What is RDDL?

- Relational Dynamic Influence Diagram Language
- Relational
  - DBN + Influence Diagram
- Everything is a fluent!
  - states
  - observations
  - actions
- Conditional distributions are probabilistic programs

Wildfire Domain (new in 2014)

- Contributed by Zhenyu Yu (School of Economics and Management, Tongji University)

Wildfire in RDDL

```
cpfs { burning('x, y) = if put-out('x, y) then false
  else if (~out-of-fuel('x, y) ^ ~burning('x, y))
  then Bernoulli(1.0 / (1.0 + exp(4.5 - (sum_{x2: x_pos, y2: y_pos}(NEIGHBOR('x, y, 'x2, 'y2) ^ burning('x2, 'y2)))))
  else burning('x, y); // State persists

  out-of-fuel('x, y) = out-of-fuel('x, y) | burning('x, y); }
reward = [sum_{x: x_pos, y: y_pos} [ COST_CUTOUT*cut-out('x, y) ]]
  + [sum_{x: x_pos, y: y_pos} [ COST_PUTOUT*put-out('x, y) ]]
  + [sum_{x: x_pos, y: y_pos} [ COST_NONTARGET_BURN*[burning('x, y) ^ ~TARGET('x, y)]
  + [sum_{x: x_pos, y: y_pos} [ COST_TARGET_BURN*[ (burning('x, y) | out-of-fuel('x, y) ^ TARGET('x, y) ]
```

Facilitating Model Development by Writing Simulators: Relational Dynamic Influence Diagram Language (RDDL)

- Sanner (2010)

```
// Store alive-neighbor count for each
count-neighbors('x, 'y) =
  KrosDelta(sum_{x2: x_pos, y2: [NEIGHBOR('x, 'y, x2, y2), 'y2]: y_pos} [alive('x, 'y)]
  + (count - alive('x, 'y))

// Determine whether
alive('x, 'y) = if
  then Bernoulli(1.0 -
  else Bernoulli(1.0 -

// Store cut-out count for each
cut-out('x, 'y) = 2
```