OSU CS536

Relational Dynamical Influence Diagram Language (RDDL)

Scott Sanner
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

cpbs {

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

// Store alive-neighbor count for each
count-neighbors(?x,?y) =
    KronDelta(sum_{?x2 : x_pos, ?y2 :}
        [NEIGHBOR(?x,?y,?x2,?y2]

// Determine whether
alive'(?x,?y) = if (in
    ^ (count_neigh
        | [~alive(?x
            ^ (count_neigh
                | set(?x,?y)
        when Bernoulli(PROB_R
            else Bernoulli(1.0 -

Automatic Translation

Write probabilistic programs for transitions
RDDLSim Software

Open source & online at

https://github.com/ssanner/rddlsim