Wallbreaker

Schulz, Mihov, Mitankin, Gerdjikov

CIS Technische Universität München, IICT Bulgarian Academy of Science,FMI Sofia University,

22 March 2013, Genoa

The Wall Effect

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TGTTTCTCAATCCCACTTACTATTTTATCAAAAGTTATCTCCACCAAT,8
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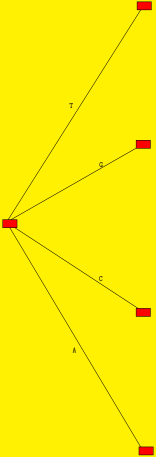

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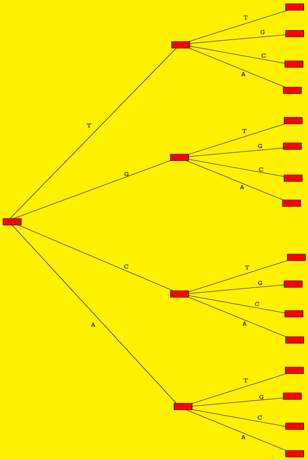

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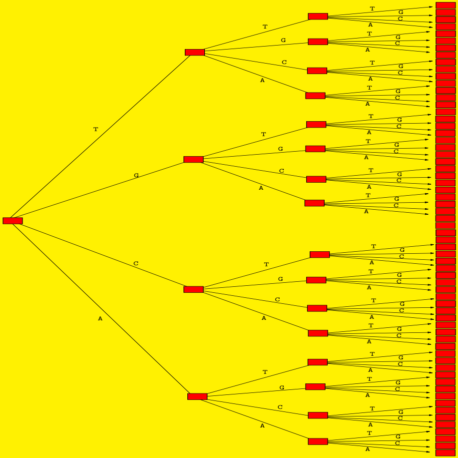

Through the Wall

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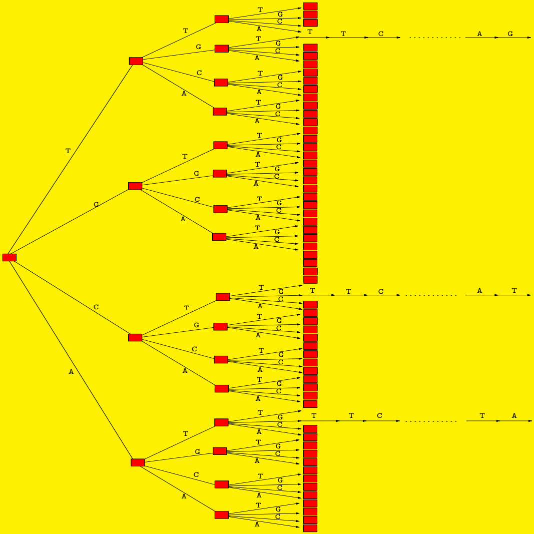

Divide and Conquer

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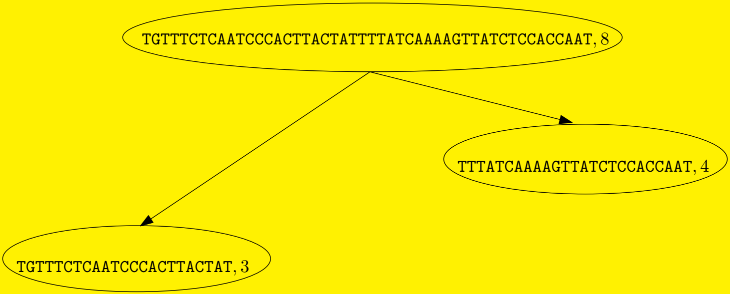

