# Two-Dimensional Jumping Finite Automata

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Finite automata work in a way that the head reads from left to right, starting at the beginning of the input word. It reads the input symbol-by-symbol until the end of the input is reached. Jumping finite automata (JFAs) were proposed with the intention of processing information in a discontinuous way. JFA can jump over part of the input word. Once a symbol is read, it cannot be reread. The read head can start anywhere in the input word. It can move in either direction, left or right. Therefore, the reading of the input word is nondeterministic.

There are one-way jumping finite automata (right and left). Right one-way jumping finite automaton (ROWJFA) operates similarly to JFA, except that its head moves from left to right (starting with the leftmost letter of the input). If there are some symbols to be read by the rule, then it reads the nearest symbol on the right side of the read head. When the end of the input word is reached, and there are still unread symbols, it returns to the beginning and continues. Left one-way jumping automata (LOWJFA) are defined in a similar fashion.

We introduce the two-dimensional jumping finite automata (2-JFA) which played an important role in image processing, as an extension of JFA. The input of 2-JFA is not a one-dimensional array of symbols (as for JFA) but a matrix of symbols. The read head of 2-JFA begins at an arbitrary row and an arbitrary position. When the automaton completes a row by reading its every symbol, it nondeterministically jumps to the other row. It is important to note that the automaton can jump to the other row only after completing the computation of the current row. There are also left and right variants of 2-JFA. Those automata are defined similarly as left or right one-way dwo-dimensional jumping finite automata.