Grand Valley State University

Project 1 – Snakes and Ladders Analysis

Repository: [github.com/vandents/MTH302-Project1](https://github.com/vandents/MTH302-Project1)

A screenshot of a computer screen

Description automatically generated

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A command line application was written in Python for this project. The application is able to perform an analysis on any sized square board with any configuration of snakes and ladders. A link to the repository is located on the cover page. The game board in Figure 1 shows the configuration that we’ll analyze in this write up. The board has four consecutive snakes in a row and a single ladder starting at square 6 and ending all the way up at square 22.

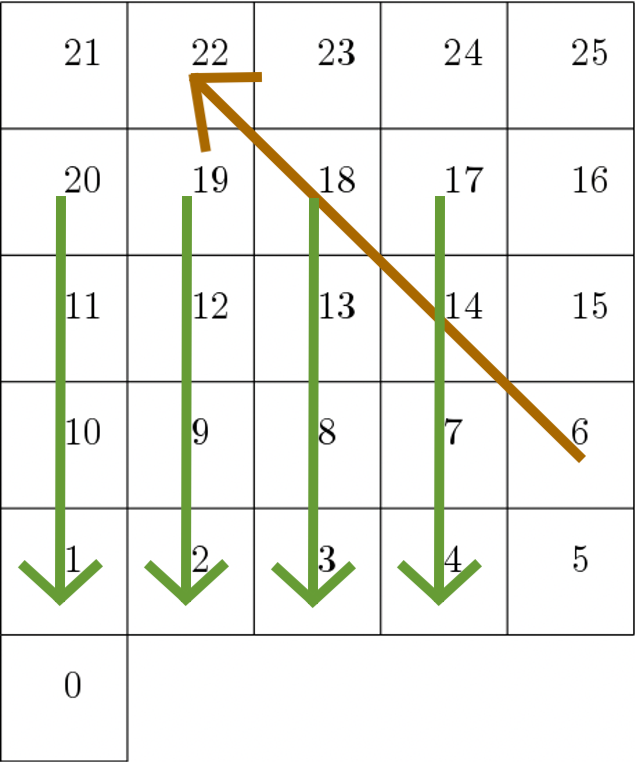


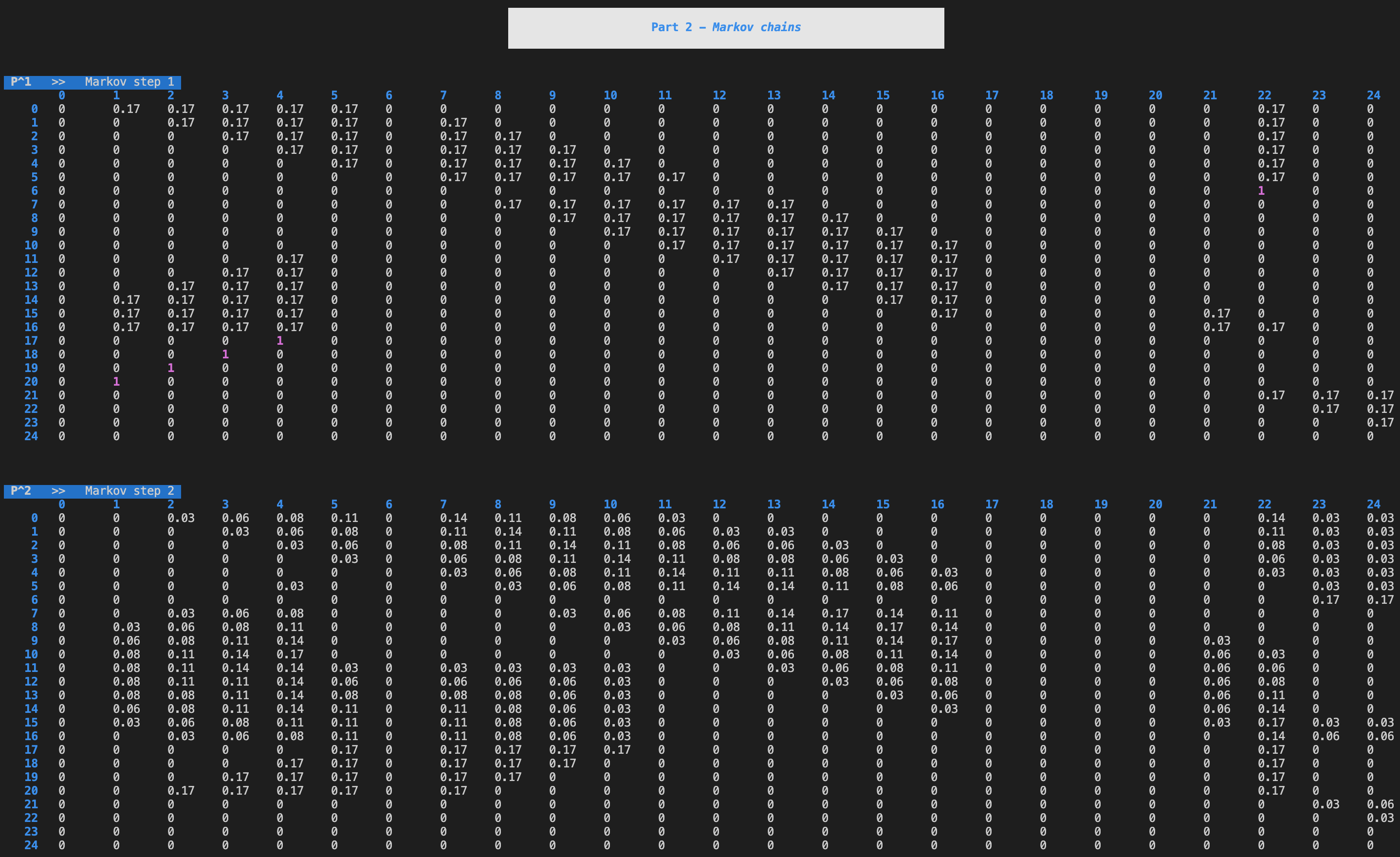
Figure 1. Game board to be analyzed