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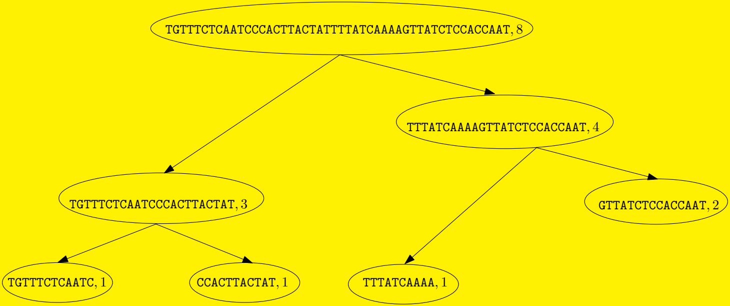

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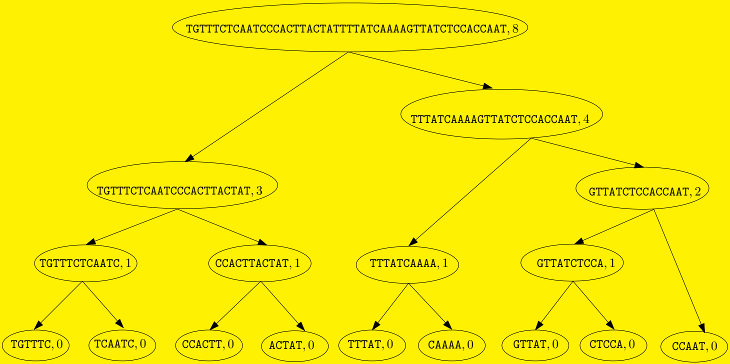
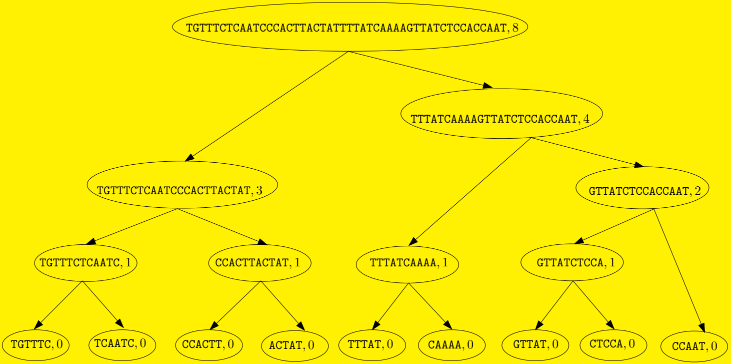


Answering Query

AGGGAATTTTTTTCCAATTTTGCCTCCTTTTTAAAGGGTCACCA
TCCCAGCCTGTTTCTAAAGGGTATTTTCAGAGTGCCTTTTTTTCATC
TGTTTTTCTATCCCACTTACTATTTTACTCAAAAGTTTCTCCACGAAT



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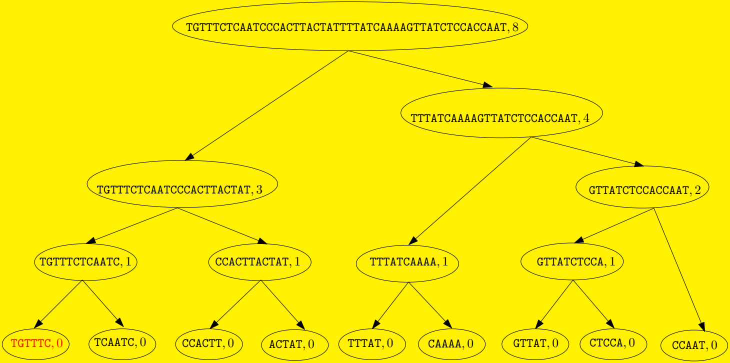

