THIS THESIS AIMS TO PROVIDE A ROBUST MULTIUSER DETECTION STRUCTURE THAT ADAPTIVELY TRACKS SIGNATURE WAVEFORM DISTORTION FOR FADED CDMA SIGNALS. WE FIRST SYSTEMATICALLY SURVEY VARIOUS LINEAR MULTIUSER DETECTORS (LMDS) AND EXPLORE THEIR CONNECTIONS IN THE AWGN CHANNEL IN PRACTICAL WIRELESS ENVIRONMENT, MULTIPATH FADING LEADS TO SIGNATURE WAVEFORM DISTORTION. THAT SEVERELY DEGRADES THE PERFORMANCE OF THE LMDS DESIGNED BY EXPLOITING THE ORIGINAL SIGNATURE WAVEFORM. THE IMPACT OF SIGNATURE WAVEFORM PERTURBATION ON THE PERFORMANCE OF THE LMDS IS EXTENSIVELY ANALYZED IN THIS PAPER. IN WHAT FOLLOWS, AN ITERATIVE ALGORITHM IS PROPOSED TO TRACK THE SIGNATURE WAVEFORM PERTURBATION SUCH THAT THE DETECTOR CAN BE DESIGNED BY EXPLOITING THE ESTIMATED EFFECTIVE SIGNATURE WAVEFORM. THE RATIONALE OF ADAPTIVE PROCESSING IS BASED ON THE SUBSPACE METHOD AND THE MINIMUM VARIANCE DISTORTIONLESS RESPONSE (MVDR) BEAMFORMING TECHNIQUE. PERFORMANCE EVALUATION REVEALS THAT UNDER HOMOGENEOUS FADING ENVIRONMENT, THE PROPOSED ADAPTIVE MULTIUSER DETECTION STRUCTURE REDUCES THE IMPACT OF SIGNATURE WAVEFORM PERTURBATION ON THE PERFORMANCE OF THE LMDS TO A GREAT EXTENT. MOREOVER, THE PROPOSED ITERATIVE ALGORITHM IS NEAR-FAR RESISTANT SINCE BOTH THE SUBSPACE METHOD AND THE MVDR BEAMFORMING TECHNIQUE ARE ENERGY INDEPENDENT TO THE INTERFERERS.


