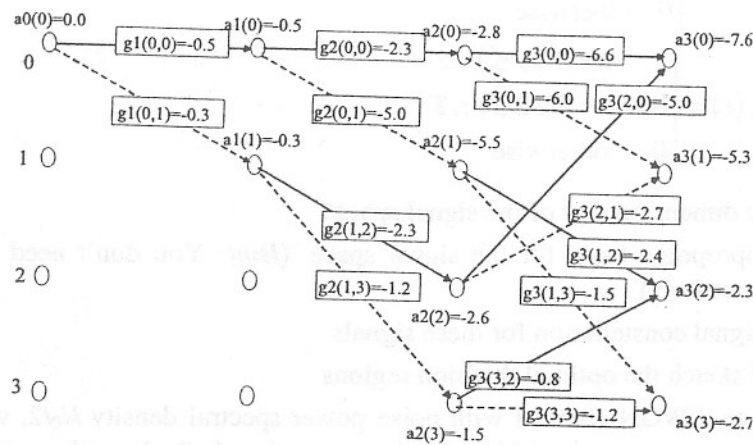


4. Explain briefly the main ideas of the BCJR algorithm and discuss its role in detection/decoding in advanced communications systems. What are the similarities and differences with the Viterbi algorithm? How are the log-MAP and max-log-MAP algorithms related to BCJR? The figure shows an example of trellis-based calculations in one of the mentioned algorithms. Explain how the calculations are carried out, for example, explain how $a_3(2)$ is obtained. In addition to the shown forward recursion, what other main steps are included in the overall algorithm?



5. Discuss the different approaches in multi-antenna communications. Which different kind of gains can be achieved through the use of multiple antennas? Can the different gains be achieved simultaneously? Explain also the significance of antenna spacing and nature of propagation environment in the choice of multi-antenna approach.

- DIVERSITY GAIN (STBC, STTC FULL DIVERSITY)
- ARRAY GAIN (IMPROVEMENT IN SNR)
- CODING GAIN