Nicholas F Travers* (ntravers@math.ucdavis.edu) and James P Crutchfield. A characterization theorem for exact, unifilar hidden Markov models, and a polynomial time test for exactness.

A hidden Markov model (HMM) is unifilar if the next state is completely determined by the current state and next output symbol generated. A HMM is exactly synchronizable (or exact) if there exists a synchronizing word $w$ such that an observer knows the machine state exactly after observing $w$. We present a characterization theorem for exact, unifilar HMMs, and use it to construct an algorithm for testing exactness. The algorithm is closely based on the DFA table filling algorithm, and runs in polynomial time. More precisely, the total run time is of order $AN^2$, where $A$ is the number of alphabet symbols and $N$ is the number of states. (Received September 20, 2011)