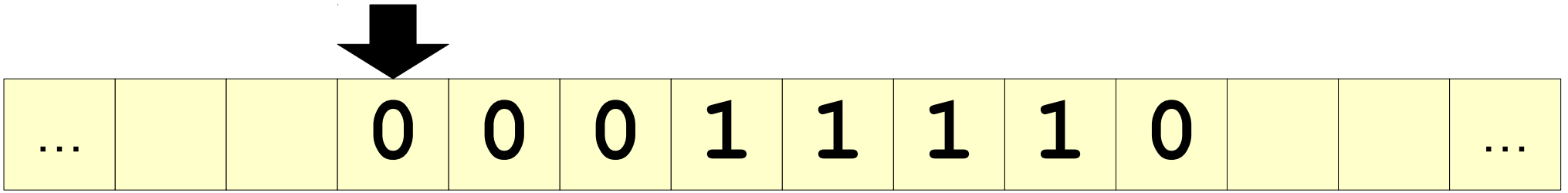
Another TM Design

- We just designed a TM for this language over $\Sigma = \{$**0**, **1**$\}$:

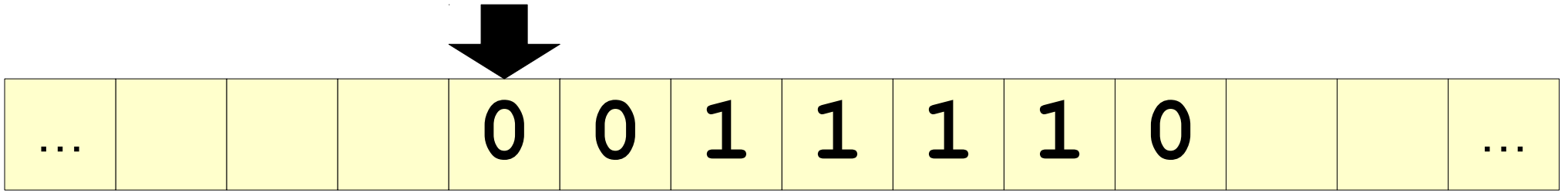
  $L = \{ w \in \Sigma^* \mid w$ has the same number of **0**s and **1**s $\}$

- Let's do a quick review of how it worked.

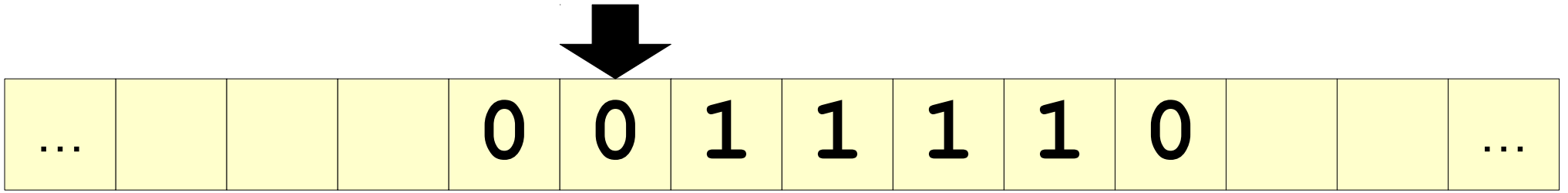
A Leap of Faith



A Leap of Faith



A Leap of Faith



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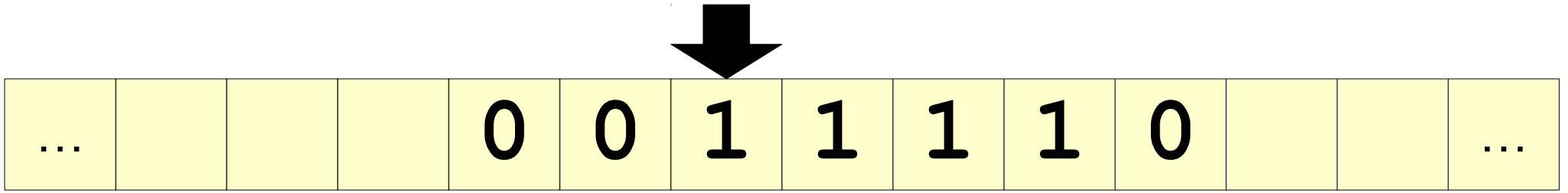

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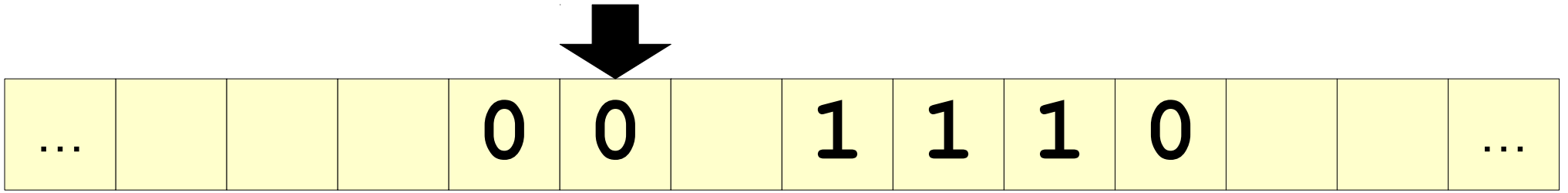

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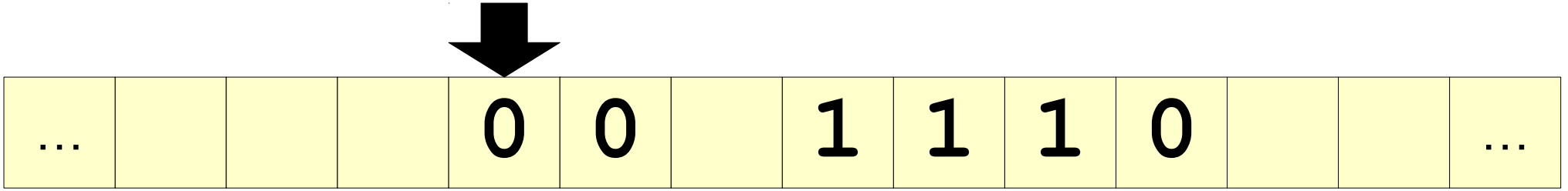

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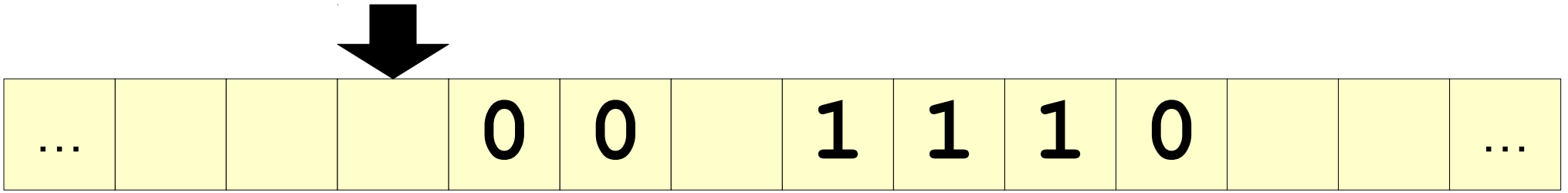

