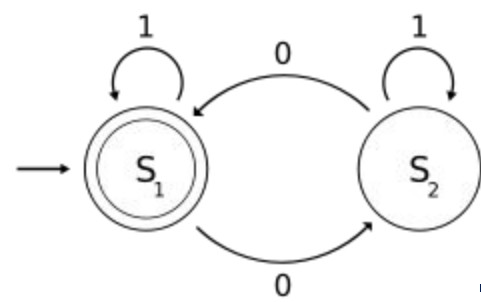
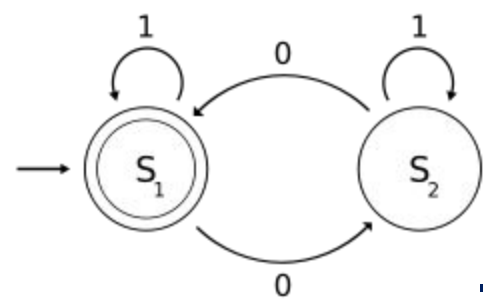




Closure under Regular Operations

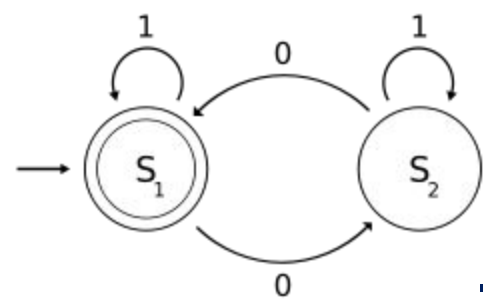


Today's adventure

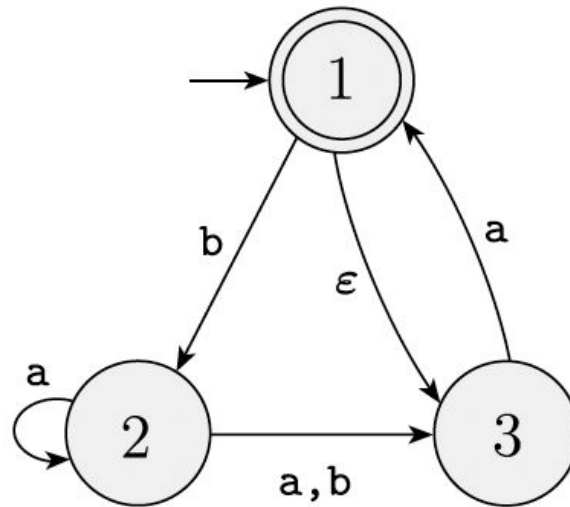


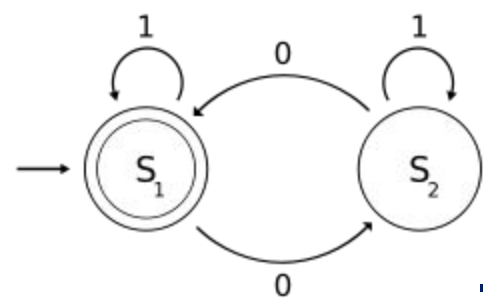
- Closure under regular operations:
 - concatenation
 - Kleene star
 - revisiting union

Weekly tip:



Warmup





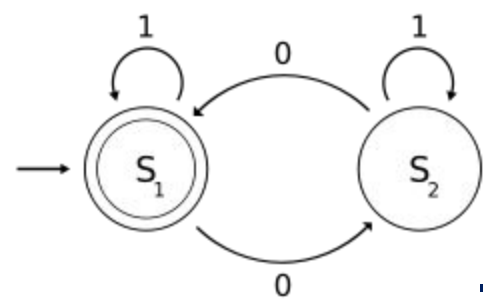
Let's go back to our old friends

Theorem. The class of regular languages is closed under concatenation.

BUT! We just proved NFAs and DFAs are equivalent!

