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HEP Pattern Recognition with an Automata Processor

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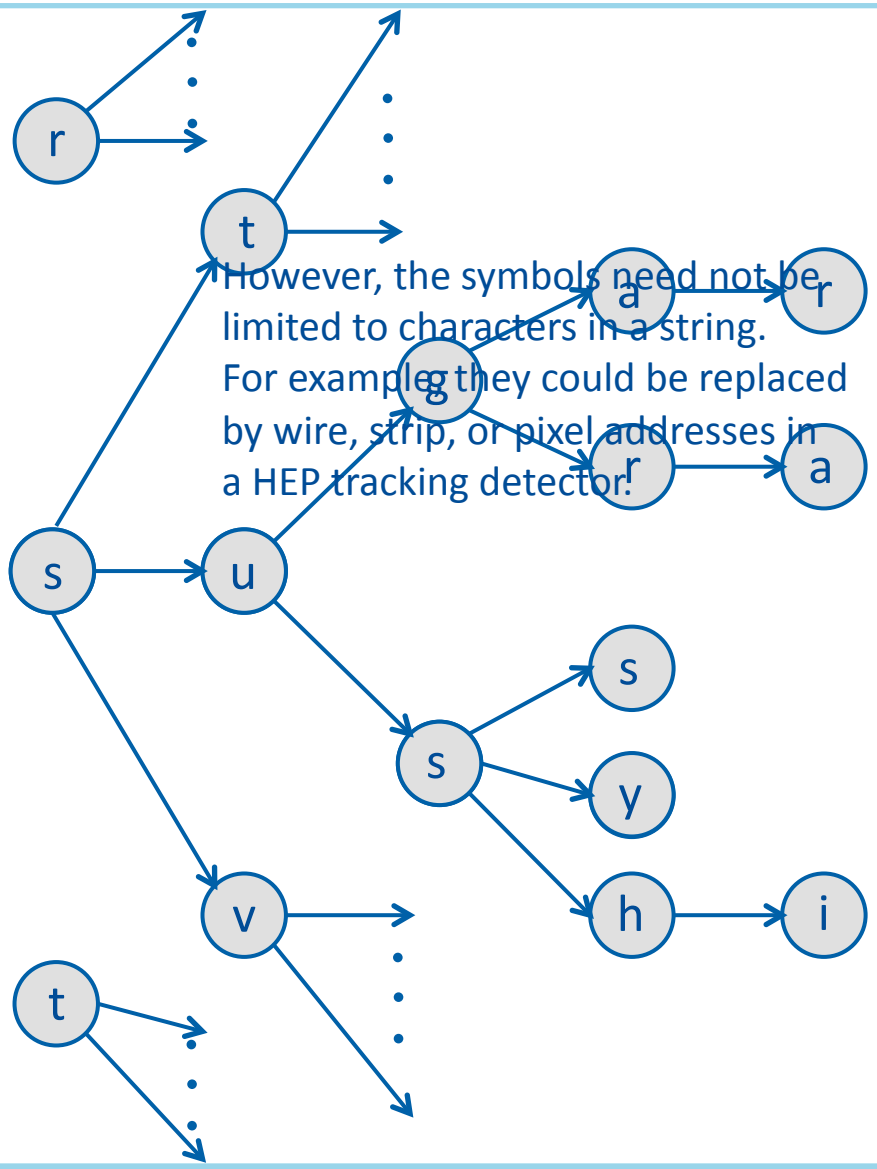
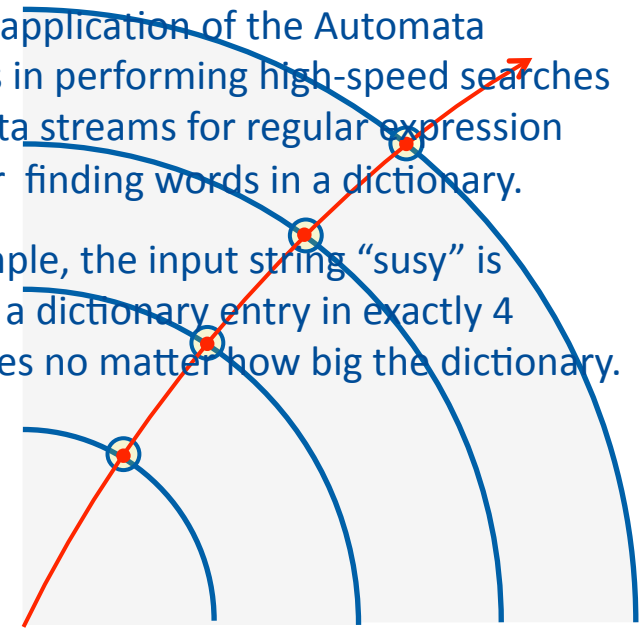
The Micron Automata Processor in High Energy Physics