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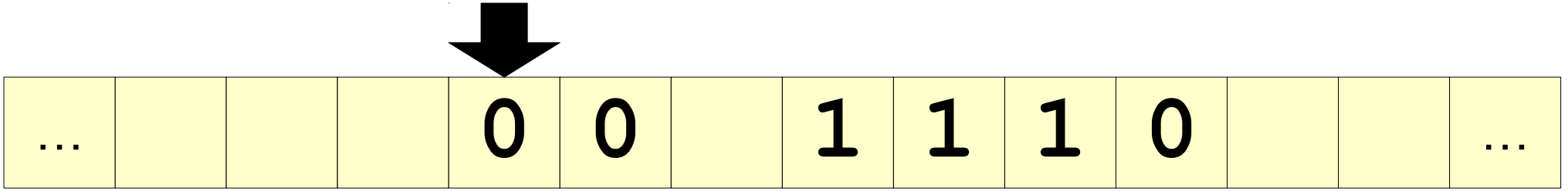
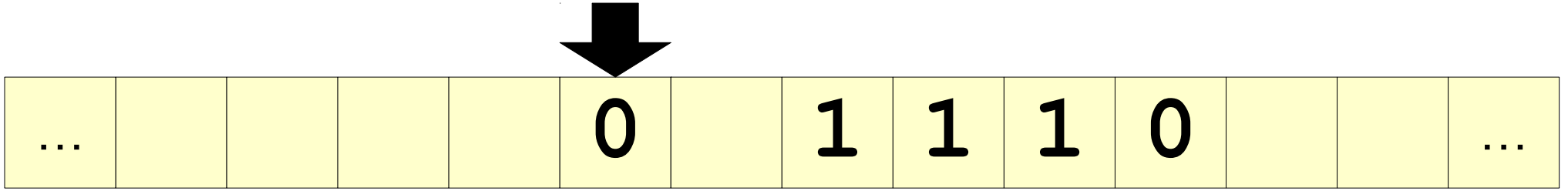


A Leap of Faith



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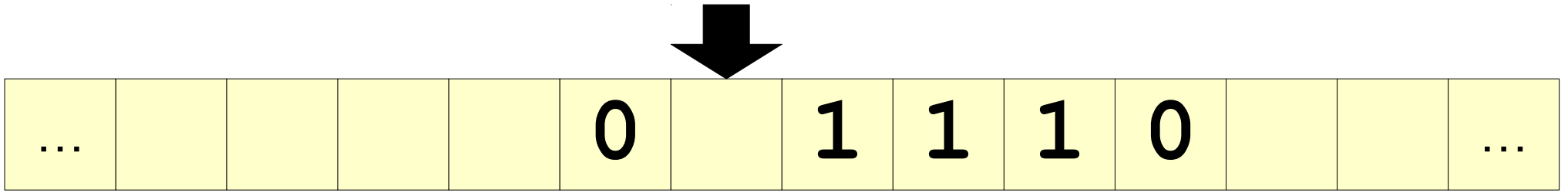
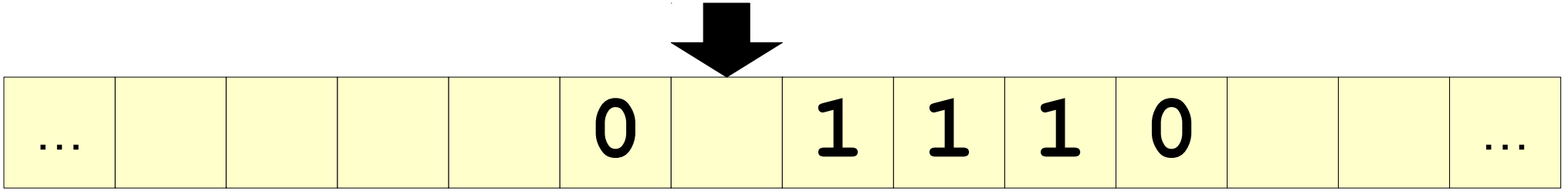
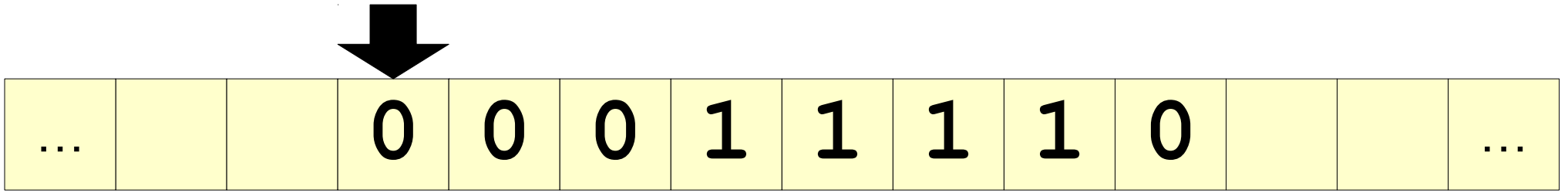


A Leap of Faith

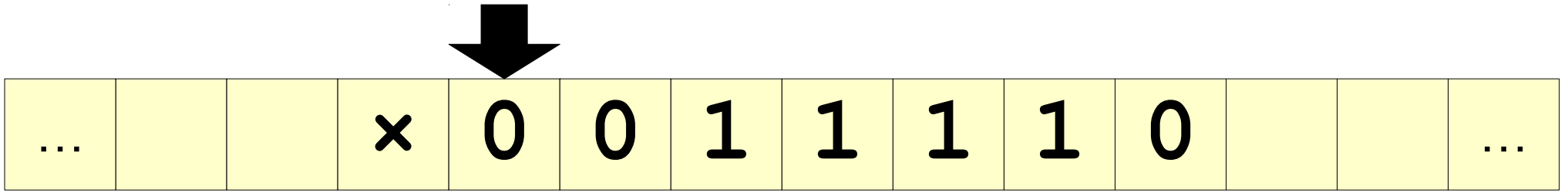


How do we know that this blank isn't one of the infinitely many blanks after our input string?

The Solution



The Solution



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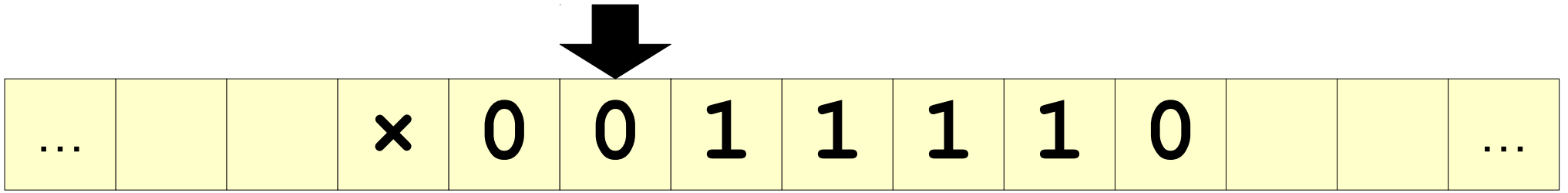