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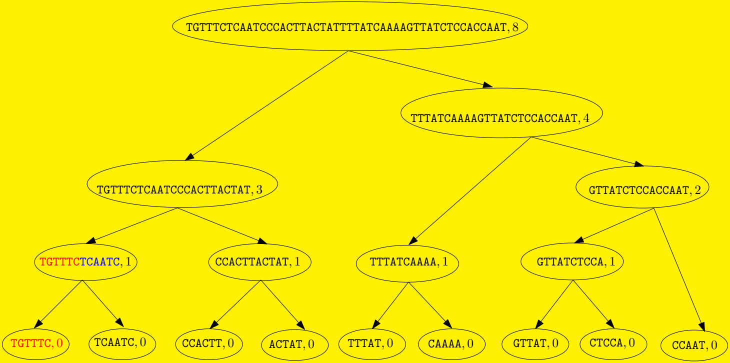

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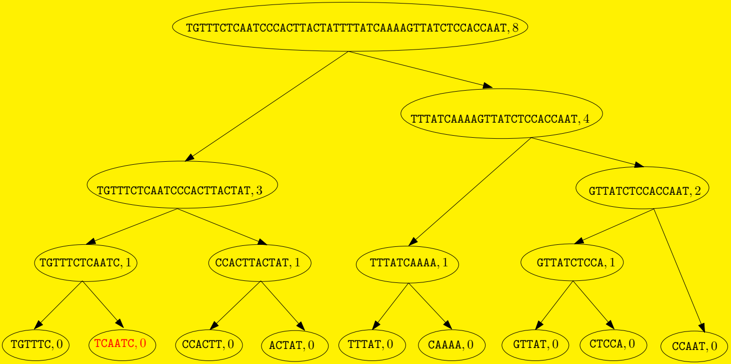

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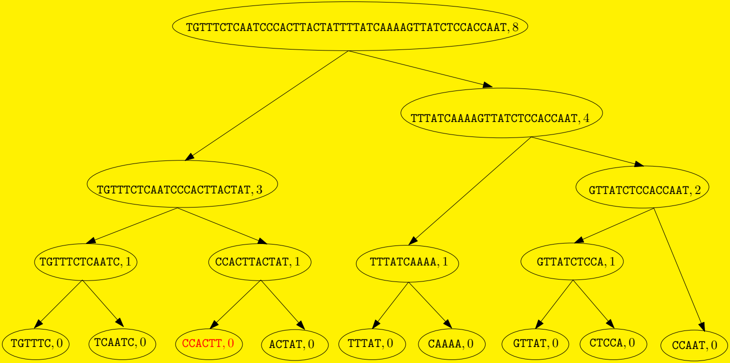

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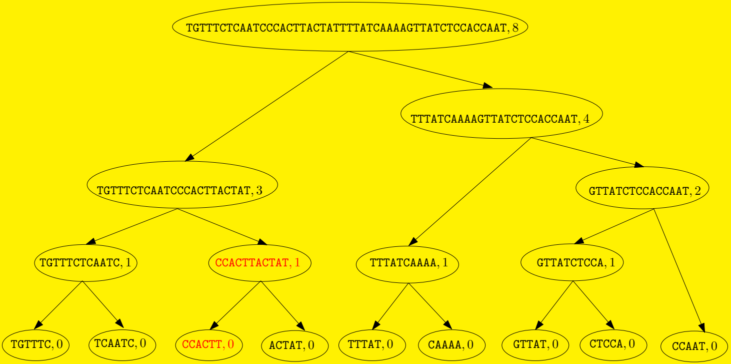

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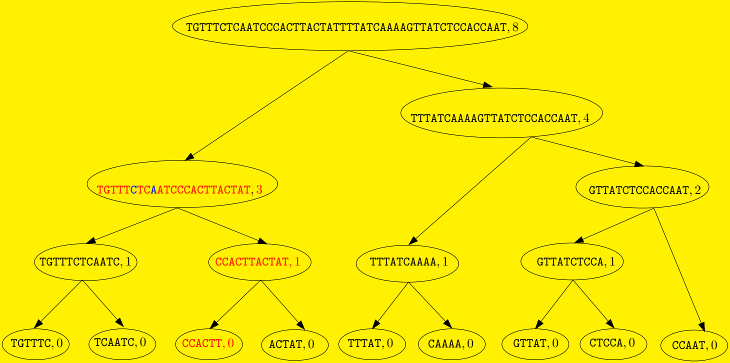

