



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title: **Investigation on Some Approaches for Improving Channel Equalization in Wireless Environment**

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SHORT ABSTRACT

This thesis deals with channel equalization techniques for mitigating the effect of inter-symbol interference owing to the multipath propagation, and rapid channel variations due to the large Doppler spread in a band-limited wireless channel. In this work, we investigate the channel equalization performance using some algorithms, which to our best of knowledge have not been adequately explored in the context of realization of the decision feedback equalizer. We use data-reusing 'Affine Projection' (AP) and 'Binormalized least mean square' (BNLMS), and data-selective 'Set-membership Normalized least mean square' (SM-NLMS), 'Set-membership Affine Projection' (SM-AP) and 'Set-membership Binormalized least mean square' (SM-BNLMS) as adaptive algorithms to track the time-varying characteristics of the mobile channel. Objective of this work is to reduce the complexity of time domain equalizers, at the same time maintain their performance adequately in a fading environment.

In recent times, multiple-input multiple-output (MIMO) communication has come up as one of the most promising technologies due to its advantage in terms of high data rate and diversity gain without any additional bandwidth and power. MIMO figures prominently in the rapidly developing modern wireless systems such as WLAN, WiMAX, and Long-term evolution (LTE). Design of equalizer for MIMO receiver maintaining a balance between complexity and performance is quite challenging. This thesis also investigates the problem of channel equalization in MIMO dispersive fading environments. Performance evaluation of the decision feedback equalizer (DFE) for a MIMO system using data-reusing and data-selective adaptive algorithm has been carried out in this thesis, and some aspects of implementation of such equalizers have also been discussed.

The contribution of this thesis work includes performance investigation and feasibility assessment of data reusing and data selective algorithms for the realization of adaptive DFEs on a practical frequency selective single-input single-output (SISO) and MIMO channels. The performance analysis includes evaluation of convergence speed, computation requirement, steady-state error and BER, when such algorithms are used in DFE for ITU-R wireless channel models recommended by the WiMAX forum.