A New Kinship Machine: Characteristics, Use, and Perspectives

Carlos Eduardo Ferreira, Álvaro Junio Pereira Franco, and Marcio Ferreira da Silva
University of São Paulo and Federal University of Santa Catarina, Brazil

Introduction

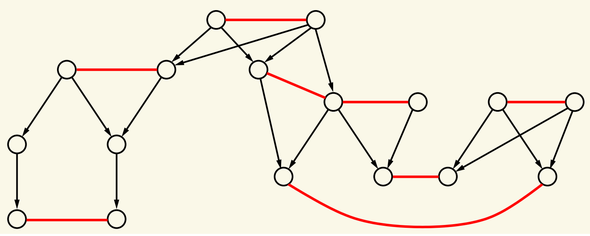
- Kinship Machine is a tool that helps anthropologists to find certain structures in a kinship network
- The first version of the Kinship Machine was produced
  - using concepts of database area
- A new version of the Kinship Machine have been produced
  - using concepts of graph area

A New Kinship Machine: Characteristics

- Characteristics
  - The modeling: mixed graphs
  - The structures of interest
  - Definition of the problems, and its complexities

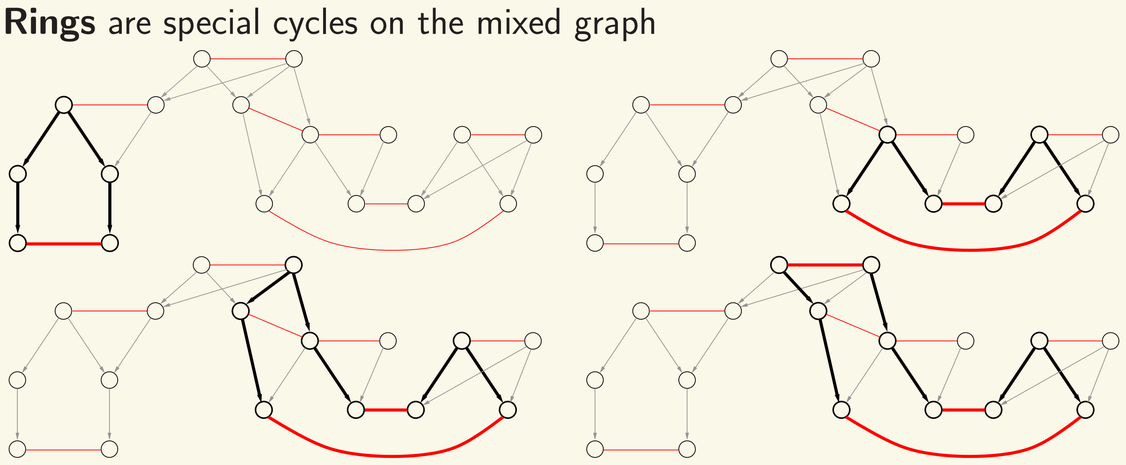
The Modeling: Mixed Graph

- Individuals are vertices
- Affinity connections are edges
- Filiation connections are arcs



