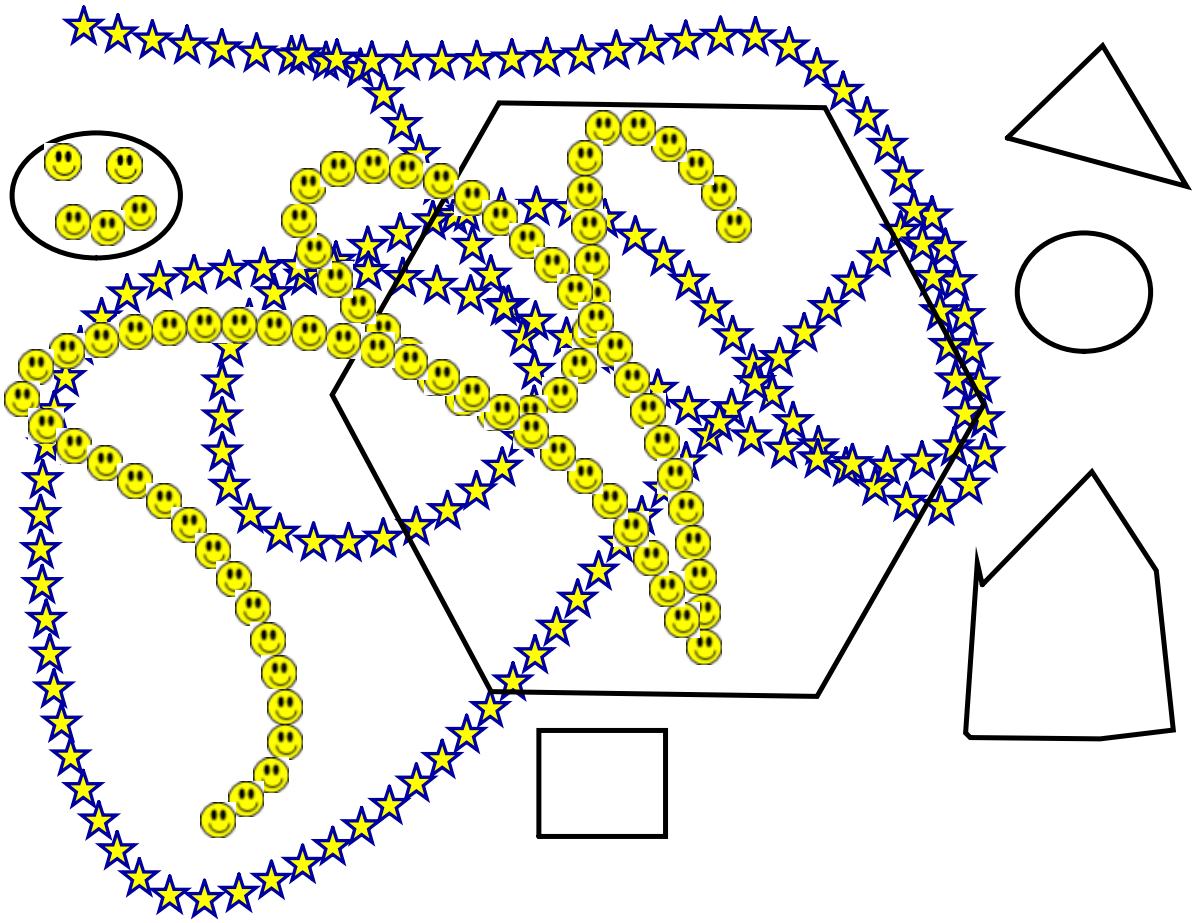
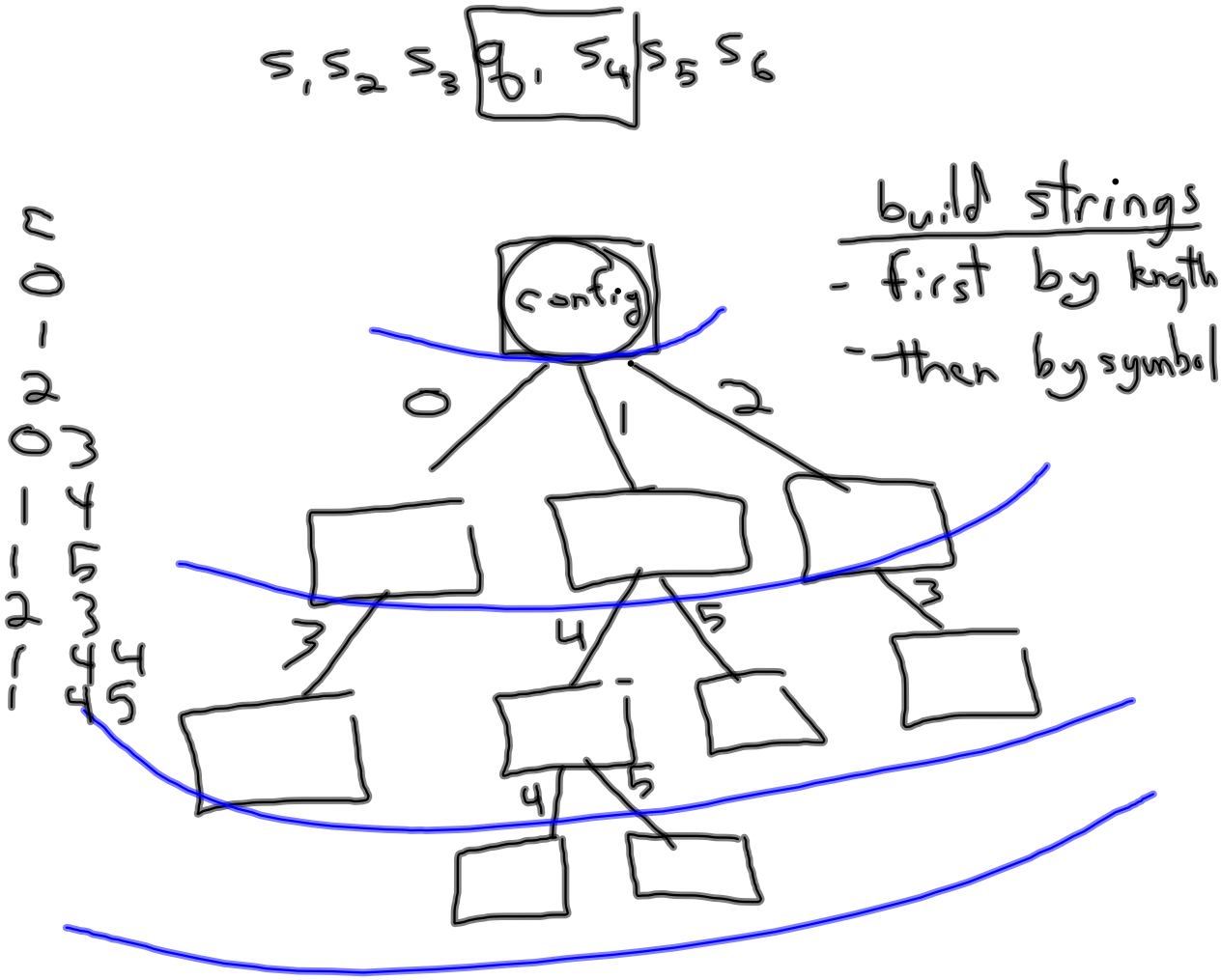