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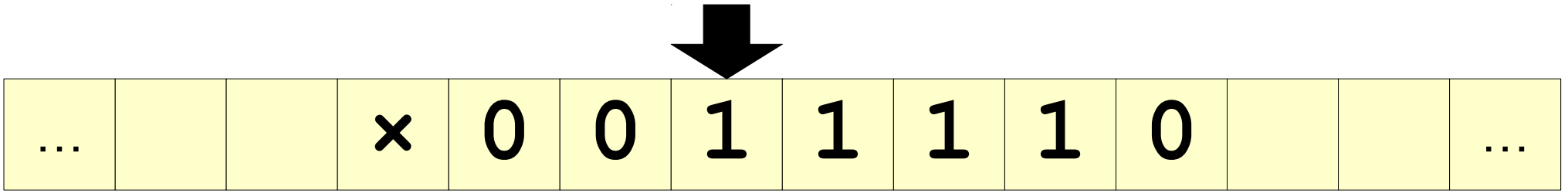

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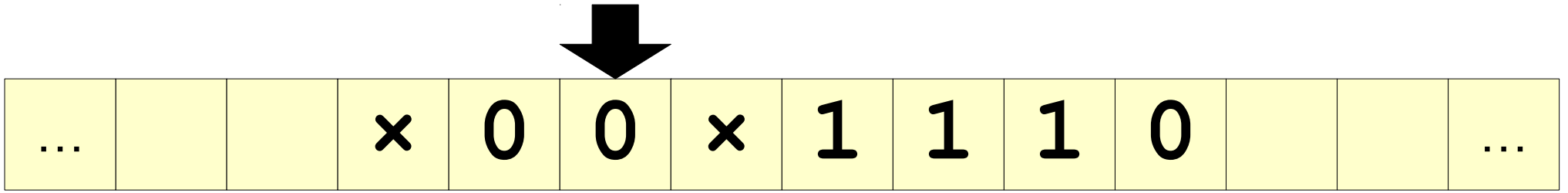

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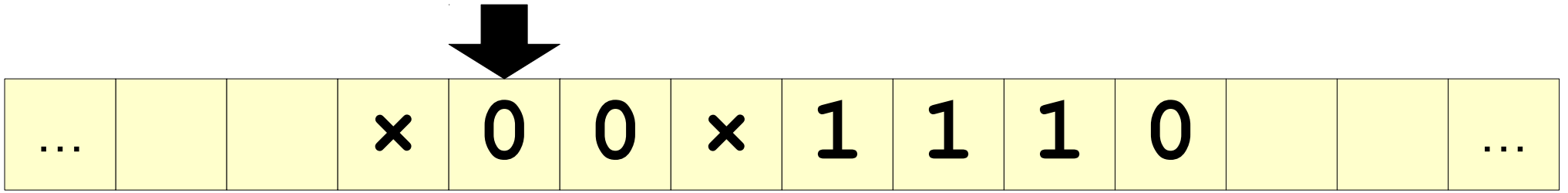

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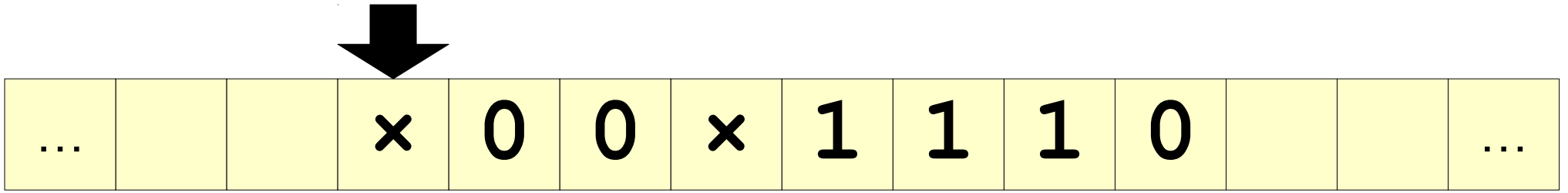

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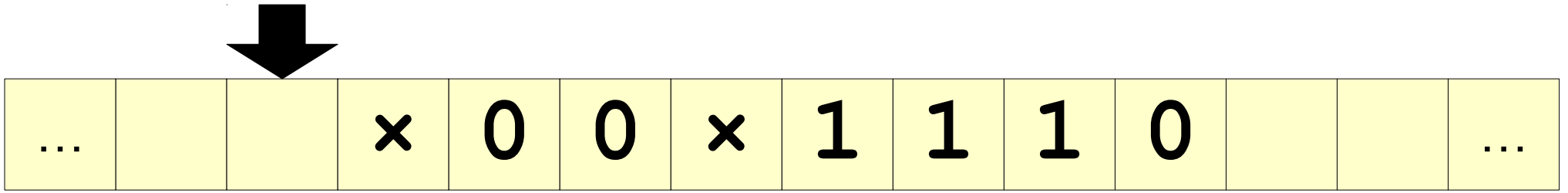

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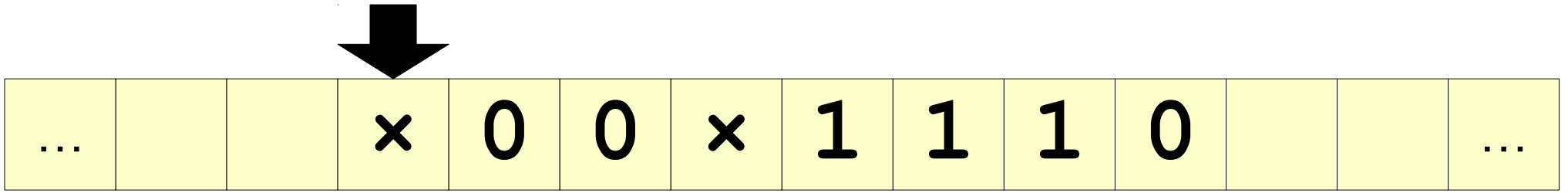

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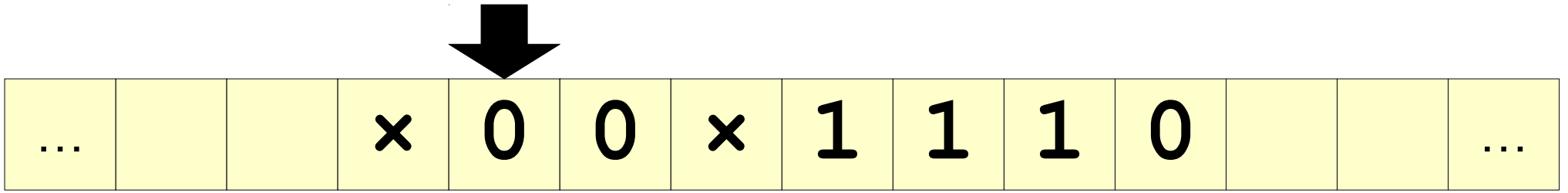

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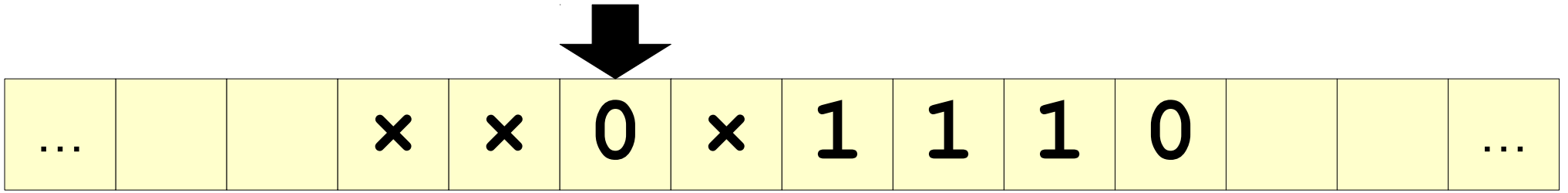

