

Sources With Memory

Information Theory Exercises

1. Consider a discrete source with memory, with the graphical representation given below. The states are defined as follows: $S_1 : s_1s_1$, $S_2 : s_1s_2$, $S_3 : s_2s_1$, $S_4 : s_2s_2$.

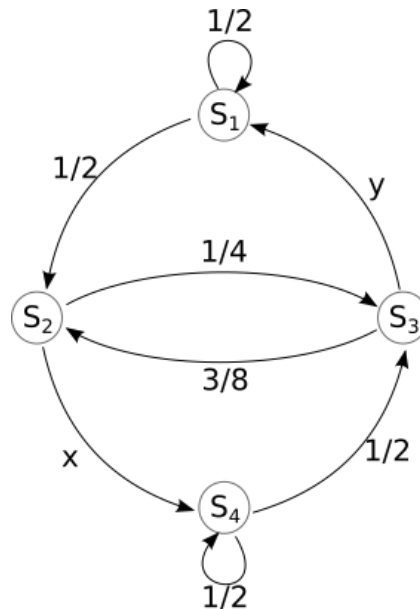


Figure 1: Graphical representation of the source

- a. What are the values of x and y ?
- b. Write the transition matrix $[T]$;
- c. What is the probability of generating s_1 if the current state is S_3 ?
- d. If the initial state is S_4 , what is the probability of generating the sequence $s_1s_2s_2s_1$?
- e. Compute the entropy in state S_4 ;
- f. Compute the global entropy of the source;
- g. What are the memory order, m , and the number of messages of the source, n ?
- h. If the source is initially in state S_2 , in what states and with what probabilities will the source be after 2 messages?