MIMO-OFDM Systems Using Sparse Channel Estimation in High-Mobility Situation

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Abstract: This work proposes a new multi antenna channel estimation approach that may be used in high-mobility circumstances like high-speed trains. To improve modeling accuracy, the channel impulse response is decomposed into three domains. The orthogonal frequency division multiplexing (OFDM) frame implements both the time-domain preamble and the frequency-domain pilot. To begin, the time domain training is used to obtain the channel's partial common support. The genetic algorithm's optimal pilot site is then used to construct the framework of structured compressive sensing and recover the channel. The problem is solved using an unique compressive recovery algorithm termed adaptive support-aware block orthogonal matching pursuit for multiple input multiple output OFDM systems. The simulation shows that the proposed scheme outperforms previous schemes in terms of recovery probability, mean square error, and bit error rate over a doubly selective channel with low computing complexity.

Index Terms—MIMO-OFDM, channel estimation, doubly selective channel, structured compressive sensing (SCS).

1.INTRODUCTION

As the demand for communication grows exponentially, multiple input multiple output (MIMO), which benefits from the property of huge capacity, has piqued the interest of both academics and industry. Simultaneously, the capacity of the system can be enhanced by using the orthogonal frequency division multiplexing approach (OFDM). As a result, the aforementioned two approaches are frequently coupled as MIMO-OFDM, which improves communication performance. MIMO-OFDM is not only one of the most important techniques today, but also a future technique. It is critical to execute channel estimate with high precision in order to maintain system performance. Due to the many antennas, proper channel estimate for the MIMO-OFDM system is difficult. In a MIMO-OFDM system, a large amount of channel information must be recovered from all transmit ends for each receive antenna. The time-domain prologue [1] or frequency domain pilot [2] are frequently included in the training. The majority of classic methods use orthogonal training with limited capacity, whose number increases linearly with the number of transmit antennas. A high spectral efficiency channel estimation approach with non-orthogonal training was also proposed [3]. However, channel estimate approaches in high-mobility circumstances, such as high-speed trains [4], [5], have received little