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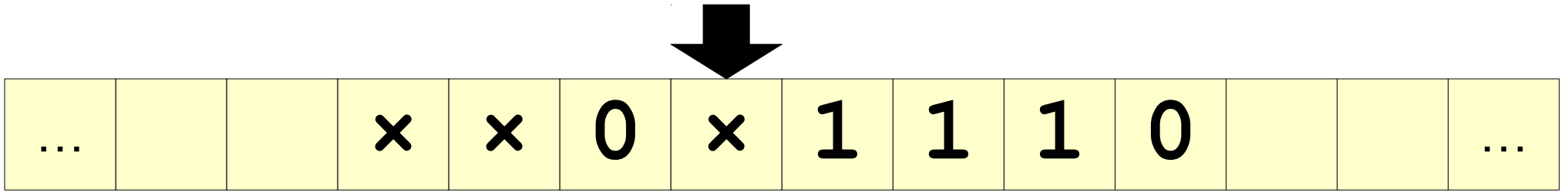

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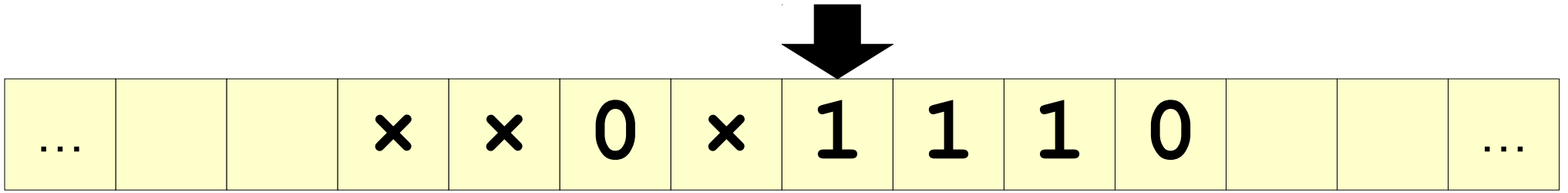

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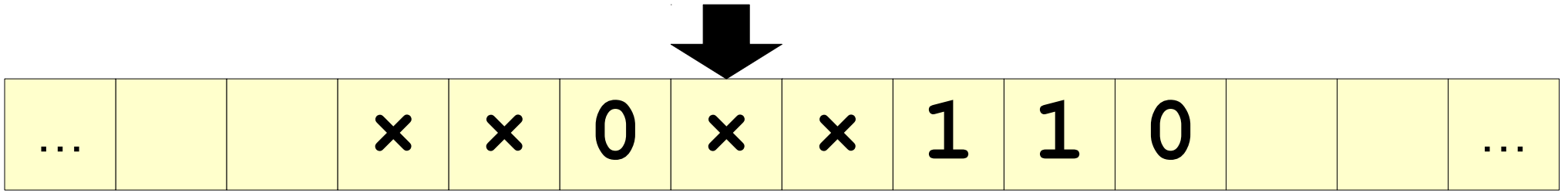

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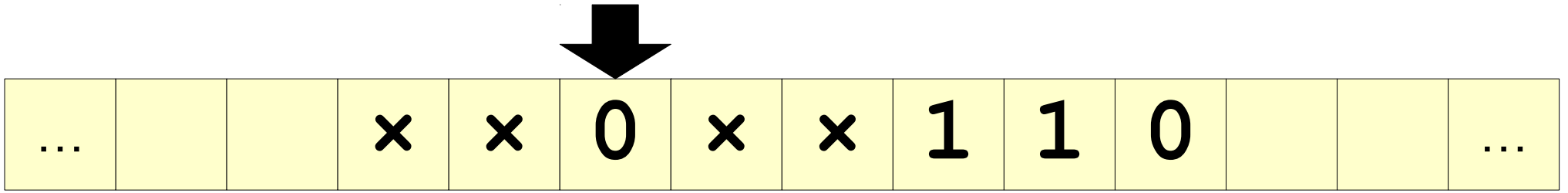

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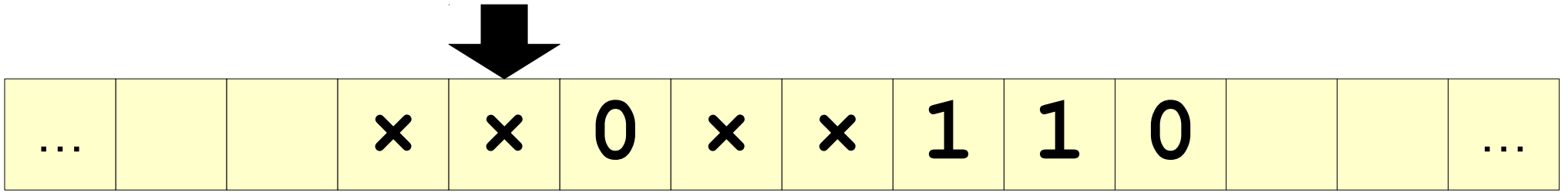

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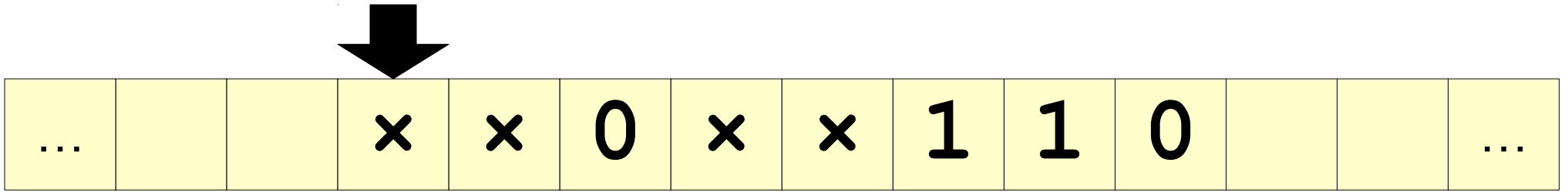

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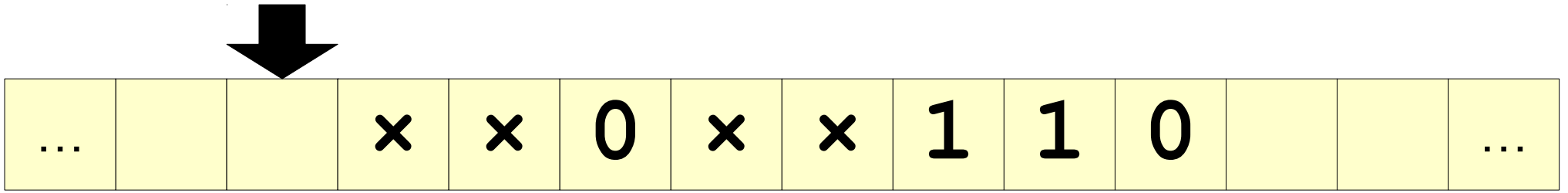

