

To Prove: A language is regular if and only if it is accepted by a Multistart FA.

Proof:

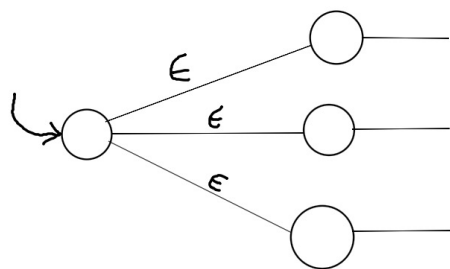
There are two parts we need to prove,

1. If a language is Regular, then it is accepted by Multistart FA.
2. If a language is accepted by Multistart FA, then the language is Regular.

Part 1.

Multistart FA is a FA with multiple start state where there exist a start state, if computation starts in that state it finishes in a Final state (hence accepted) otherwise reject if it finishes in a non-final state. We can say that Multistart FA behaves in a similar manner as a FA. Therefore, if a language is regular then there exists a start state and final state in Multistart FA where the language is accepted.

Part 2.



MFA to NFA

We can convert Multistart FA to NFA by concatenating multiple start states using an empty transition. Doing so, we get a new machine/automata which acts as an NFA.

By Kleene's Theorem, we can express this NFA to a FA. Therefore if a language is accepted by a Multistart FA, it is also accepted by an FA. Then, the FA corresponds to a regular expression hence the language is Regular.

Conclusion:

Therefore, we proved that a language is regular if and only if it is accepted by a multistart FA.