**Models for Clearance**

- **Inputs**: Road network condition, clearance capacity per period, debris amounts, relief supply/demand locations and quantities
- **Output**: Clearance sequence for a set of roads
- **Complete debris information**: All debris amounts assumed to be known
- **Incomplete debris information**: Reachable arcs known, beliefs about unreachable arcs updated as clearance proceeds
- **Regional updates** as arcs in the same region become reachable

**Phases of Debris Operations**

- **Clearance**: Unblock roads
  - Prioritize roads to be cleared
  - Connect relief supply to demand points
- **Collection**: Transport debris to collection sites
  - Assign roads to collection teams
  - Minimize collection time and balance workload
- **Disposal/recycling**: Sort debris and decide on final processes
  - Debris processing site location
  - Process selection: wood grinding, concrete crushing, incineration, compaction, etc.
  - Landfilling/recycling tradeoff

**Computational Experiments**

- Example: Earthquake near Cambridge, MA
  - A 6.5 magnitude earthquake
  - Debris estimates using Hazus (FEMA's methodology for estimating potential losses from disasters, www.fema.gov/hazus)
  - Debris flow diagrams

**Models for Collection**

- **Inputs**: Debris amounts, facility locations and capacities, contractor data
- **Output**: A fair and continuous assignment of the roads to collection teams and expected collection time
- **Objective**: Minimize cost and completion time
- **Solve a MIP**: based sequential heuristic

**Models for Disposal / Recycling**

- **Debris estimates**: Potential locations for opening processing site
- **Workforce on collection and transportation**: Workforce capacities to make available at site

**REFERENCES**

- Debris Operations Tool: Optimizing disaster debris management operations. Available at debrismanagement.gatech.edu

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