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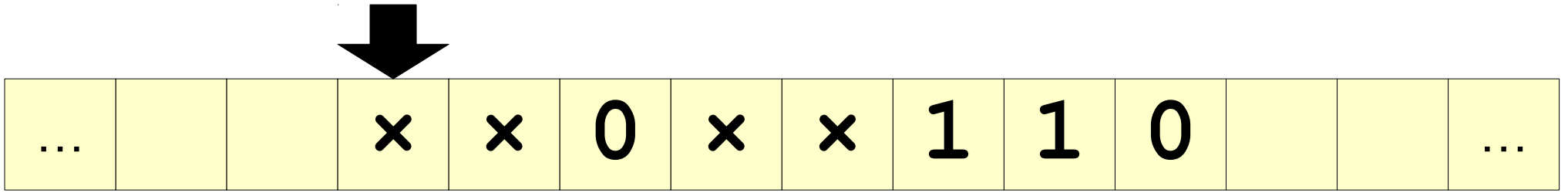
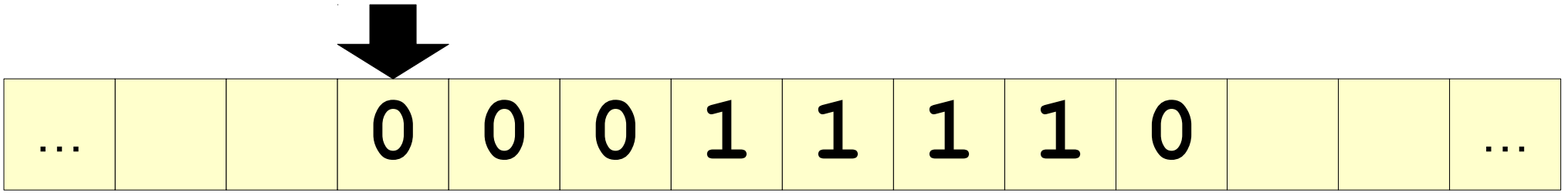
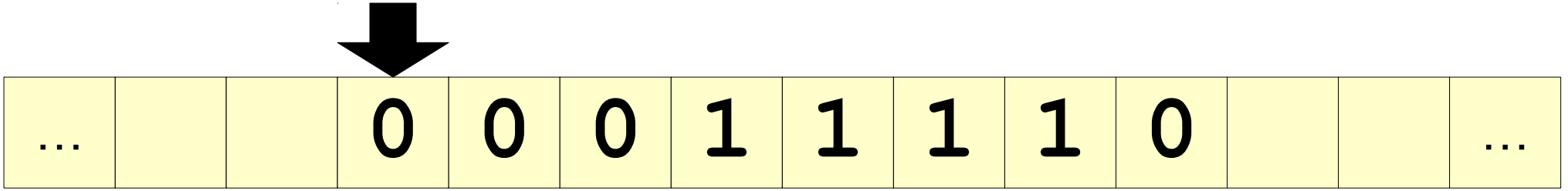


A Different Idea

A Different Strategy

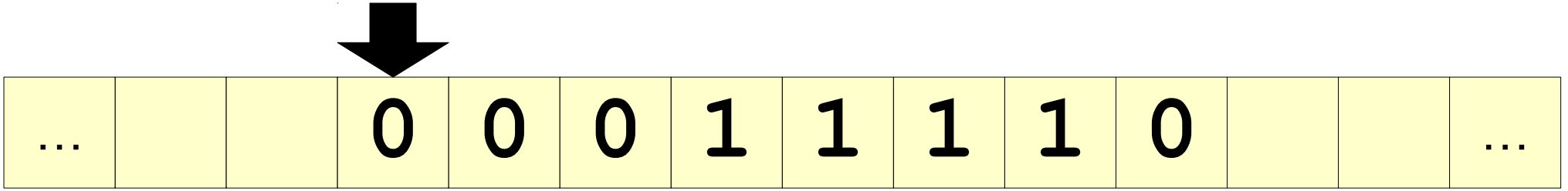


A Different Strategy



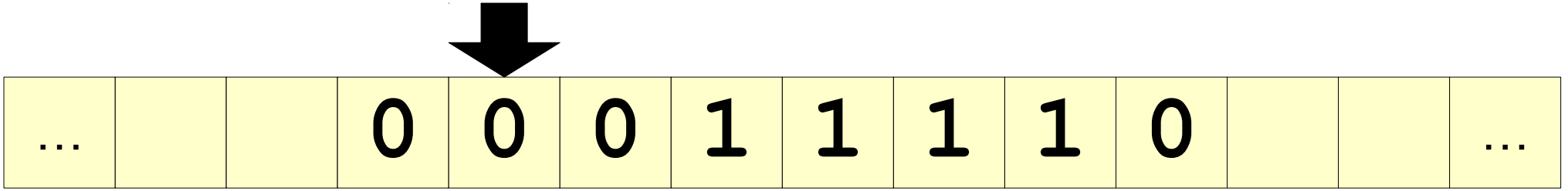
Could we sort the characters of this string?

A Different Strategy



Observation 1: A string of 0s and 1s is sorted if it matches the regex 0^*1^*.

A Different Strategy



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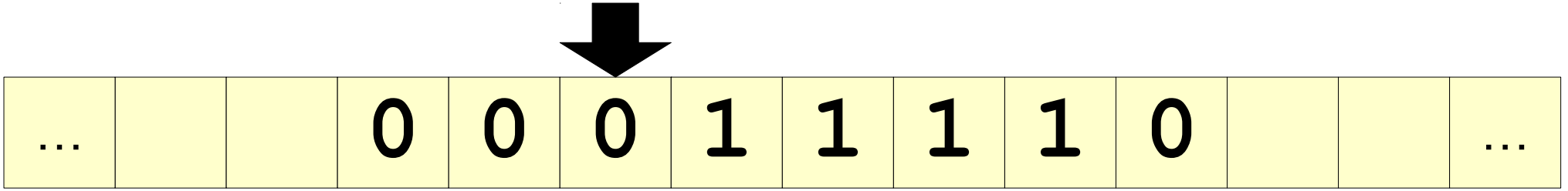

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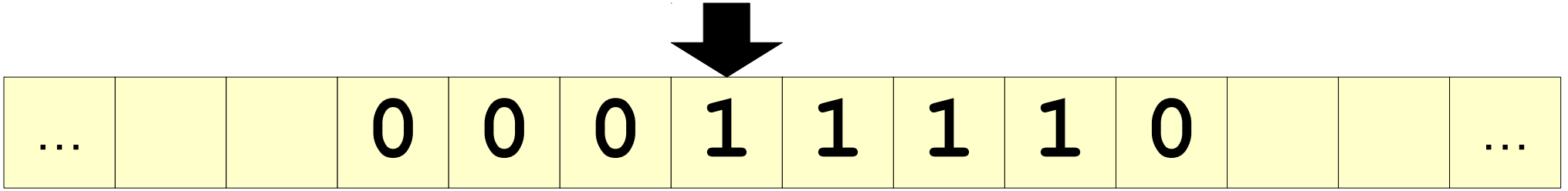

