INTELIGENTNI MULTIAGENTSKI SUSTAVI

PODSJETNIK v1.0

Racionalni agenti

Algoritam iteracije vrijednosti:

VALUE-ITERATION(T, r, γ, ϵ)

do
  $u \leftarrow u'$
  $\delta \leftarrow 0$
  for $s \in S$
    do $u'(s) \leftarrow r(s) + \gamma \max_a \sum_{s'} T(s, a, s')u(s')$
      if $|u'(s) - u(s)| > \delta$
        then $\delta \leftarrow |u'(s) - u(s)|$
  until $\delta < \epsilon(1 - \gamma)/\gamma$
return u

Očekivana funkcija korisnosti:

$$E[u_i, s, a] = \sum_{s' \in S} T(s, a, s')u_i(s'),$$

Sebična politika:

$$\pi_i^*(s) = \arg\max_{a \in A} E[u_i, s, a]$$

Raspodijeljeno zadovoljavanje ograničenja

Pretraživanje u dubinu:

DEPTH-FIRST-SEARCH-CSP(i, g)

if $i > n$
  then return g
for $v \in D_i$
  do if setting $x_i \leftarrow v$ does not violate any constraint in P given g
    then $g' \leftarrow$ DEPTH-FIRST-SEARCH-CSP$(i + 1, g + \{x_i \leftarrow v\})$
      if $g' \neq \emptyset$
        then return g'

return $\emptyset$

Rezolucijsko zaključivanje:

$$\frac{\begin{array}{c} A_1 \vee A_2 \vee \cdots \vee A_m \\ \neg(A_1 \wedge A_{11} \wedge \cdots) \\ \neg(A_2 \wedge A_{21} \wedge \cdots) \\ \vdots \\ \neg(A_m \wedge A_{m1} \wedge \cdots) \end{array}}{\neg(A_{11} \wedge \cdots \wedge A_{21} \wedge \cdots \wedge A_{m1} \wedge \cdots)}.$$

Algoritam filtriranja:

FILTERING()

for $j \in \{\text{neighbors of } i\}$
  do REVISE(x_i, x_j)

HANDLE-NEW-DOMAIN(j, D')

$D_j \leftarrow D'$
REVISE(x_i, x_j)

REVISE(x_i, x_j)

old-domain $\leftarrow D_i$
for $v_i \in D_i$
  do if there is no $v_j \in D_j$ consistent with v_i
    then $D_i \leftarrow D_i - v_i$
if *old-domain* $\neq D_i$
  then $\forall_{k \in \{\text{neighbors of } i\}} k.$HANDLE-NEW-DOMAIN$(i, D_i)$

Algoritam asinkronog vraćanja:

HANDLE-OK?(j, x_j)

local-view $\leftarrow$ *local-view* $+(j, x_j)$
CHECK-LOCAL-VIEW()

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if *local-view* and x_i are not consistent
  then if no value in D_i is consistent with *local-view*
    then BACKTRACK()
    else select $d \in D_i$ consistent with *local-view*
      $x_i \leftarrow d$
      $\forall_{k \in neighbors}$ $k.$HANDLE-OK?(i, x_i)

HANDLE-NOGOOD$(j, nogood)$

record *nogood* as a new constraint
for $(k, x_k) \in nogood$ where $k \notin neighbors$
  do $k.$HANDLE-ADD-NEIGHBOR(i)
    neighbors $\leftarrow$ *neighbors* $+k$
    local-view $\leftarrow$ *local-view* $+(k, x_k)$
old-value $\leftarrow x_i$
CHECK-LOCAL-VIEW()
if *old-value* $\neq x_i$
  then $j.$HANDLE-OK?(i, x_i)

HANDLE-ADD-NEIGHBOR(j)

neighbors $\leftarrow$ *neighbors* $+j$

BACKTRACK()

nogoods $\leftarrow \{V \mid V =$ inconsistent subset of *local-view* using hyper-resolution rule$\}$
if an empty set is an element of *nogoods*
  then broadcast that there is no solution
    terminate this algorithm
for $V \in$ *nogoods*
  do select (j, x_j) where j has lowest priority in V
    $j.$HANDLE-NOGOOD(i, V)
    local-view $\leftarrow$ *local-view* $-(j, x_j)$
CHECK-LOCAL-VIEW()

Teorija igara

Maxmin strategija: $s_i^* = \max_{s_i} \min_{s_j} u_i(s_i, s_j)$

Strategija iterativne dominacije: $\forall_{s_{-i}} \forall_{r_i \neq s_i} u_i(s_{-i}, s_i) \geq u_i(s_{-i}, r_i)$

Strategija društvene dobrobiti: $s^* = \arg\max_s \sum_i u_i(s)$

Nashova ravnoteža: $\{s \mid \forall_i \forall_{a_i \neq s_i} u_i(s_{-i}, s_i) \geq u_i(s_{-i}, a_i)\}$

Pareto optimalna strategija: $\{s \mid \neg\exists_{s' \neq s}(\exists_i u_i(s') > u_i(s) \wedge \neg\exists_{j \in -i} u_j(s) > u_j(s'))\}$