

Tips for generating the channel LLR.

The derivation of the branch metric for turbo decoding on page 830 of the textbook assumes an AWGN channel. Note that for your course project, you will consider an MIMO, not an AWGN channel. Thus, it is important that you provide the correct input to your turbo decoder to make it work for the MIMO channel. The input to the turbo decoder should be the channel LLR for each bit

$$\lambda_i = \log \frac{P(x_i = +1 | \mathbf{r})}{P(x_i = -1 | \mathbf{r})},$$

where \mathbf{r} is the received sequence. For the special case of AWGN channel, the channel is memoryless, and thus $\lambda_i = L_c r_i$. For general channels, the λ_i might not have a simple closed form, and thus you need to use the maximum a posterior probability (MAP) detector to generate λ_i . The papers that you are reading for your course project tell you how to implement the MAP detector for your channel of interest. Once λ_i is generated by the MAP detector, these will be passed to turbo decoder for decoding. The turbo decoder does not have to worry about what channels you are dealing with, as long as you provide the correct channel LLR as input, the turbo decoder will perform iterative decoding in the standard way.

To be specific, given the channel LLR λ_i , you only need to replace $L_c r_{ul}$ by λ_{ul} and $L_c r_{pl}$ by λ_{pl} in (16.109), page 830, to make it work for the MIMO channel.