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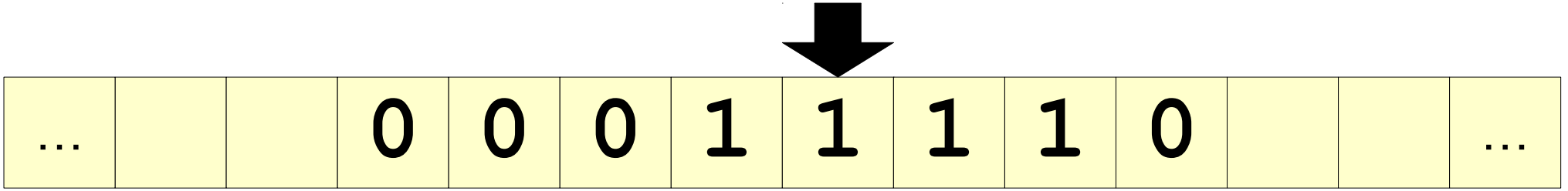

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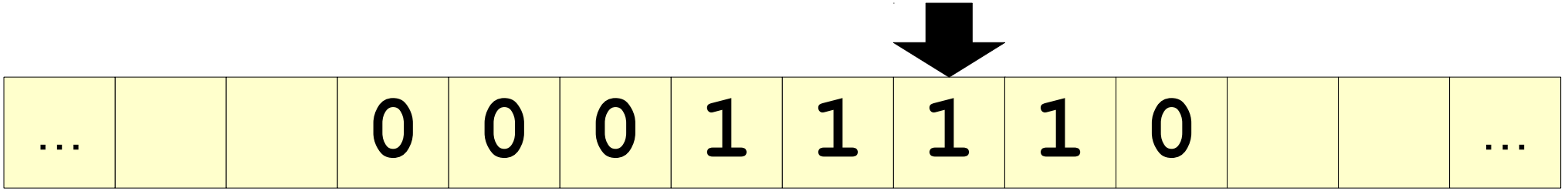

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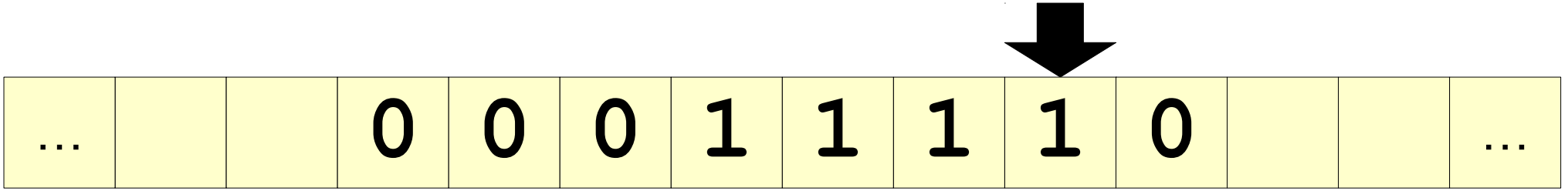

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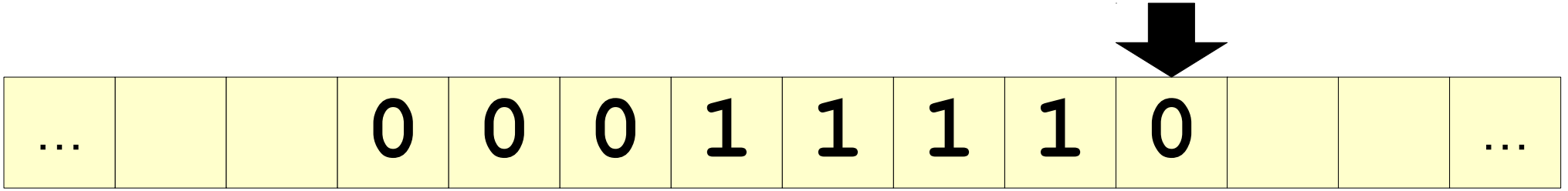

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A Different Strategy

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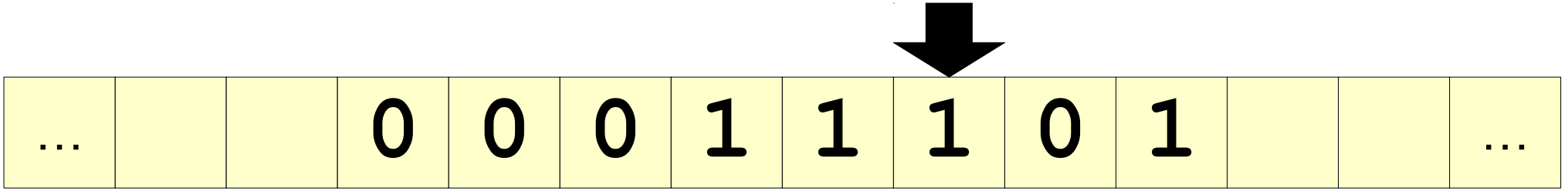

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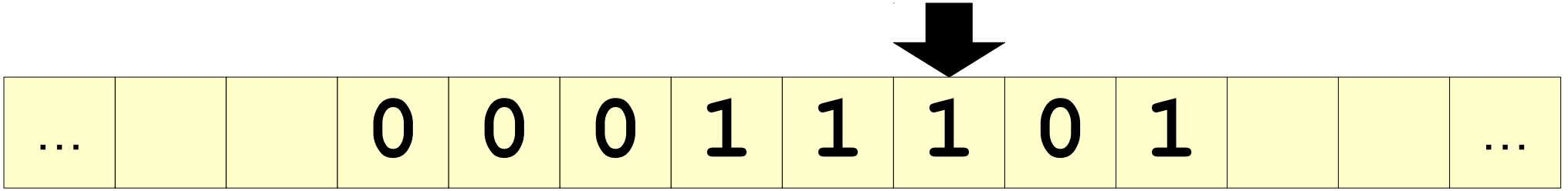
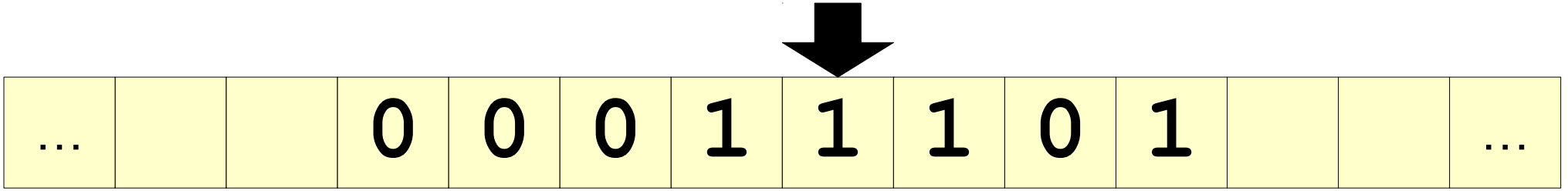


Idea: Repeatedly find a copy of 10 and replace it with 01.