The matrix in Figure 2 is the transition matrix for our game. Figure 1 shows us that there is a snake or ladder in the squares 6, 17, 18, 19, 20. The snakes and ladders force the probabilities in columns 6, 17, 18, 19, 20 to be zero since it isn’t actually possible to land on these squares. Deleting columns removes probabilities and causes rows to not add up to 1. To counteract this, the deleted probability is added to the outlet of a snake/ladder. The rows 6, 17, 18, 19, 20 all have a 1 in the column of the corresponding snake/ladder end square because there is a 100% probability that the player will go to the end square next.

A close up of a computer

Description automatically generated

Figure 2. Transition matrix for the current game variation



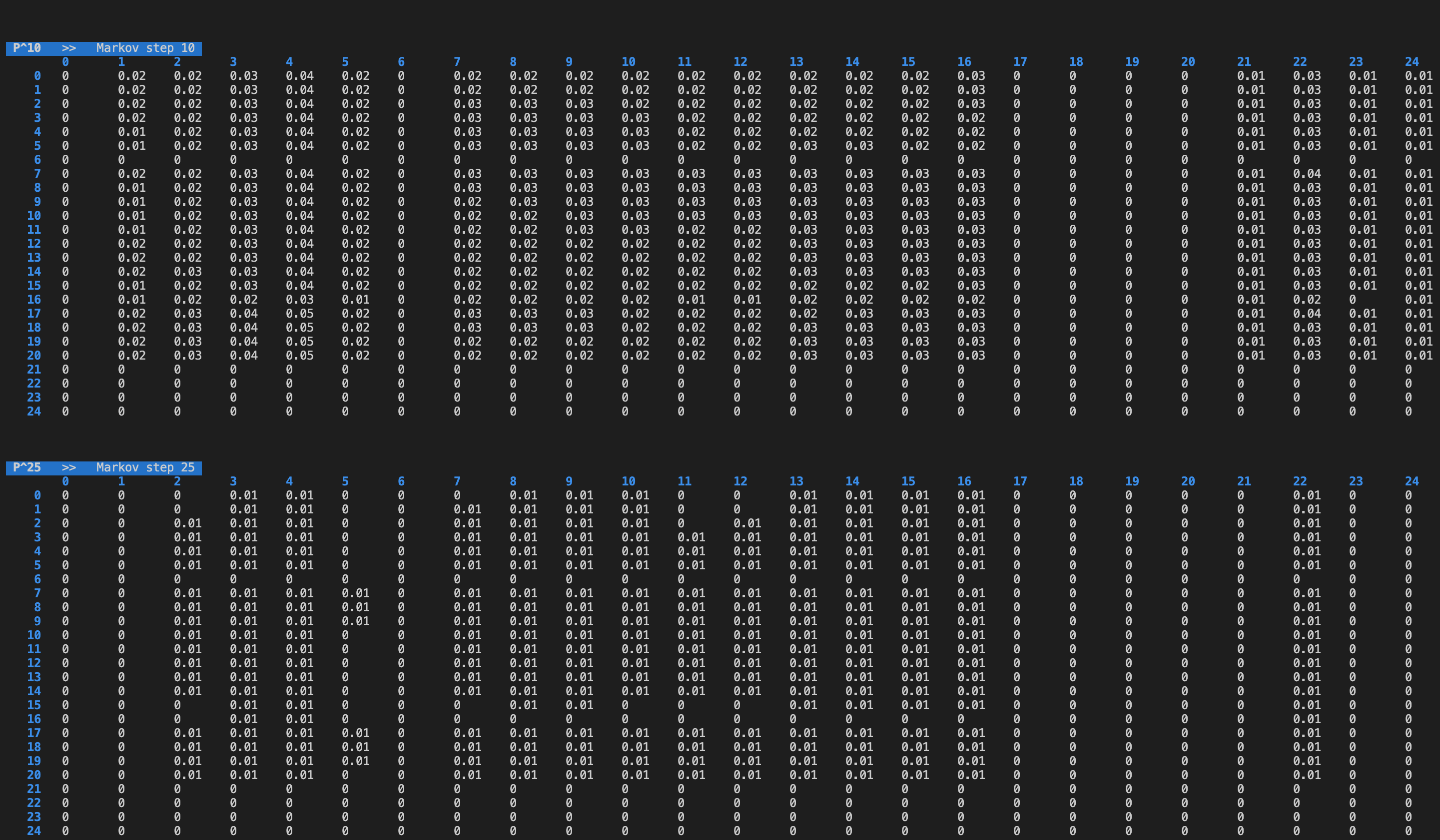


Figure 3. Markov chain at steps 1, 2, 10, 25

The Markov matrices were