

## ON THE DIAMETER OF VARIOUS CLASSES OF H SYSTEMS<sup>1,2</sup>

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### ABSTRACT

We investigate the complexity of various classes of H systems from the point of view of the length of their splicing rules. Specifically, we consider the *diameter* of an H system, the quadruple of integers representing the maximal length of strings in the rules of the system. We systematically examine the classes of controlled and distributed H systems from the monograph [8]. Improvements of the results in [8] with respect to the measure called diameter are obtained.

*Keywords:* DNA, splicing, H systems, controlled H systems, formal languages.

### 1. Introduction; H Systems

The extended H systems are generative mechanisms based on the *splicing operation* introduced in [3]. A splicing rule corresponds to two restriction enzymes producing sticky ends which match each other, hence can be pasted by a ligation reaction. Because the enzymes have recognizing patterns of a small length, it is of interest to consider H systems which use splicing rules of a small dimension. This parameter, called the *radius* of a splicing rule, was already considered in several papers (see references in [8]). A refinement is considered in [4], which is called the *diameter* of a rule.

First, we recall some results from [4, 5, 6], then we give a series of new results.

A *splicing rule* (over an alphabet  $V$ ) is a string  $r = u_1\#u_2\$u_3\#u_4$ , where  $u_1, u_2, u_3, u_4 \in V^*$  and  $\#, \$$  are two special symbols not in  $V$ . ( $V^*$  is the free monoid generated by the alphabet  $V$  under the operation of concatenation; the empty string is denoted by  $\lambda$ ; the length of  $x \in V^*$  is denoted by  $|x|$ .)

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