A Different Strategy



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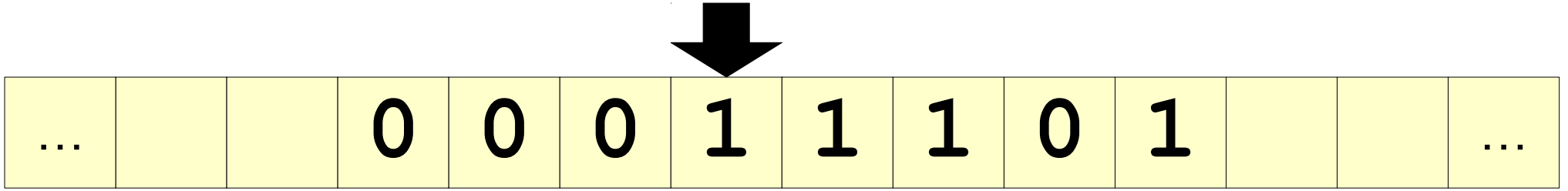

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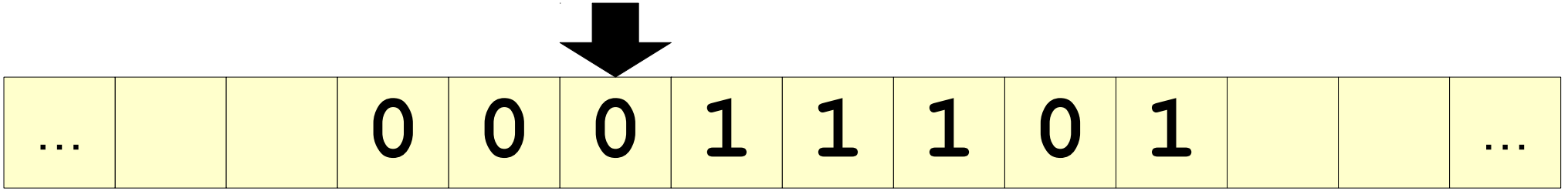

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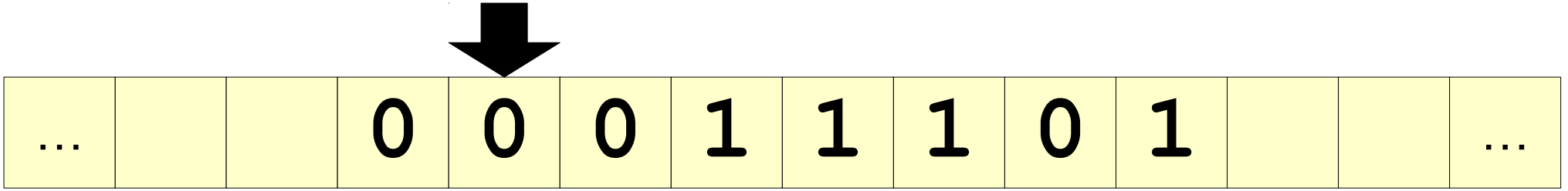

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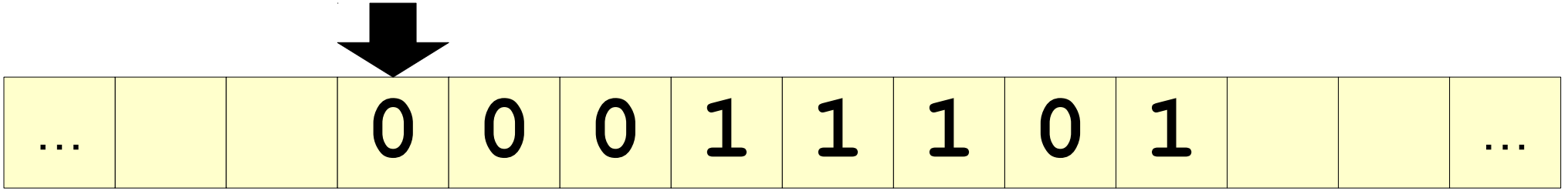

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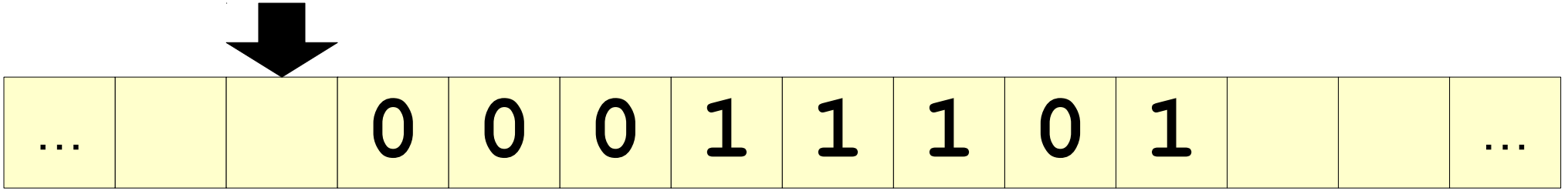

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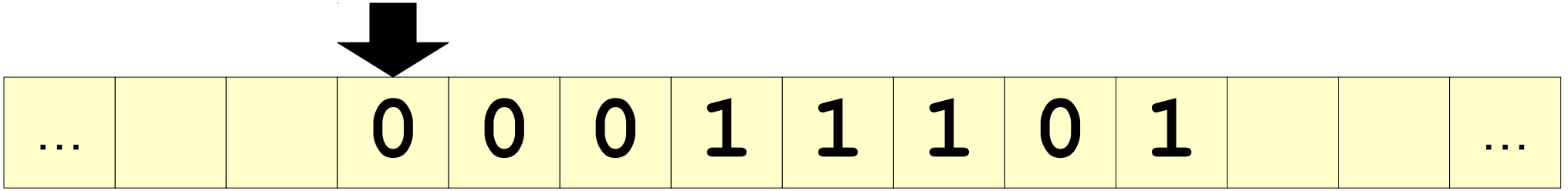

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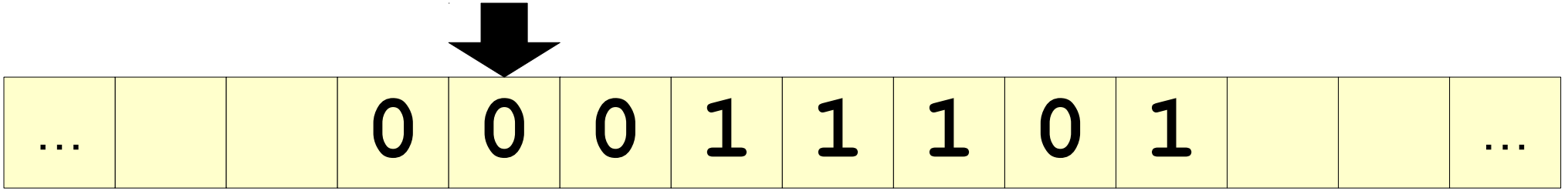

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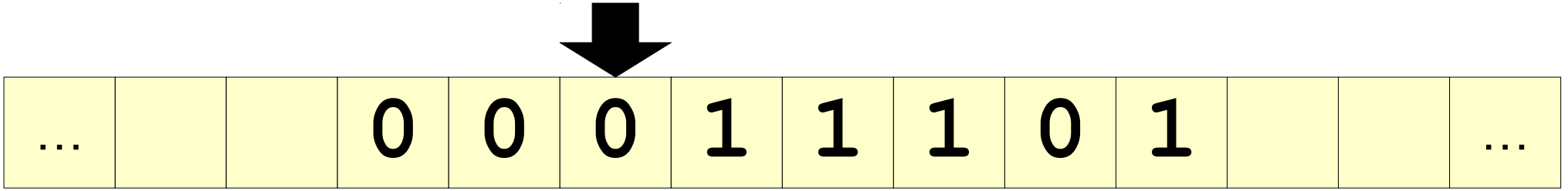

