

Transmit Diversity when the Receiver does not know the number of Transmit Antennas

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Abstract – Communications systems employing antenna diversity in practice use varying numbers of transmit and receive antennas. Using different implementations in the same network raises the question of how much the receiver must know about the transmitter in order to communicate at a reasonable rate. In particular, must the receiver know precisely the number of transmit antennas, or will it suffice to know only the transmit code? This question is answered in the framework of space time codes based on orthogonal designs. We assume a transmitter having K of N antennas. Two receivers are constructed; one which is informed of the value of K , and another which is not. We examine the coherent communications problem, and show that there is a performance loss which is a function the ratio $\frac{K}{N}$. We show this to be due solely to channel estimation, rather than symbol detection, and that the performance loss can be made arbitrarily small. We then examine the differential detection scheme using orthogonal space time codes. For the 2×2 space time code and 1 of a possible 2 transmit antennas, we show the performance is the same whether the receiver knows the number of transmit antennas or not. For the single transmit antenna case, the performance is the same as for conventional DQPSK. These results extend to larger differential space time codes.