related to the sounds we are making and one of the first applications of our technology was to hear people talk from large distances), our sensor is basically a very sensitive electronic ear. The main aim of our research is to be able to hear the “noises” that various parts and organs of our body are doing and based on that to be able to early diagnose (in a non-contact and continues manner) developing diseases or malfunctioning of the body.