Pig with value iteration

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$S = (i, j, k)$ $i \rightarrow$ player's score

$A = \{\text{roll}, \text{hold}\}$ $j \rightarrow$ opponent's score

$k \rightarrow$ turn score

Transitions

if hold:

$(i, j, k) \longrightarrow (j, i+k, 0)$

if roll:

- if $r = \{2, \ldots, 6\}$

  $(i, j, k) \longrightarrow (i, j, k+r) / (W, L, 0)$

- if $r = 1$

  $(i, j, k) \longrightarrow (j, i, 0)$

Reward

If $(i, j, k) \longrightarrow (W, L, 0)$

Reward = 1

otherwise

Reward = 0

$$V((i,j,k), \text{roll}) = P_{i,j,k,\text{roll}} = \frac{1}{6}\left[(1 - P_{j,i,0}) + P_{i,j,k+2} + P_{i,j,k+3} + \ldots + P_{i,j,k+6}\right]$$

$$V((i,j,k), \text{hold}) = P_{i,j,k,\text{hold}} = 1 - P_{j,i+k,0}$$