

Regular Game of Volleyball?

In the past, the game of **volleyball** used these scoring rules (before “Rally Scoring”): Two teams volley the ball over a net until a team *loses the volley*. If the *serving team* loses the volley, the right to serve the ball into play is lost and goes to the other side. If **the serving team wins the volley**, they score a point.

Games are played to a score of N and must be won by a score differential of two or more (play continues past N in a sudden death fashion).

Would you consider volleyball a **regular game**? Which is to say can you draw a DFA representing **any game** with accepting states meaning “Game Over”.

Suppose you have automated tools that can easily perform the RE \rightarrow NFA \rightarrow DFA conversions. How would you use (abuse?) them to make a state diagram (DFA diagram) for volleyball?

(Hint: consider first a small number of N , like $N = 3$)

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Let $N = 3$, h and v represent a Home Team score and a Visiting Team Score respectively. It is reasonably straightforward to generate all possible sequences of outright wins and games ending in “sudden death” where the *win by two* rule needs a Kleene operator before a team finally rises to the top.

hhh
vvv
hhvh
vvhv
hvhv
:
:
hhvvh (vh) *h
hhvvh (vh) *vv
vvhhv (hv) *v
vvhhv (hv) *hh
hvhvh (vh) *h
:
:

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Alternating these together, $(hhh | vvv | hhvh | vv hv | \dots)$, and using our supposed $RE \rightarrow DFA$ tool chain ...

