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# Mining approximate periodic pattern in hydrological time series

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There is a lot of information about the hidden laws of nature evolution and the influences of human beings activities on the earth surface in long sequence of hydrological time series. Data mining technology can help find those hidden laws, such as flood frequency and abrupt change, which is useful for the decision support of hydrological prediction and flood control scheduling. The periodic nature of hydrological time series is important for trend forecasting of drought and flood and hydraulic engineering planning. In Hydrology, the full period analysis of hydrological time series has attracted a lot of attention, such as the discrete periodogram, simple partial wave method, Fourier analysis method, and maximum entropy spectral analysis method and wavelet analysis. In fact, the hydrological process is influenced both by deterministic factors and stochastic ones. For example, the tidal level is also affected by moon circling the Earth, in addition to the Earth revolution and its rotation. Hence, there is some kind of approximate period hidden in the hydrological time series, sometimes which is also called the cryptic period.
Recently, partial period mining originated from the data mining domain can be a remedy for the traditional period analysis methods in hydrology, which has a loose request of the data integrity and continuity. They can find some partial period in the time series. This paper is focused on the partial period mining in the hydrological time series. Based on asynchronous periodic pattern and partial period mining with suffix tree, this paper proposes to mine multi-event asynchronous periodic pattern based on modified suffix tree representation and traversal, and invent a dynamic candidate period intervals adjusting method, which can avoids period omissions or waste of time and space. The experimental results on synthetic data and real water level data of the Yangtze River at Nanjing station indicate that this algorithm can discover hydrological periodic patterns effectively.