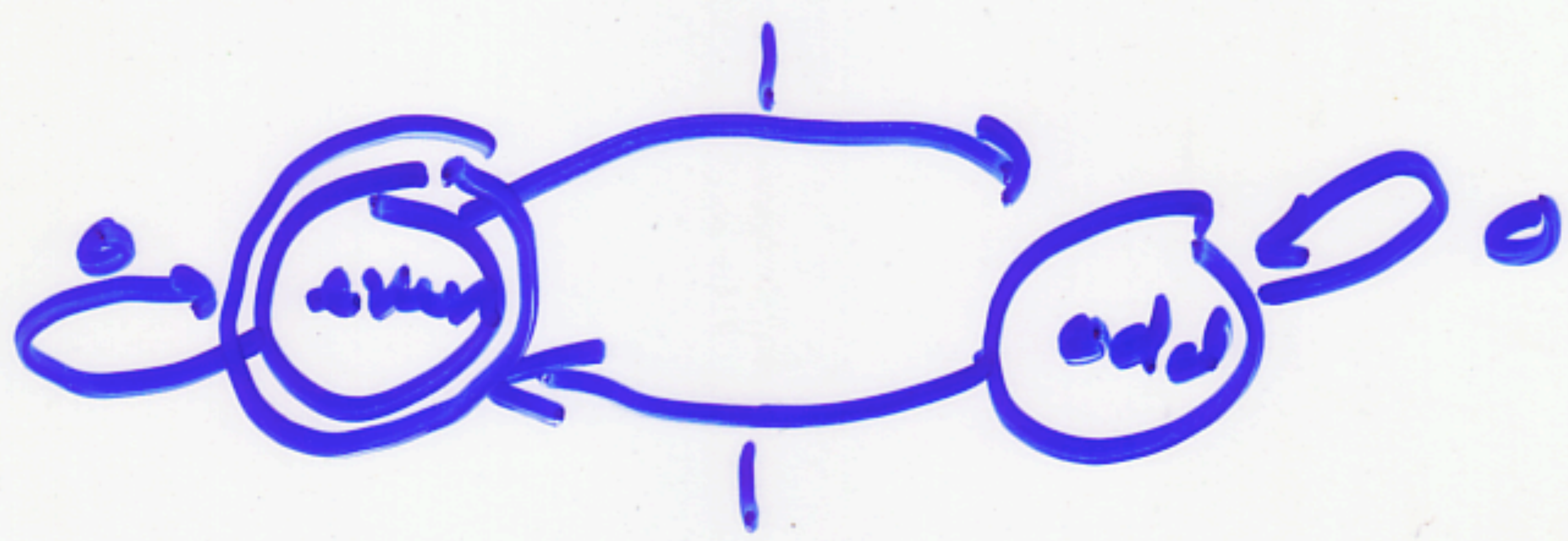
Email

$\Sigma = \{ 0, 1 \}$

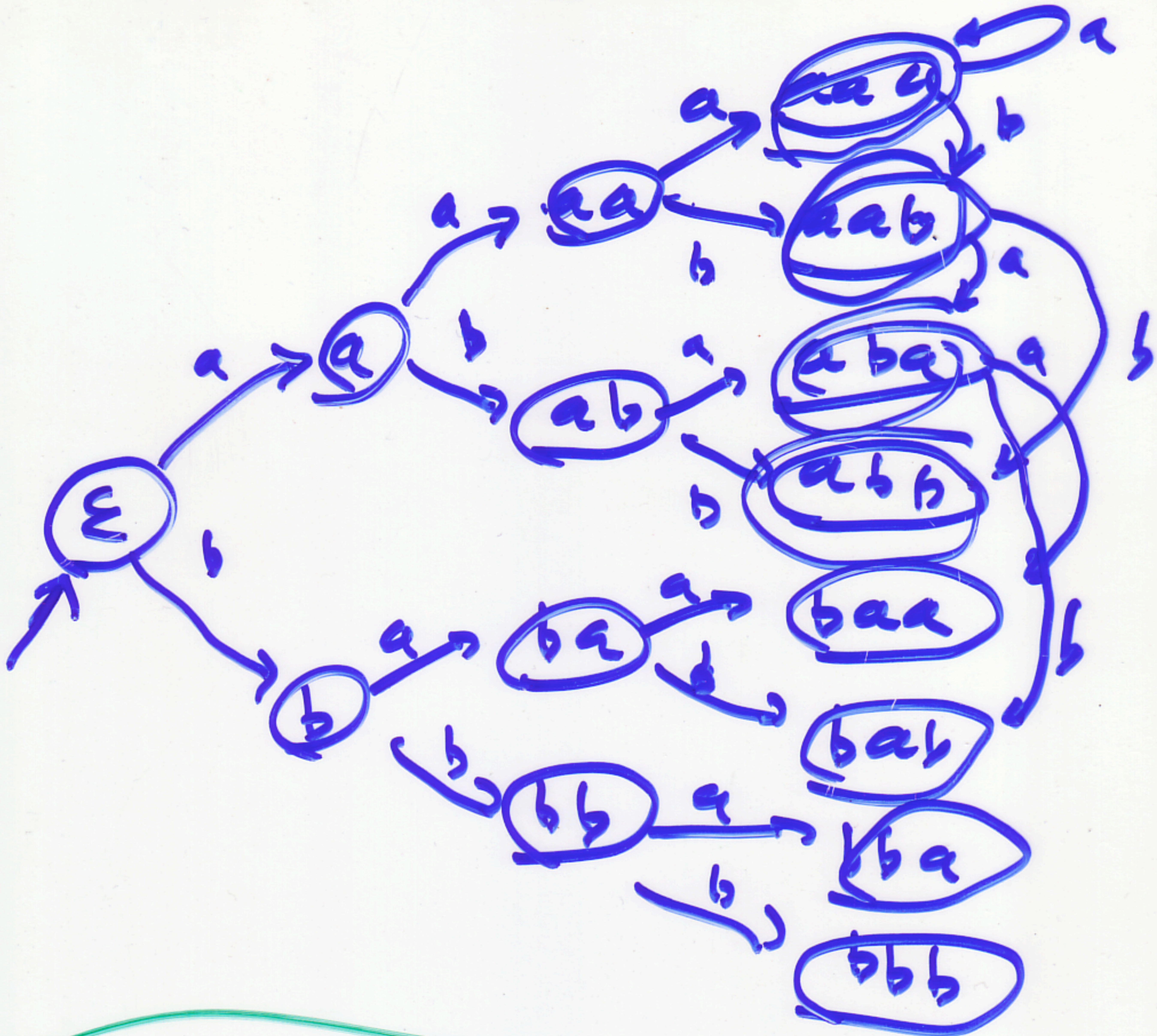
$L = \{ w \in \Sigma^* \mid$ # of 1's in w is even $\}$

