

# RECOGNITION OF PATTERNS IN PERIODIC BINARY SEQUENCES

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## 1. Introduction

When humans are presented with information, they tend to search for structure in the information—to encode it, to organize it, to look for regularities. The existence of this structure-seeking behavior can be seen in the behavior of subjects predicting a random sequence of binary events and in the behavior of subjects predicting more highly structured sequences. (A *random sequence* is a colloquialism for a sequence generated by a mechanism which for two events, 1 and 0, has  $P\{1\} = \pi$  and  $P\{0\} = 1 - \pi$ . A more *highly structured sequence* contains additional constraints on conditional probabilities. A *completely deterministic sequence* is generated by rules of the form " $S_i \rightarrow 0, 1$ " where the  $S_i$  form a mutually exclusive and exhaustive set of states for the events in the sequence, that is, each event follows one and only one state.) Although it is quite clear that subjects search for structure, the details of this structure-seeking behavior continue to elude investigators. In pursuit of models of structure-seeking behavior, investigators have studied behavior on completely deterministic sequences as well as on random and more highly structured sequences. The focus of the present paper will be on models of behavior in experiments using completely deterministic sequences. Two models proposed by other investigators will be reviewed and a third model will be proposed.

## 2. The stimulus-pattern model

In the typical experimental situation of concern here, the subject is asked to predict each symbol in a sequence of binary events. The event sequence consists of repetitions of a basic period, for example, 101010  $\dots$ , 110010110010  $\dots$ . After each prediction, the subject is informed of the event. Thus the experiment consists of an alternation of predictions and events— $P_1E_1P_2E_2P_3E_3 \dots$ . The subject continues to make predictions until he reaches a criterion, for example, a number of consecutive correct predictions equal to twice the length of a period.

In the stimulus-pattern (SP) model (Kochen and Galanter [4]) the subject is depicted as learning the sequence by learning the conditional relations that define the sequence. For example, to learn the sequence 1010  $\dots$ , the subject learns that  $1 \rightarrow 0$  and  $0 \rightarrow 1$ . More complex sequences are learned by learning