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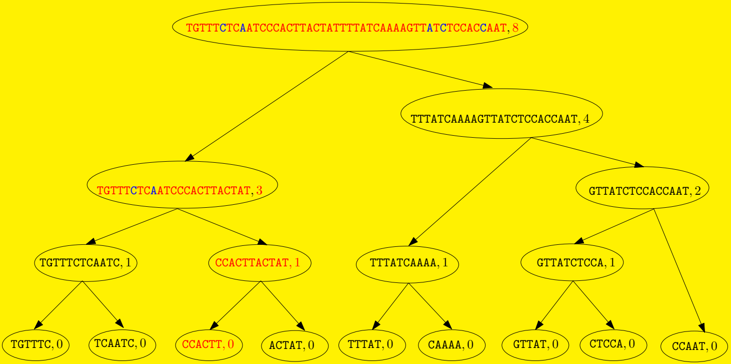

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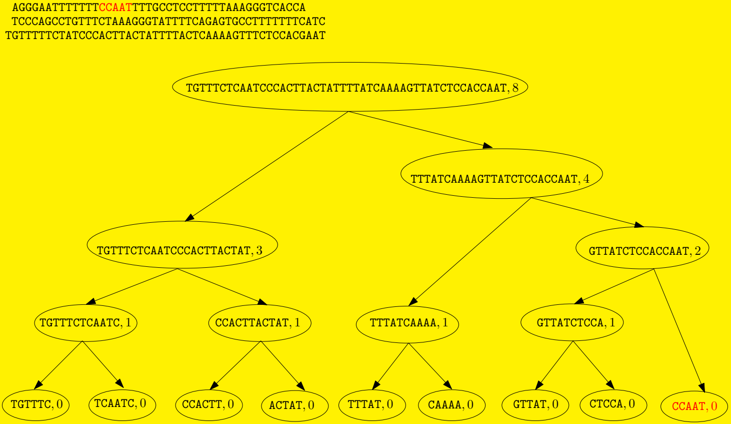

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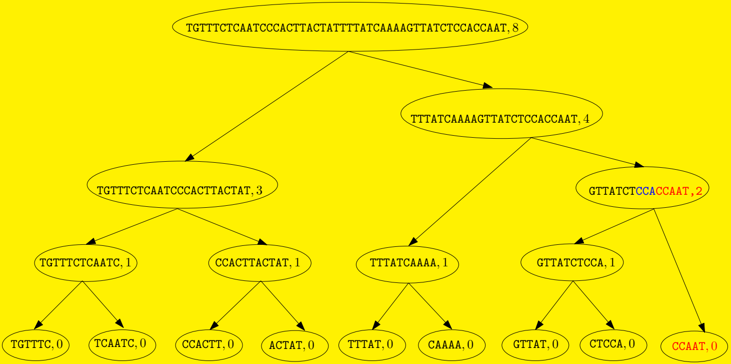

Resources

1. efficient left and right extensions.

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2. filter(s) to supervise the search.

Efficient Representation of Infixes

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Definition

[Inenaga05] If $\mathcal{S}$ is a finite set of words and X is an infix in $\mathcal{S}$, then $\overleftrightarrow{X} = \alpha \circ X \circ \beta$ is the longest infix in $\mathcal{S}$ such that whenever for a word $W \in \mathcal{S}$, $W = U \circ X \circ V$ it is true that $U = U_1 \circ \alpha$ and $V = \beta \circ V_1$.