The Structures of Interest: Rings

- **Rings** are special cycles on the mixed graph

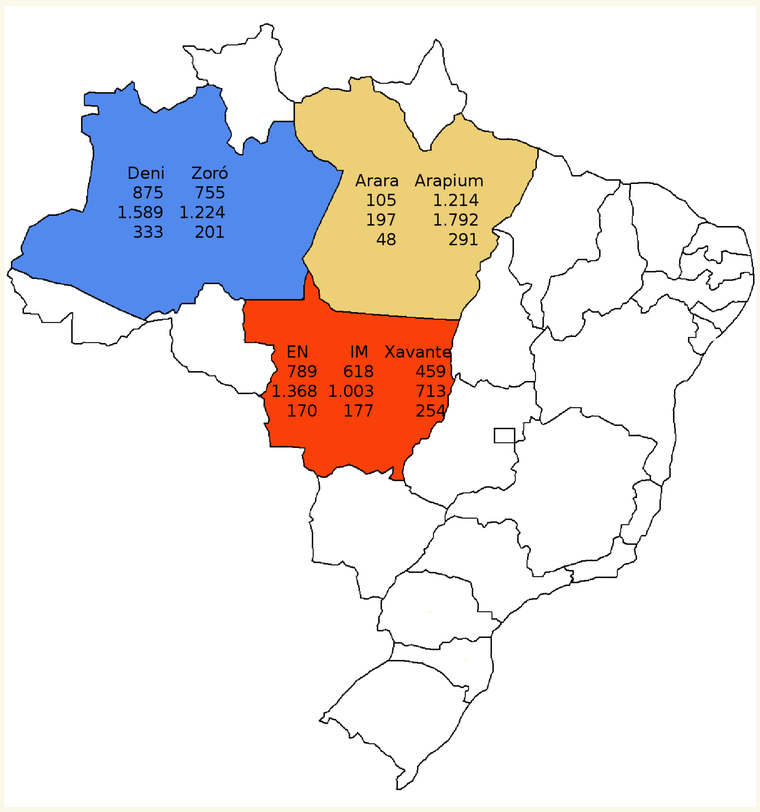


Definition of the Problems, and its Complexities

- Problem **P1**: Given a mixed graph **H** and an ordered subset of edges $\mathcal{E} = ((\mathbf{u_1}, \mathbf{v_1}), \ldots, (\mathbf{u_k}, \mathbf{v_k}))$, finds all rings with $\mathcal{E}$ in **H**
  - **H** could have an exponential number of rings with $\mathcal{E}$
- Problem **P2**: Given a mixed graph **H** and an ordered subset of edges $\mathcal{E} = ((\mathbf{u_1}, \mathbf{v_1}), \ldots, (\mathbf{u_k}, \mathbf{v_k}))$, there exists a ring with $\mathcal{E}$ in **H**?
  - $\mathcal{NP}$-hard
- Solutions for problems **P1** and **P2**
  - Exponential algorithms for general mixed graph

Now What?

- Ours colleagues anthropologists desire a solution for problems **P1** and **P2**
- The implementations of the exponential algorithms worked well on the tested instances



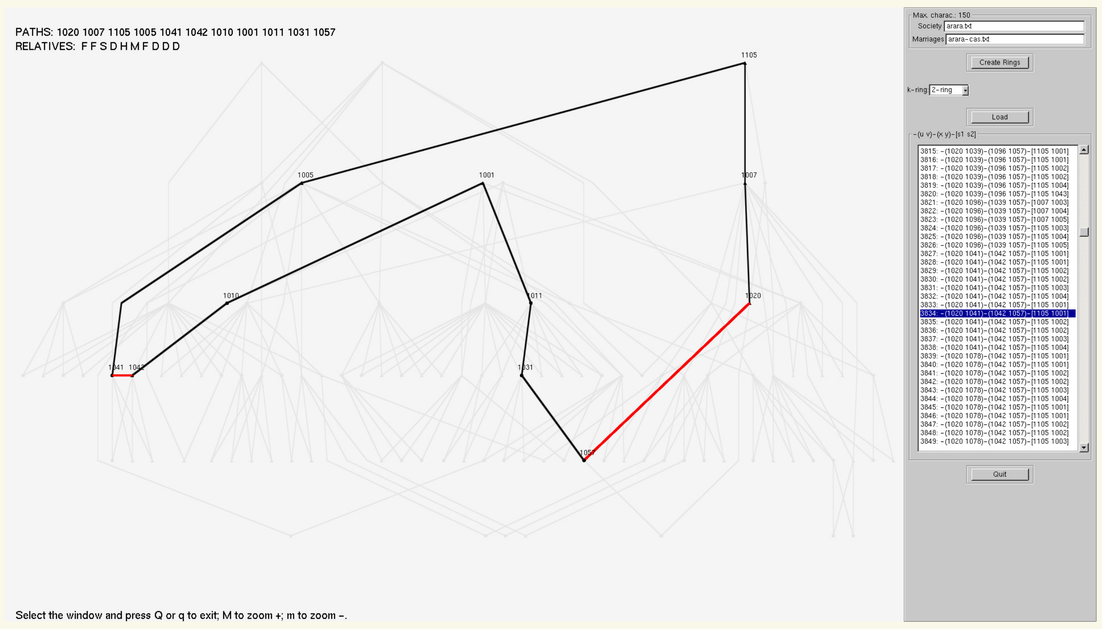
A New Kinship Machine: Use

- Two kinds:
  - A free tool available at: `www.ime.usp.br/~alvaro`; or
  - A kinship machine server which receives a mixed graph **H** and returns all the rings in **H**: `www.ime.usp.br/~alvaro/maqpar`