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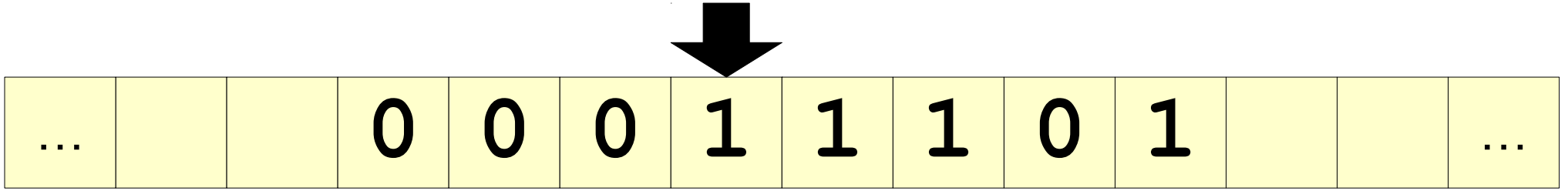

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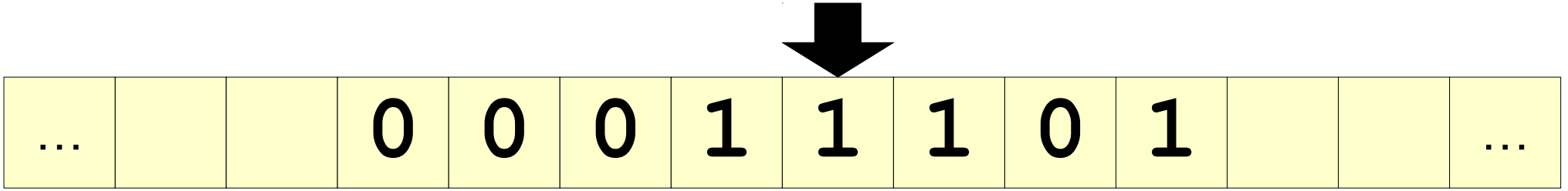

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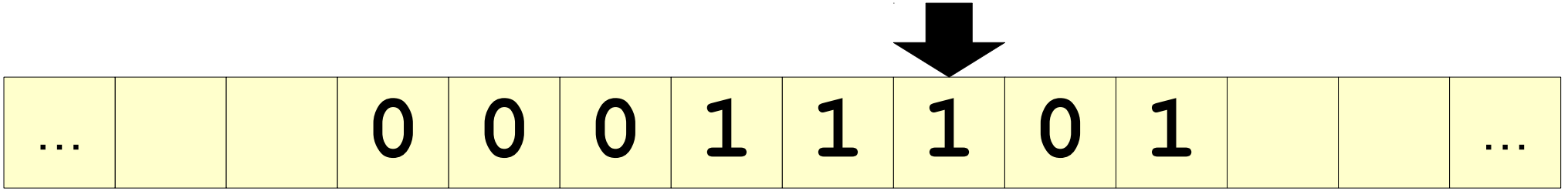

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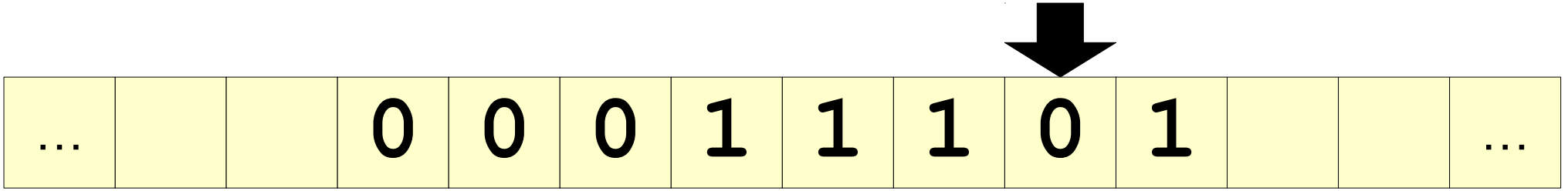

Idea: Repeatedly find a copy of 10 and replace it with 01.

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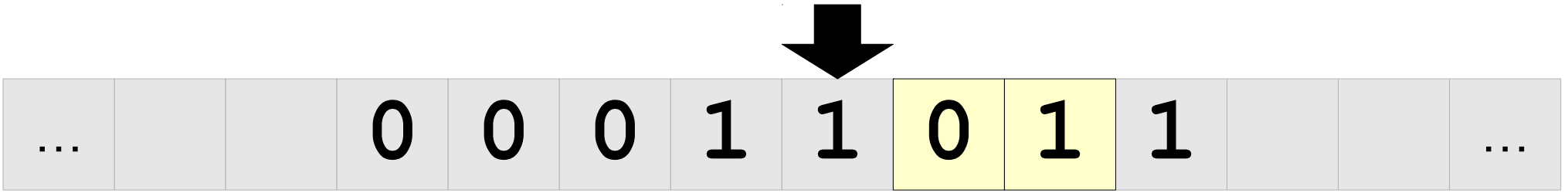

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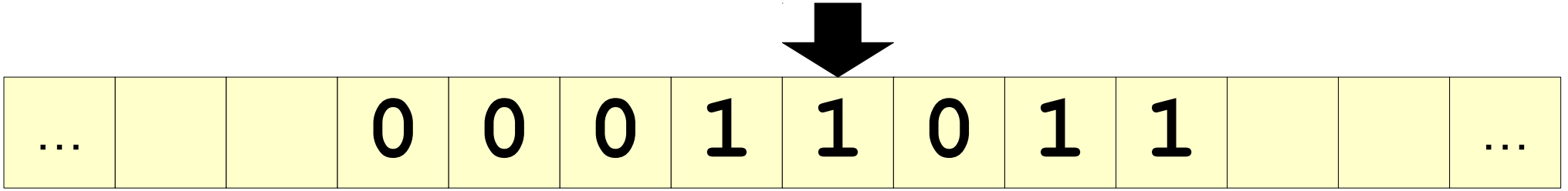

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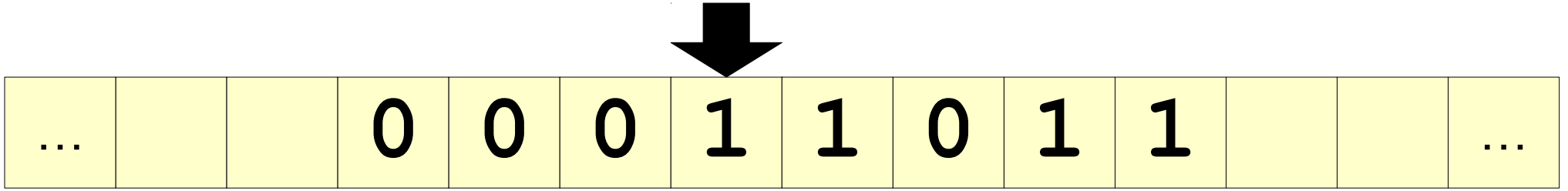

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Let's Build It!