

A MMarkov Chain

March 8, 2025

Markov chain

A MMA fight can be represented as a Markov chain. Figure 1 shows the relationships between the different states. Table 1 describes the different states and actions.

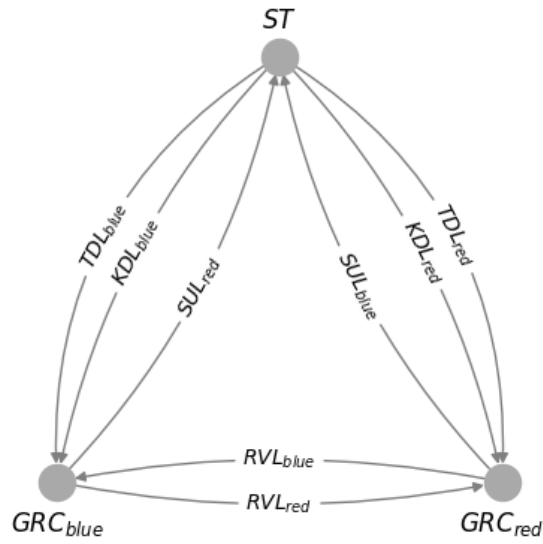


Figure 1: A visual representation of the states and transitions

Variable	Definition	Category
GRC	Ground control	state
KDL	Knockdown landed	transition
RVL	Reversal landed	transition
ST	Standing	state
SUL	Standup landed	transition
TDL	Takedown landed	transition

Table 1: A summary of the states and transitions

Stand ups

All the variables of Table 1 are known, with the exception of SUL . The chain always starts in ST and depending on the final state we can infer the following:

Final state is ST

GRC_{blue} and GRC_{red} are entered and exited the same number of times.

$$\begin{aligned}SUL_{red} &= \max(0, KDL_{blue} + TDL_{blue} + RVL_{blue} - RVL_{red}) \\SUL_{blue} &= \max(0, KDL_{red} + TDL_{red} + RVL_{red} - RVL_{blue})\end{aligned}$$

Final state is GRC_blue

The number of entries of GRC_{blue} is one greater than the number of exits. The number of entries and exits of GRC_{red} is equal to each other.

$$\begin{aligned}SUL_{blue} &= \max(0, KDL_{red} + TDL_{red} + RVL_{red} - RVL_{blue} - 1) \\SUL_{red} &= \max(0, KDL_{blue} + TDL_{blue} + RVL_{blue} - RVL_{red})\end{aligned}$$

Final state is GRC_red

The number of entries and exits of GRC_{blue} is equal to each other. The number of entries of GRC_{red} is one greater than the number of exits.

$$\begin{aligned}SUL_{blue} &= \max(0, KDL_{red} + TDL_{red} + RVL_{red} - RVL_{blue}) \\SUL_{red} &= \max(0, KDL_{blue} + TDL_{blue} + RVL_{blue} - RVL_{red} - 1)\end{aligned}$$