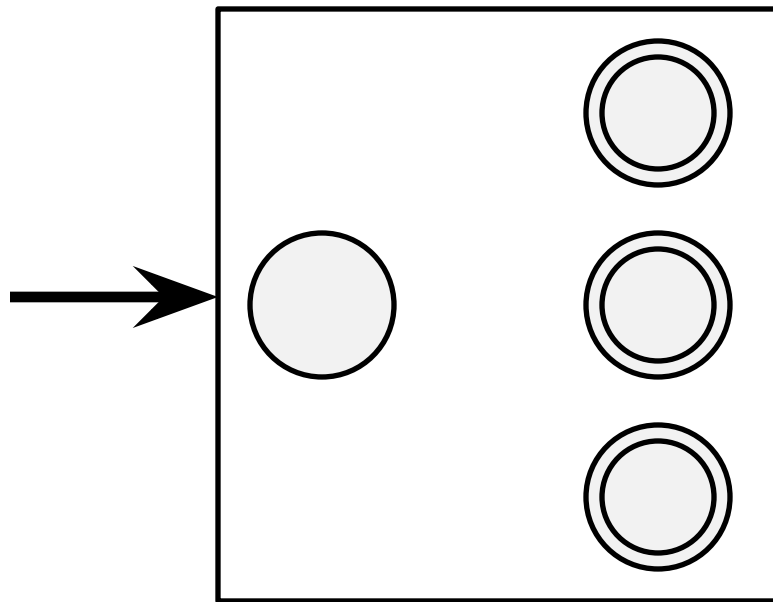
So if we could prove the class of languages recognized by NFAs is closed under concatenation...

...we'd be all set...right?

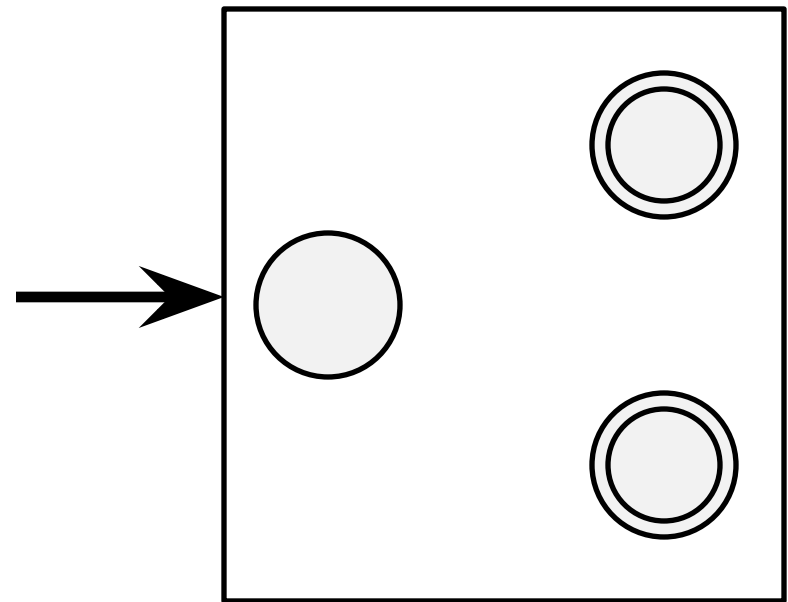


Proof idea

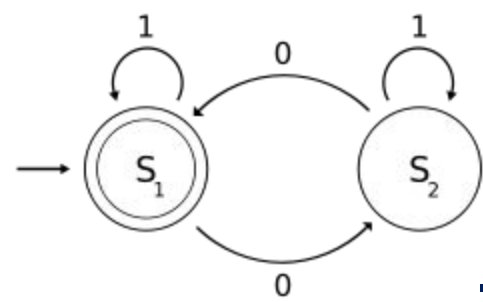
Proof Idea.



