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• Fuzzy hybrid approach in areas of
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Introduction

• In wireless Communication system, the channel is the medium by which information bearing signal are transfered from transmitter to a receiver.

• During transmission the signal faces distortion imposed by the channel and enviromental factor i.e noise, obstacles.

• Due to multipath propagation, the receiver encounters many signal paths from the transmitter, whereby each of this path is delayed.

• The aim of the receiver is to receive the signal and to overcome the disturbances or interference reconstructing the original signal with minimal distortion.
Use of Fuzzy Logic in Channel estimation

• The purpose of channel estimation is to accurately describe the channel and track its variation.

• Channel equalization and decoding recover the original transmitted data.

• In time varying channels, adaptive techniques have to be employed and this is the area fuzzy techniques and neural network is used.
Channel Estimation

- Channel estimation is performed by tracking the channel coefficients, applying a fuzzy tracking method in multipath fading CDMA.
- Fuzzy tracking method is based on associative memory models.
- Fuzzy associative memory models combines fuzzy logic and single-layer feed-forward neural network that saves the fuzzy logic rule based in matrix form.
- The output of the fuzzy tracker yield a correction term for the next coefficient.
• The tracking used in is iterative with estimated symbol being used in the prediction of the coefficient.

• There are two inputs to the fuzzy tracker: the difference between the measured and predicted coefficients and the change of difference between current and previous.

• There are two methods for estimating the channel parameters at each subcarrier:
  - Blind channel estimation techniques
  - Pilot assisted channel estimation.
    - Used in Minimum Mean square error (MMSE) Algorithms
    - Least Square (LS) Algorithms
    - Least Mean Square(LMS) Algorithms
Channel Equalization

• It involves the process of removing the degradation cause by channel with them of reconstructing the transmitted signal.
• Fuzzy adaptive filters based on both the LMS and recursive Least Squares (RLS) algorithms are constructed and applied to channel equalization.
Decoding and Equalization

• In contrast to other conventional communication systems where coding /decoding and channel equalizations are performed separately, turbo equalization schemes combine the two.

• Turbo equalizer have been implemented with bayesian algorithms and TSK fuzzy logic system is able to implement a Bayesian model in turbo fuzzy equalization approach.

• One critique against the turbo-fuzzy equalizer in is its inability to use prior information provided by decoder
Conclusion

• The neural network and adaptive algorithms are commonly used in order to train the parameters of membership function in a fuzzy interference system

• Fuzzy adaptive filters are able to use input from both human expert and or training data.