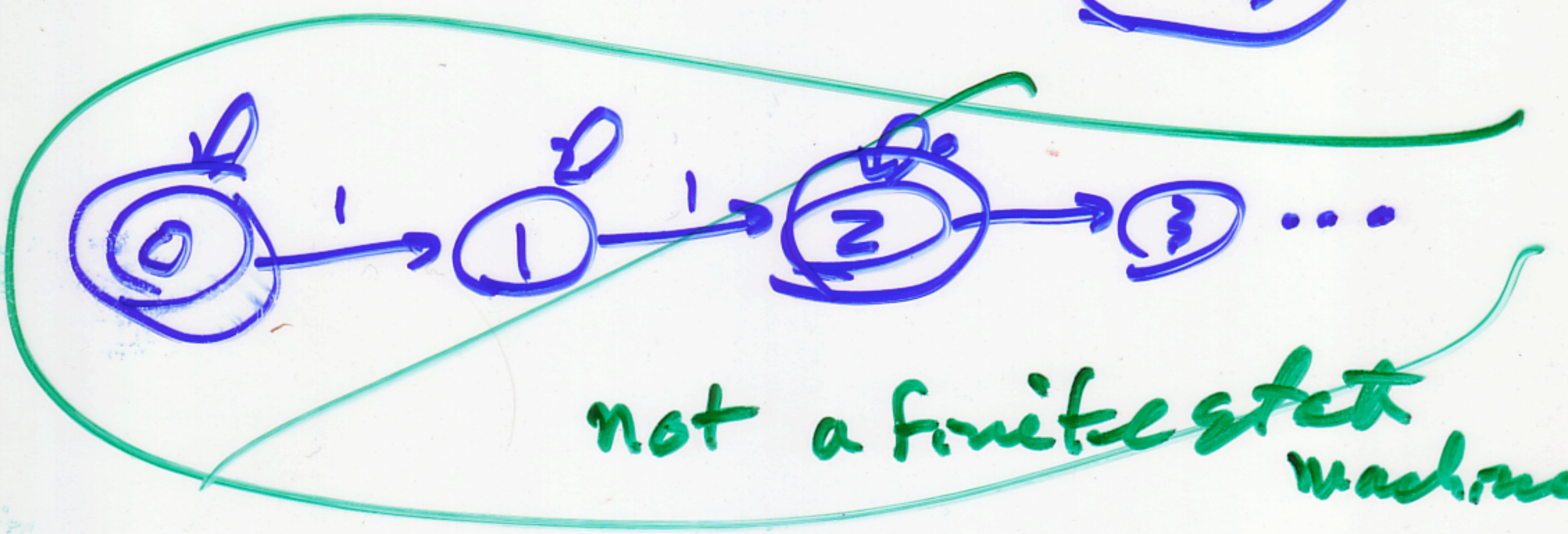


$\Sigma = \{ a, b \}$

$L = \{ w \in \Sigma^* \mid$ 3rd letter from right end is an a $\}$

b a b
a a b


ε
a
b
aa
ab
ba
bb
aaa
aab
aba
abb
baa
bab
bba
bbb


0
1
2
3
...
not a finite state machine

a b a a b a b

A finite state machine

$M = (Q, \Sigma, \delta, q_0, F)$

where

Q is a finite set (states)

$q_0 \in Q$ start state

Σ is a finite set (alphabet)

$F \subseteq Q$ Final states
Accepting states

$\delta : Q \times \Sigma \to Q$ transition function

function

Ex: $\cancel{\exists x}\ \forall x \in \Sigma^*$

$$f(x) = \begin{cases} x & \text{if } |x| \leq 3 \\ \text{last 3 letters of } x \end{cases}$$

$M_3 = (\{ w \in \Sigma^* \mid |w| \leq 3 \}$

$q_0 = \varepsilon$ $\quad \Sigma = \{a, b\}$

$F = \{ ax \mid |x| = 2 \}$

2.3

$\forall q \in Q, c \in \Sigma$

$$\delta(q, c) = f(q \cdot c)$$

An Afterthought: A simpler example

parity

$M_{parity} = (Q, \Sigma, \delta, q_0, F)$

where

$Q = \{even, odd\}$

$\Sigma = \{0, 1\}$

$q_0 = even$ (one element)

$F = \{even\}$ (a set containing one element)

$\delta(q, a)$:

$q \backslash a$	0	1
even	even	odd
odd	odd	even

Even more succinctly if we let $Q = \{0, 1\}$ also

then $\delta(q, a) = (q + a) \bmod 2$ $\quad \forall q \in Q$, $\forall a \in \Sigma$