N_1



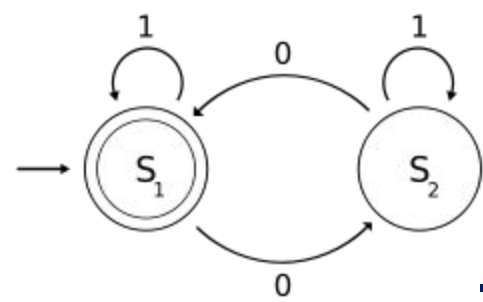
N_2



Closure under concatenation

Theorem. The class of regular languages is closed under the concatenation operation.

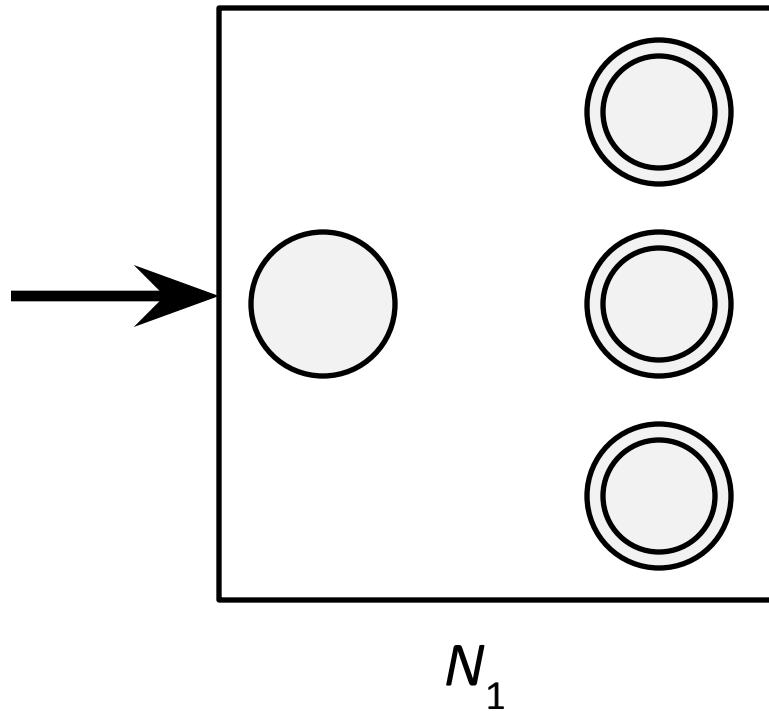
Proof.

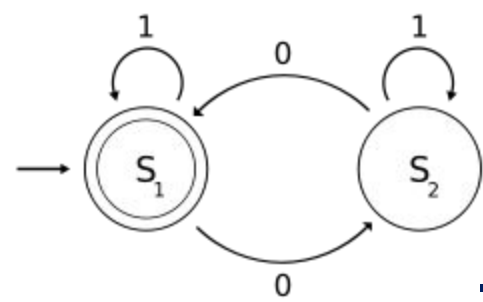


Closure under Kleene Star

Theorem. The class of languages recognized by NFAs is closed under Kleene star.

Proof Idea.

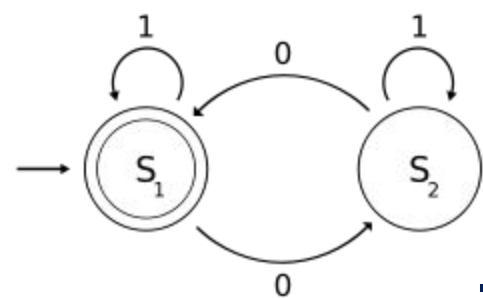




Closure under Kleene Star

Theorem. The class of regular languages is closed under Kleene star.

