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S E M I N A R

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RAIN ESTIMATION FROM STANDARD RECEIVED SIGNAL LEVEL MEASUREMENTS TAKEN FROM COMMERCIAL MICROWAVE LINKS

Abstract

Recently, Commercial Microwave Links (CMLs) have been used as virtual sensors for rainfall monitoring. This technique is most attractive as it capitalizing on existing, widely spread, cellular networks. To minimize the burden to the cellular providers, it has been proposed to use existing measurements of the Received Signal Level (RSL), which are routinely collected and logged by the Network Management Systems (NMSs). However, the NMSs usually produce a quantized version of the minimum and the maximum observed received signal levels (reported at 15-minute intervals).

This study is focused on the use of statistical signal processing techniques for extraction of the rainfall information from these coarse RSL measurements. The idea is to treat the rain intensity in a given location and at a given time as a sample of a random process, and to apply parameter estimation techniques on the available received signal level observations. The estimates reveal the rain statistical properties, which in turn are used to calculate the averaged rain intensity and the accumulated rainfall. Differently from previous approaches, the theory behind each step of the presented workflow is rigorously established and proven, including the calibration of the rain-induced attenuation model for use with extreme attenuation measurements. Furthermore, the fact that the produced samples are quantized is analyzed and treated systematically for the first time. The presented workflow is applied and demonstrated on actual measurements as recorded by CMLs.