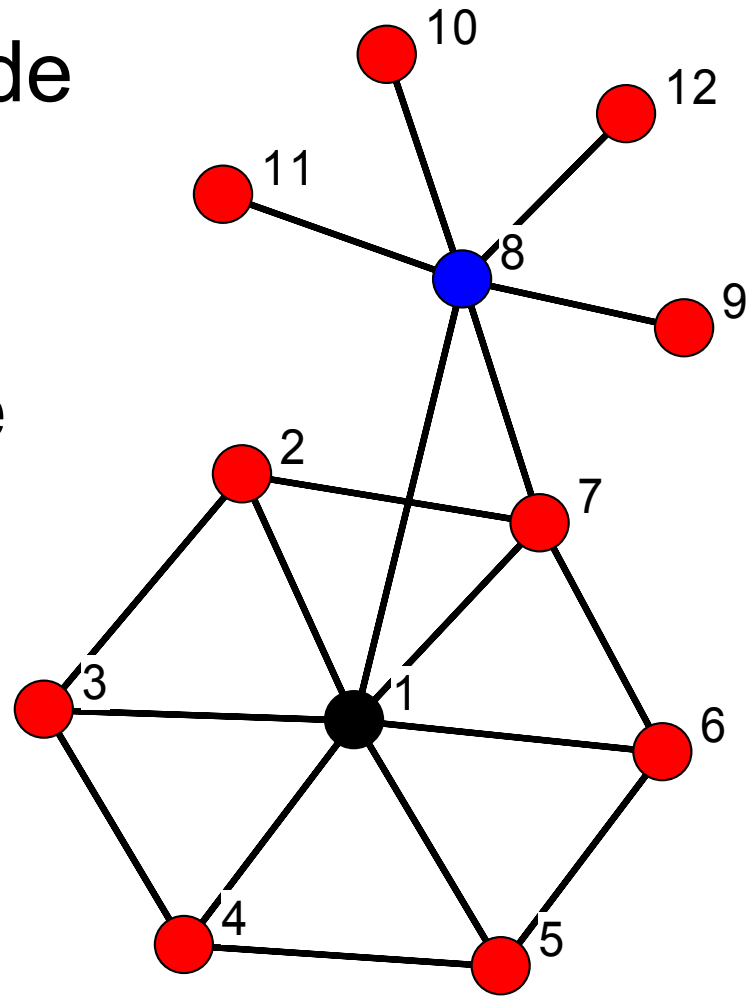
How things flow

Walks, Trails, Paths

- Path: can't repeat node
  - 1-2-3-4-5-6-7-8
  - Not 7-1-2-3-7-4
- Trail: can't repeat line
  - 1-2-3-1-7-8
  - Not 7-1-2-7-1-4
- Walk: unrestricted
  - 1-2-3-1-2-7-1-7-1



Things that move thru networks

- Used goods
- Money
- Packages
- Personnel
- Gossip / information
- E-mail
- Infections
- Attitudes

Used Goods Process

- Canonical example:
  - passing along used paperback novel
- Single object in only one place at a time
- Doesn't (usually) travel between same pair twice
- Could be received by the same person twice
  - A--B--C--B--D--E--B--F--C ...
  - Travels in trails

Mooch Process

- Examples
  - Obnoxious homeless relative who visits for six months until kick out and moves to next relative
  - Personnel flows between firms
- In just one place at a time
- Doesn’t repeat a node (bridges burned)
  - Travels along paths

Money Exchange Process

- Examples:
  - specific dollar bill moving through the economy
  - Erdos itinerary
  - Any markov process
- Single object in only one place at a time
- Can travel between same pair more than once
    - A--B--C--B--C--D--E--B--C--B--C ...
    - Travels along unconstrained walks

Gossip Process

- Example:
  - Confidential story moving through informal network
- Multiple copies exist simultaneously
- Person tells only one person at a time*
- Doesn't travel between same pair twice
- Can reach same person multiple times

* More generally, they tell a very limited number at a time.

E-Mail Process

- Example:
  - forwarded jokes and virus warnings
  - e-mail viruses themselves
- Multiple copies exist simultaneously
- All (or many) connected nodes told simultaneously
  - Except, perhaps, the immediate source

Influence Process

- Example:
  - attitude formation
- Multiple “copies” exist simultaneously
- Multiple simultaneous transmission, even between the same pairs of nodes

Infection Process

- Example:
  - virus which activates effective immunological response
- Multiple copies may exist simultaneously
- Cannot revisit a node
    - A--B--C--E--D--F...

Package Delivery Process

- Example:
  - package delivered by postal service
- Single object at only one place at one time
- Map of network enables the intelligent object to select only the shortest paths to all destinations

Properties of Flow Processes

- Sequence type: path, trail, walk
  - path: can't revisit node nor edge (tie)
  - trail: can revisit node but not edges
  - walk: can revisit edges & nodes
- Deterministic vs non-deterministic
  - blind vs guided
  - always chooses best route; aware of map
- Combine into 4-way "traversal type" property:
  - geodesics, paths, trails, walks

Properties -- cont.

- Duplication vs transfer (copy vs move)
  - transfer/move: only one place at one time
  - duplication/copy: multiple copies exist
- Serial vs parallel duplication
  - serial: only one transmission at a time
  - parallel: broadcast to all surrounding nodes
- Combine into “method” 3-way property:
  - parallel dup., serial dup., transfer

Simplified Typology

information

goods

	parallel duplication	serial duplication	transfer
geodesics	<no process>	mitotic reproduction	package delivery
paths	internet name-server	viral infection	mooch
trails	e-mail broadcast	gossip	used goods
walks	attitude influencing	emotional support	money exchange

*Note: Names not to be taken too seriously.

Markov