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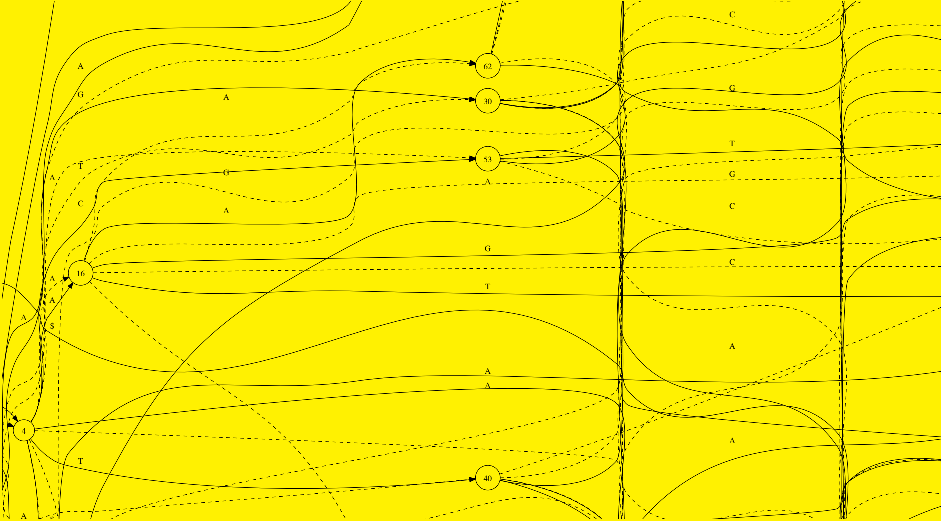
$X \equiv_{\mathcal{S}} Y$ iff $\overleftrightarrow{X} = \overleftrightarrow{Y}$.

SCDWAG for a Set of Words



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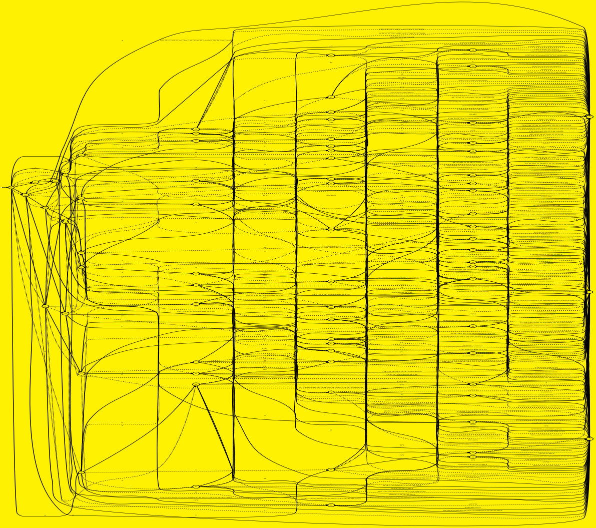

SDWAG for a set of words, $\mathcal{S}$

1. states - $\{\overleftrightarrow{X} \mid X \in \mathit{Inf}(\mathcal{S})\}$
2. *right* transitions - $\{\langle \overleftrightarrow{X}, a, \overleftrightarrow{\overleftrightarrow{X} a} \rangle \mid \overleftrightarrow{X} a \in \mathit{Inf}(\mathcal{S})\}$

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3. *left* transitions - $\{\langle \overleftrightarrow{X}, a, \overleftrightarrow{a \overleftrightarrow{X}} \rangle \mid a \overleftrightarrow{X} \in \mathit{Inf}(\mathcal{S})\}$

