

Research on the design of a linearization feedback controller for signal amplifiers helps optimize data transmission performance in wireless data systems (WDS).

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Abstract: This thesis investigates the design of a linearizing feedback controller for signal amplifiers to optimize data transmission performance in Wireless Data Systems (WDS). The inherent nonlinearity of power amplifiers introduces significant signal distortion and spectral regrowth, degrading transmission efficiency and bit error rates. To address this, a control strategy based on feedback linearization is proposed. The study develops a mathematical model of the amplifier's nonlinear dynamics and synthesizes a controller that effectively cancels these nonlinearities, forcing the system to behave as a linear, high-fidelity amplifier. The controller design is validated through simulation and experimental implementation within a WDS testbed. Performance metrics, including Error Vector Magnitude (EVM), Adjacent Channel Power Ratio (ACPR), and data throughput, are evaluated. Results demonstrate that the proposed linearizing feedback controller substantially reduces distortion and improves spectral efficiency compared to conventional amplifier operation. This work provides a robust solution for enhancing data integrity and transmission rates in modern wireless communication systems, contributing to more efficient spectrum utilization.

Keywords: linearization feedback control, signal amplifier, data transmission optimization, wireless data system