Hi

Non-deterministic TM



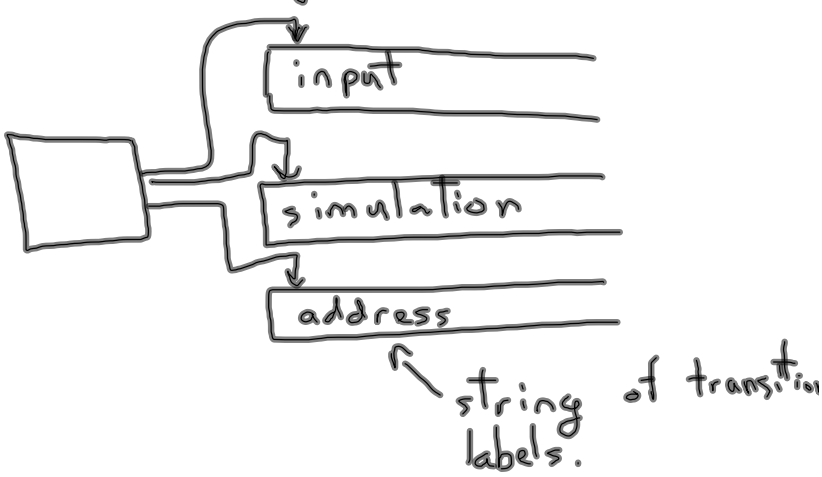
transitions: a, b, c, d

ε
a
b
c
d
aa
ab
ac
ad
ba
bb
bc
bd
⋮

⋮
aaa
aab
aac
⋮

Lexicographical order.

Every non-deterministic TM has an equiv. det. TM.



1. tape 1 is input, tape 2 & 3 are empty.
2. copy tape 1 to tape 2
3. Use tape 3 to make configuration decisions (w/ address in the config tree).
   If accept state is reached, then accept.
   If reject state is reached or we run out of transitions on tape 3, then go to 4.
4. Replace tape 3 w/ next address string and go to 2.

Algorithms

Hilbert's Problems

#10 devise an algorithm that tests whether a polynomial has integral roots.

$D = \{ p \mid p \text{ is a polynomial w/ integral roots} \}$

D is Turing recognizable, but not decidable.

$D_1 = \{ p \mid p \text{ is a polynomial over } x \text{ w/ integral roots} \}$

TM M_1 recognizes D_1

input: polynomial over x

1. evaluate p w/ x set to $0, 1, -1, 2, -2, 3, -3, \ldots$

   if $p(x) = 0$, accept.

D_1 is also decidable

roots must be in

$$\pm k \frac{c_{max}}{c_1}$$

k: # terms

c_{max}: largest abs. val of coeff

c_1: coeff of the highest order term.