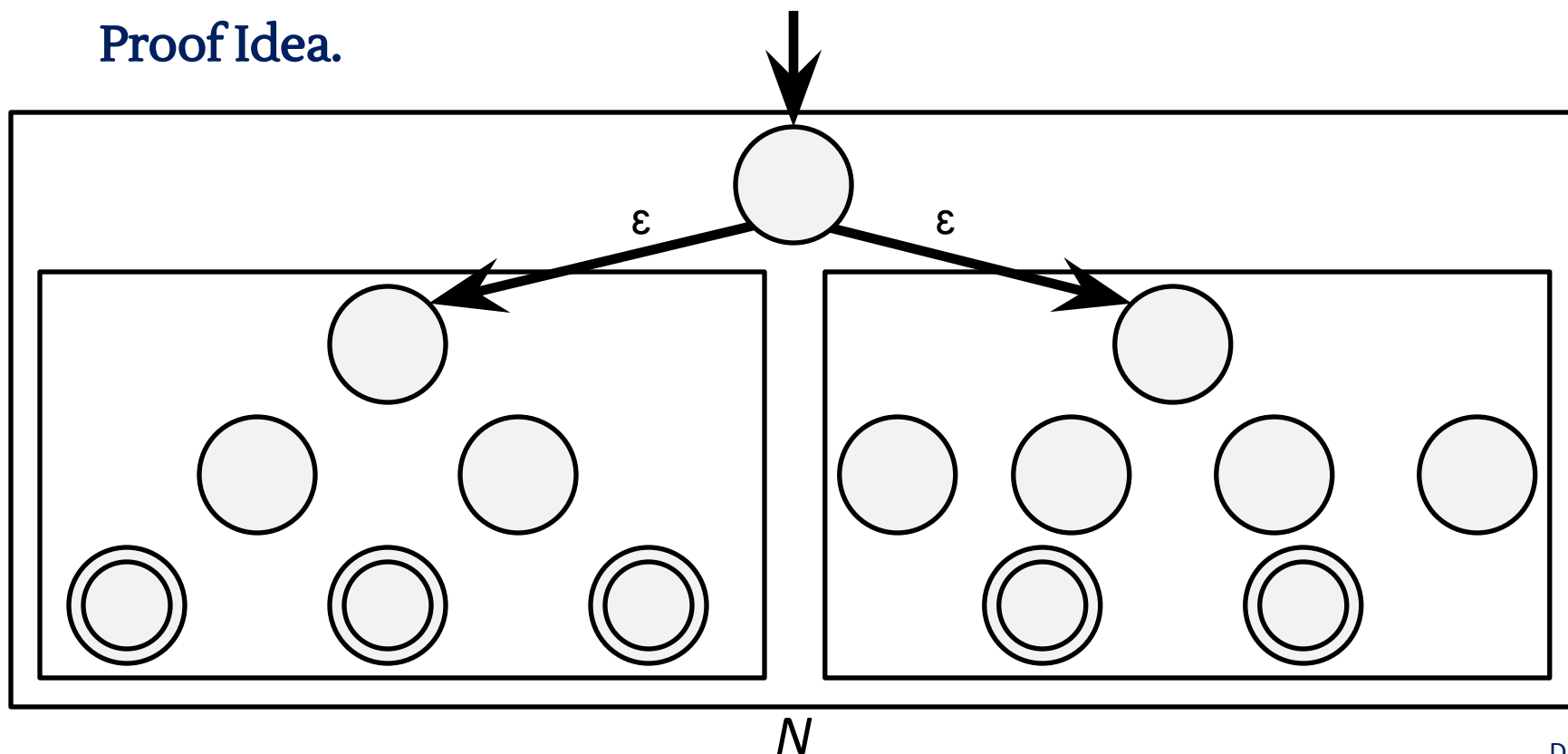
Proof.

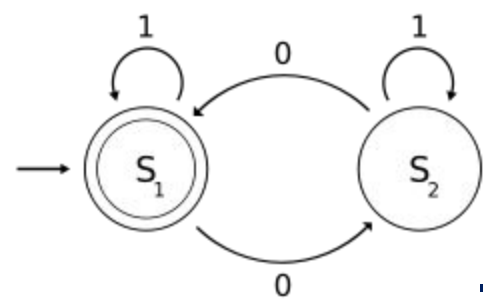


Closure of Regular Languages Under Union Using NFAs

Theorem. The class of regular languages is closed under the union operation.

Proof Idea.





Closure of Regular Languages Under Union Using NFAs

Theorem. The class of regular languages is closed under the union operation.

Proof.