Filters

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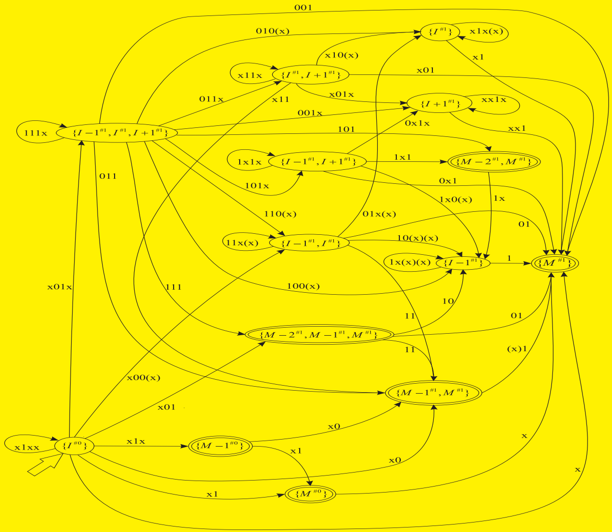
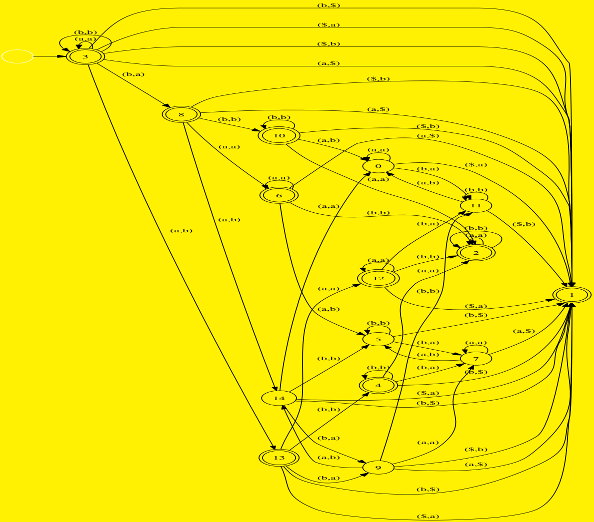
Universal Levenshtein Automata



Synchronised Levenshtein Automata



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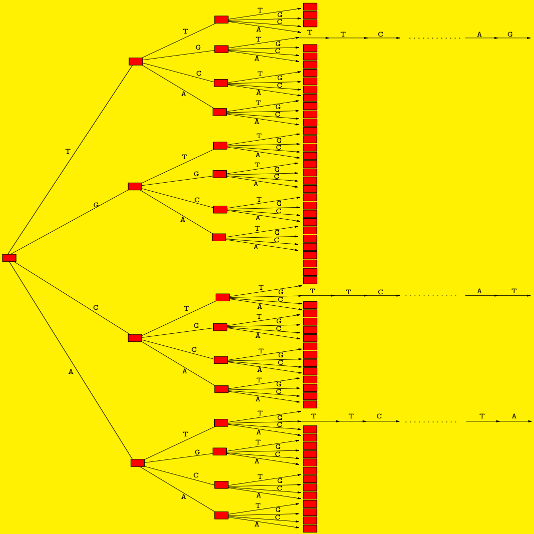
Wallbreaker	space	total time	average time
query	2623.13 MB	8.794 sec	0.000 008 794 sec

Breaking the Wall



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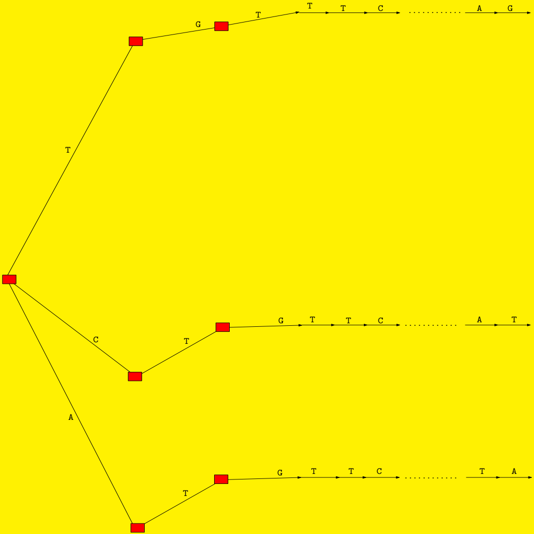

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