

Detection and Correction of Single-Sideband Carrier Frequency Mismatch by Means of Speech-Signal Characteristics

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ABSTRACT

In some radio-supervision applications, speech signals with uncertain carrier frequencies may be detected. Beyond strong noise and other disturbances, carrier mismatches distort the demodulated SSB signals by frequency shifts. Our detection and correction of such errors exploit two characteristics of natural speech signals: a) Voiced parts are ("short-time") periodic, i.e., they have a line spectrum with multiples of a fundamental frequency often termed "pitch frequency" f_p . b) The periodicity is slowly varying, yielding a more or less random variation of f_p . After a carrier mismatch, the harmonic structure of voiced speech is destroyed by shifts, whereas equi-spaced spectral lines are maintained. Pitch-detection methods are applicable, need, however, to be noise-robust and modified to handle the frequency shift. Two versions are shown to reliably correct carrier errors, if they are smaller than $f_p/2$. An extension of this a-priori error-range is briefly addressed, as well as combinations with standard noise-reduction techniques and a novel pause-noise suppression.