However, the symbols need not be limited to characters in a string. For example they could be replaced by wire, strip, or pixel addresses in a HEP tracking detector.

An obvious application of the Automata Processor is in performing high-speed searches on input data streams for regular expression matching or finding words in a dictionary.

In this example, the input string "susy" is matched to a dictionary entry in exactly 4 symbol cycles no matter how big the dictionary.



"s u s y"

symbol A - hit address 1

symbol B - hit address 2

symbol C - hit address 3

symbol D - hit address 4

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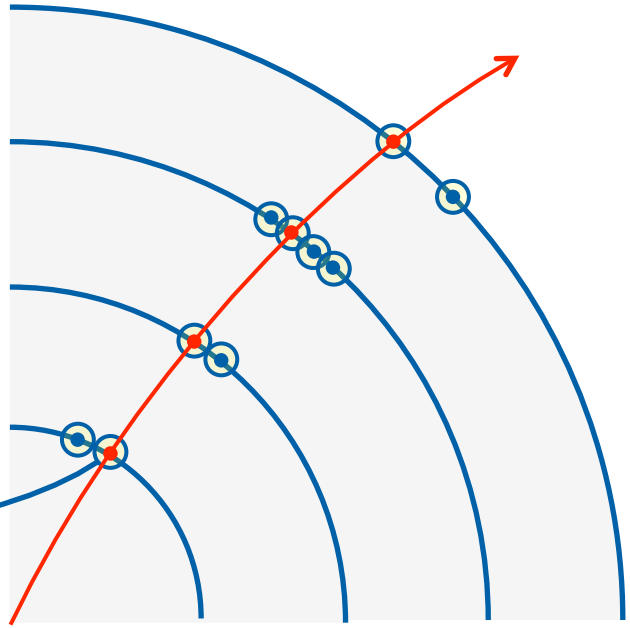
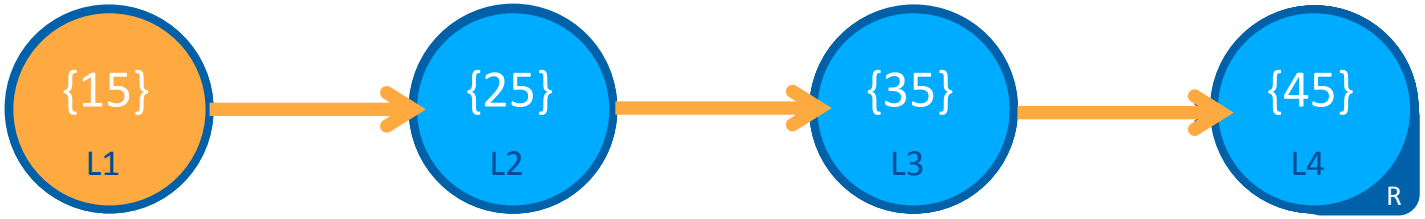
Basic Operating Principle of an Automata Track Finder

Addresses of detector "hits" read out by layer:

