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| ADAPTIVE CO-CHANNEL INTERFERENCE CANCELLATION FOR OPENBTS |
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ADAPTIVE CO-CHANNEL INTERFERENCE CANCELLATION FOR OPENBTS

Prof Dr. Magdi Fikri

**Abstract:**

In cellular mobile communication systems carrier frequency reuse is made mainly for two reasons, to increase spectral efficiency and to increase system capacity. Frequency reuse causes the phenomena of CCI (co-channel interference), this phenomena leads to an undesired signal at the receiver superimposed on the desired signal. Thus, the uplink system capacity is limited by the ability of base stations to recover the desired signal in the presence of CCI.

CCI necessitates interference suppression techniques; one of these techniques is Joint detection. A practical single-antenna joint-detection receiver can provide significant gain in system capacity for the TDMA (time-division multiple- access). [10]

Joint detection is an effective technique for interference cancellation in both CDMA (Code vision multiple access) and TDMA systems. We focus on TDMA systems, specifically GSM(Global system for mobile communication).JMLSE (Joint maximum-likelihood sequence stimation) of symbol-synchronous co-channel signals is known, however, in the GSM system, base station transmitters are not synchronized, so that desired and interfering signals are symbol-synchronous.

We extend the joint MLSE (Maximum likelihood sequence estimator) formulation to this case. The resulting receiver samples the received signal at multiple timings, corresponding to the timings of the co-channel signals. Because the receiver has typically cost, size, and power-consumption constraints, an approximation is made to simplify the formulation so that only one timing, the timing of the desired signal, is used.

The receiver simply consists of a single user detector, a two-user joint detector, and a control Unit that dynamically selects one of the two detectors .Each detector consists of a synchronization unit, an acquisition unit, and a demodulation unit. The receiver has an analog front-end ﬁlter which is matched to the transmitted pulse-shaping ﬁlter.

**CONCLUSION:**

We found that OpenBTS system can work properly with all its features using GMSK modulation technique, so we began with simpler modulation technique which is QPSK modulation technique to make us able to do primary test to our algorithm easily without complicated data packets as that is used in GMSK modulation technique that is used in real GSM systems.

But, we noticed that using QPSK made us unable to reach the expected results from the cancellation algorithm as it was based on a linear detection method (Linear Viterbi) which can‘t simulate a real GSM system where all data are non-linearly modulated.

So , we decided to rebuild our algorithm with a non-linear modulation technique (GMSK) to reach the real GSM system results, but our progress was stopped when we discovered that there is no a known metric that can be used inside the viterbi algorithm for detecting the desired user and vanish the interferer.

Then, we found that the only way we can move through is to find an intermediate modulation technique that achieves both requirements (i.e. with a less complicated detection metric and at the same time give a results that is close to the real GSM system) which was found in OQPSK modulation technique.

The main difference between QPSK & OQPSK, that in OQPSK, only a 90 degree phase shift is allowed to avoid the discontinuity that occurs in QPSK waveform in case of 180 degree phase shift.

This can be done by offsetting the quadrature phase ( Q ) & the in-phase ( I ) from each other to prevent the transition ( 00 ---> 11 ) & ( 10 ---> 01) which leads to a 180 degree phase shift.

Offset QPSK can be viewed as either a phase modulation or a frequency modulation.

Because the shaped variants of OQPSK are best interpreted from a frequency modulation viewpoint, we will adopt the FM description here. If we use the notation commonly employed for Continuous Phase Modulation (CPM) waveforms.