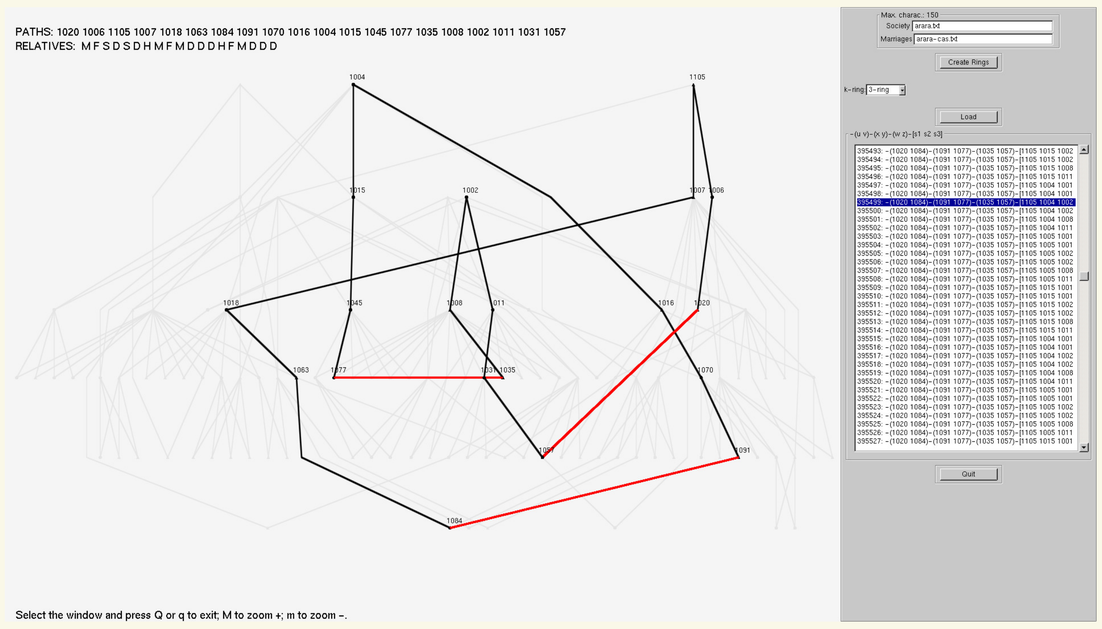
The Tool: Use

- Input:
  - A mixed graph divided in two files containing:
    - the individuals and the filiation connections
    - the pairs of married individuals
- Output:
  - A drawing of a graph (the individuals and the filiation connections)
  - A highlighted ring (chosen by the user)

A Snapshot of the Kinship Machine Tool



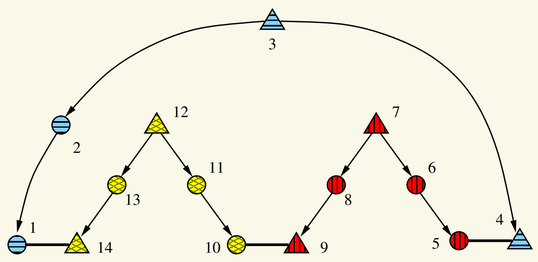
Another Snapshot of the Kinship Machine Tool



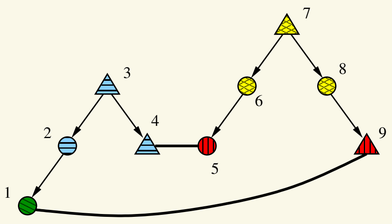
A New Kinship Machine: Perspectives

Chromatic Rings are rings whose vertices obey certain color constraints

- Descendant lines with the same color



- Same color for the spouses of relatives



Dynamic Kinship Networks are kinship networks that support operations of insertion and deletion (of vertices, arcs, or edges)

Conclusions

- **Kinship Machine** is a tool which helps anthropologists to find structures (called **rings**), and it is available to download or to use from a server
- The Kinship Machine finds rings in a **static uncolored mixed graph**
- The perspectives: to find **chromatic rings** in a **dynamic mixed graph**

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