

Air Pollution Estimation Based on the Intensity of Received Signal in 3G/4G Mobile Terminal

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Abstract

In order to estimate the attenuation in a communication system, it is necessary to take into account not only the attenuation due to the medium in which our wave propagates, but also all the components of which the system is composed. The electromagnetic wave signal may suffer attenuation by suspended particles. Particulates Matter is defined as mix of all solid and liquid particles suspended in air. PM can be originated from natural processes (soil erosion, forest fires and pollen dispersion) and human activities, typically combustion processes, road transport and vehicular traffic. Moreover, secondary air pollutants through chemical reactions in the atmosphere such as nitrogen oxides, sulfur dioxide, ammonia and Volatile Organic Compounds form sulfates, nitrates and ammonium salts. In our experimental campaigns carried out in the territory of Catania (Italy), the main source contributions to high levels of particulate PM10 are traffic congestion, vehicular traffic, natural sources as desert sand transported by air masses from North Africa and volcanic eruption injection or volcanic passive degassing since Catania is situated on east coast of Sicily under the active volcano Mount Etna. In this paper we propose a new Air Pollution Estimation method based on a probabilistic neural network on the Intensity of Received Signal in 3G/4G Mobile Terminal. For the estimates of the effective signal attenuation and particulate matter PM10 have been required measurements of signal strength using Ubiquiti NanoStation at frequency of 2.4 Ghz in controlled ambient. The experimental set-up provides a tube in each side locked with many perforations from which different sources of PM10 are injected. To control the emission of PM2.5 and PM10 Aerocet 531S Handheld Particle Counter is located into the tube

References

1. A. MUSA S. O. BASHIR A.H ABDALLA. Review and Assessment of Electromagnetic Wave Propagation in Sand and Dust Storms at Microwave and Millimeter Wave Bands. Part I.. Progress In Electromagnetics Research M (2014) , 40, 91-100.
2. G.CAPIZZI G. LO SCIUTO P. MONFORTE C. NAPOLI. Cascade Feed Forward Neural Network-based Model for Air Pollutants Evaluation of Single Monitoring Stations in Urban Areas. International Journal of Electronics and Telecommunications, 61(4), 327-332..