Markov Chains and Numerical Transitions

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Graduate Project Presentation
Andrey Markov (1856 – 1922)

- “A Markov chain is a kind of probabilistic state machine that can be easily trained given a set of training data”
  – *Artificial Intelligence: A Systems Approach* by M. Tim Jones
What is a Numerical Transition?

Within a value, it's the change from one group of digits to another group of digits.
Numerical Transition Example

- Given the value: 12345
- Possible transitions sets include:
  - \{1, 2, 3, 4, 5\}
  - \{123, 234, 345\}
  - \{1, 12, 23, 34, 45, 5\}
  - \{1, 12, 123, 234, 345, 45, 5\}
Why is this useful?

- Finding patterns in value, while maintaining the state at each stage.
What kind I chose.

- Basic Rules:
  - Add the character " " to the beginning and end of the value as an *empty character*.
  - " " evaluates the same as " ", so " 1" = " 1" and " 5 " = " 5 "

- Example:
  - Given: Value = 12345, Max length = 3
  - Result set:
    - {" 1", " 12", "123", "234", "345", "45 ", "5 "}
Program Motivation

- Finding patterns that could potentially help in determining if a value is prime or not.
Program Implementation

- Java v1.6
- Netbeans IDE
Development Stages

Created:
- \( N \)-Dimensional Markov Chain
- Transition Iterator for values
  - Letter, Word, Transition
- Value Generators
  - Primes, Integer, Multiple*Primes, Multiple*Integer
- GUI Interface
  - Table displays and exports
Program Results

- Lots of Data, lots of patterns, but nothing I can say definitively about the patterns without a mathematical proof.
Future Versions?

- Evaluation of transitions in different base
- Regular expression searches
- Probabilistic evaluations of counts
Questions?
Thank You