PUMPING LEMMA

TOMPING LEMMA
M = -2 $M = -2$ $M = -2$ $M = -2$
No DFA can accept L= {anbn/n>0} because no
DFA can count how many a's there are.
I dea Suppose we have a putative recognizer for he
this is in a DEA Come it las a state change
Idea Suppose we have a putative recognizer for he this is is a DFA. Suppose it has n states. Choose a string of the form a min where m>n.
a string of the form a b where m>n.
(7a's
SOME ACCEPT STATE
-manyo
START a'S a'S b'S
Such a string must hit the same state twice as it
Such a string must hit the sauce state twice as it reads the a's. So there is a loop of size, say, k driven by a's. But now I should be able to recognize
by a's. Rut now I should be able to recomine
amth bm: going around the loop twice amt 2k bm: going around the loop 3 times
mt2k 1m going around the loop fivice
a b going around the loop 3 times
also am-Rbm: skipping the loop
also a ^{m-k} b ^m : skipping the loop
PORMAL STATEMENT. If I is a regular language
FORMAL STATEMENT: If Lisa regular language $\exists p \in \mathbb{N} p > 0 s.t. \forall \omega \in L with w \geqslant p$ $\exists x, y, z \in Z^* s.t. \omega = xyz $
∃ x,43€ Z" s.t. ω=x42 2 /x4/≤ β 2/4/>0
Viell xyizeL
1 mare las => 1 can be pumped
1 regular ⇒ 1 can be pumped
L'annot be pumped => L'is not regular
L'annot be pumped => Lis not regular NOTE
L'eau be pumped does NOT imply Lis regular
Lis gearlar

CONTRAPRETTIVE . Summer 1 C 5*
CONTRAPOSITIVE: Suppose L & Z* is a language them, s.t. Yp>0] wel with w > p s.t.
There s.t. TP >0 I with 16/2 p s.t.
$\forall x,y,z\in \mathbb{Z}^*$ s.t. $\omega = xyz 2 xy \le \beta 2 y > 0$ $\exists i \in \mathbb{N}$ s.t. $xy^i 3 \notin L$ then L is not regular.
JieN s.t. xyiz4L
There L is not regular.
How to cope with all those quantifiers?
GAMES
V: Demon J: You
2) Dewon chooses w with $ w \ge p$ 3) Dewon chooses x, y, z meeting the conditions above 4) You choose i & Show $xy^{i}z \notin L$
2) You choose w with lw/>p
3) Demon chooses x, 43 meeting the conditions above
S) Secretary Charles as of S meeting the conductions associated
1) Tou choose i 2 stow xy 3 & L
Section's choices are (1) symbolic to cover all
Demon's choices are (1) symbolic to cover all cases & (3) you have to analyze all demonic choices.
choices.
EXAMPLE L= {anbn/neN}
(1) Deven chooses p
(2) I choose a b
(3) Deven has to choose x, y, z with 1xy1 & p
so x, y consist purely of a's & y + E suice /y/>0
(4) I choose i = 2 so the string xy's is
(4) I choose i = 2 so the string xy'3 is a P+i.l b where l = /y/>0
p+i.l+p so this sping is not in L.
Theex 1 is not and 0
Thees L is not regular