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METHOD FOR UNOBTRUSIVE MEASUREMENT OF INDOOR AIR EFFECTS ON THE CARDIO-RESPIRATORY FUNCTIONS

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Abstract

In this paper we describe a wireless system, including smart sensing nodes for indoor air quality and unobtrusive cardio-respiratory monitoring. The sensing nodes include a set of solid state gas sensors, sensors for temperature and relative humidity, a microwave Doppler radar sensor for cardio-respiratory function, and appropriate conditioning circuits expressed by active filters and amplifiers. The analog signals provided by the signal conditioning circuits is applied to a data acquisition module (DAQ) wireless or wired connected to a computer that works as part of a client-server architecture that allows monitoring the relation between indoor air quality and the cardio-respiratory function. Measured air pollutants include carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxides (NO_x), ozone (O₃), and volatile organic compounds (VOCs). Using signal from a Doppler radar sensor, the heart rate, the respiratory rate and the heart rate variability is calculated. Evidences on the relation between heart rate variability and air quality are discussed. The described system for air quality and cardio-respiratory signal monitoring may be a tool for long term monitoring of the effects of air quality on humans' organism.

Key words: FMCW Doppler radar, heart rate variability, indoor air quality

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