15,17,23,25,31,32,35,36,41,45

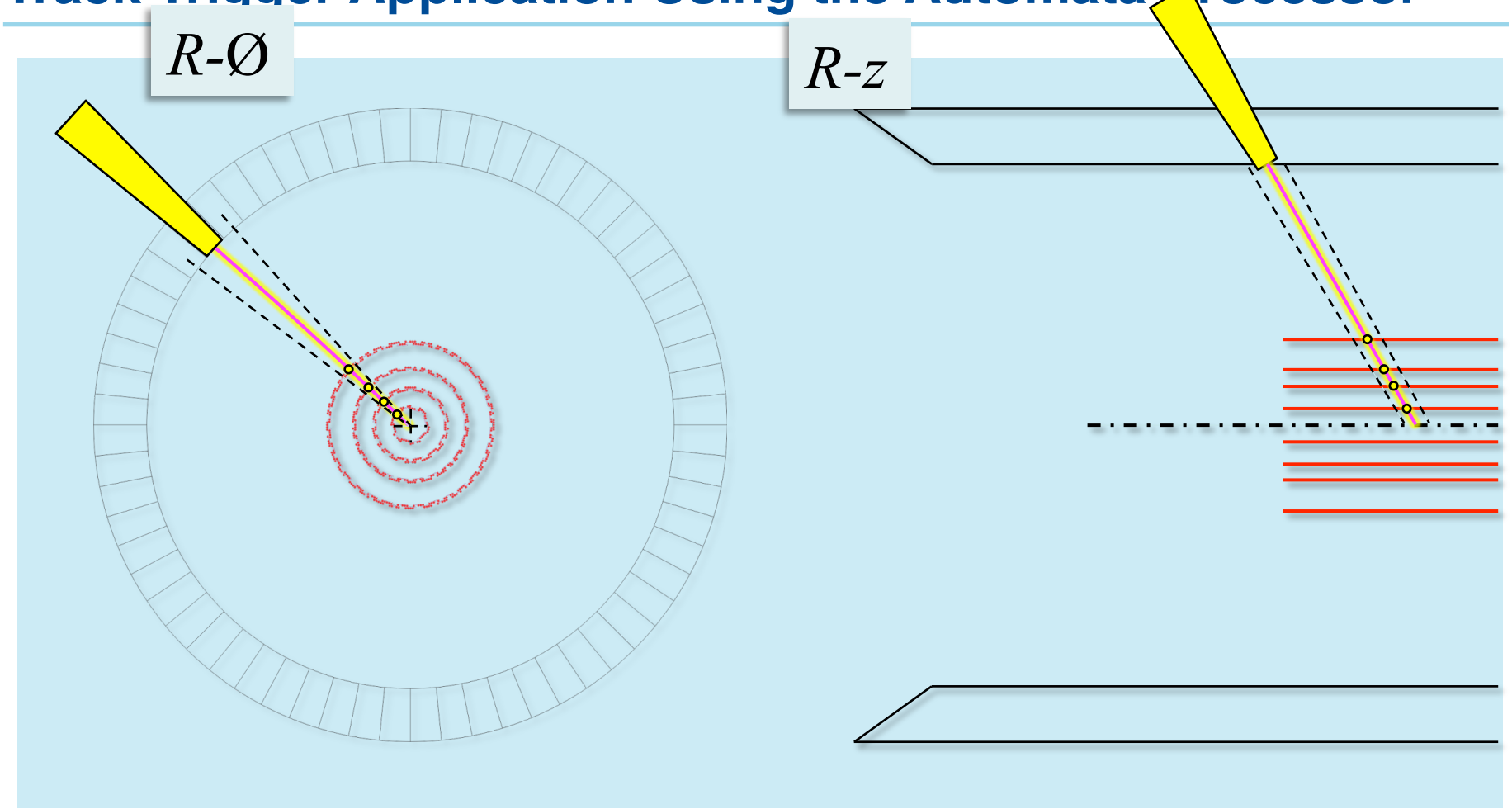
Layer 1 Layer 2 Layer 3 Layer 4





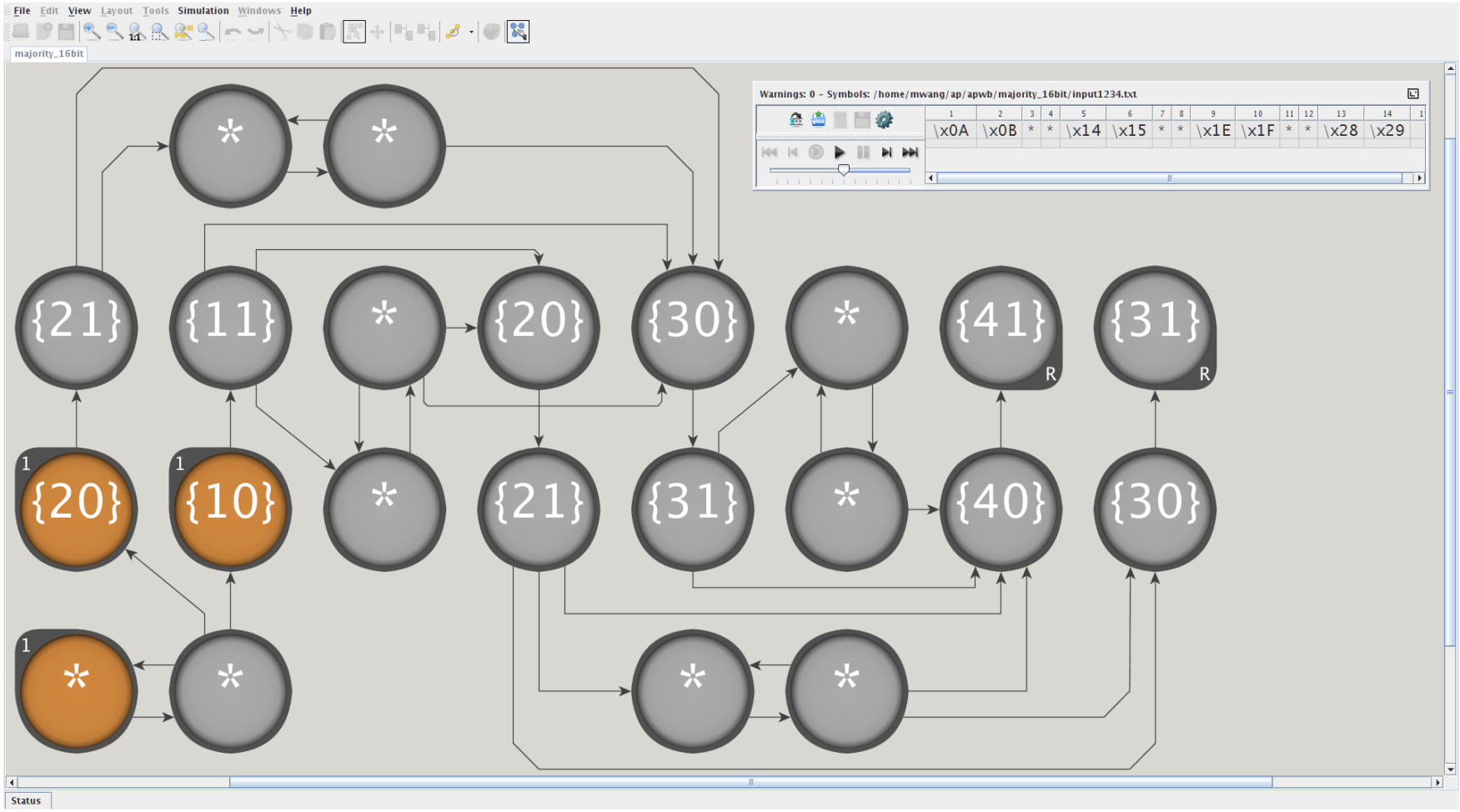
The idea is to create a pattern bank containing every possible track pattern. Each pattern is represented by an Automata network like the one showed above (with latch attributes enabled). Detector hits are fed into the AP sequentially by layer and all hit combinations with matching patterns in the bank are found.

Track Trigger Application Using the Automata Processor



Currently investigating the suitability of the Automata Processor for fast pattern recognition applications in HEP. Using as a test case: an electron trigger that associates calorimeter clusters with hits in an inner tracking detector.

AP Workbench Simulation



Sample implementation allowing up to one missing layer

End