Tic Tac Toe Phase 3

IFT-703 Informatique cognitive

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Rappel de la problématique

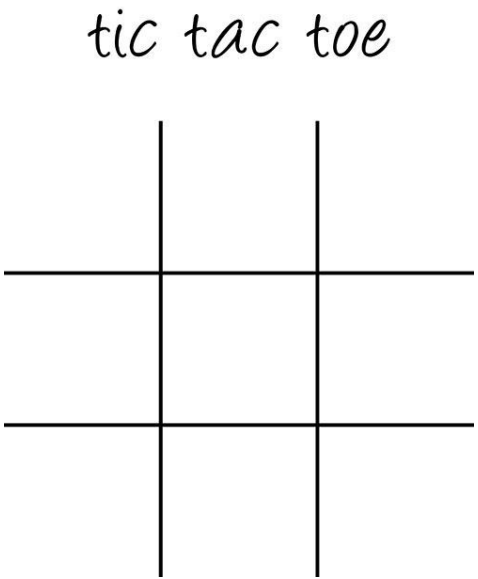
Les règles :

- 2 Joueurs
- Une grille de 3 lignes 3 colonnes
- Placent chacun à leur tour dans la grille leur symbole X ou O
- But : aligner 3 symboles identiques horizontalement, verticalement ou en diagonal

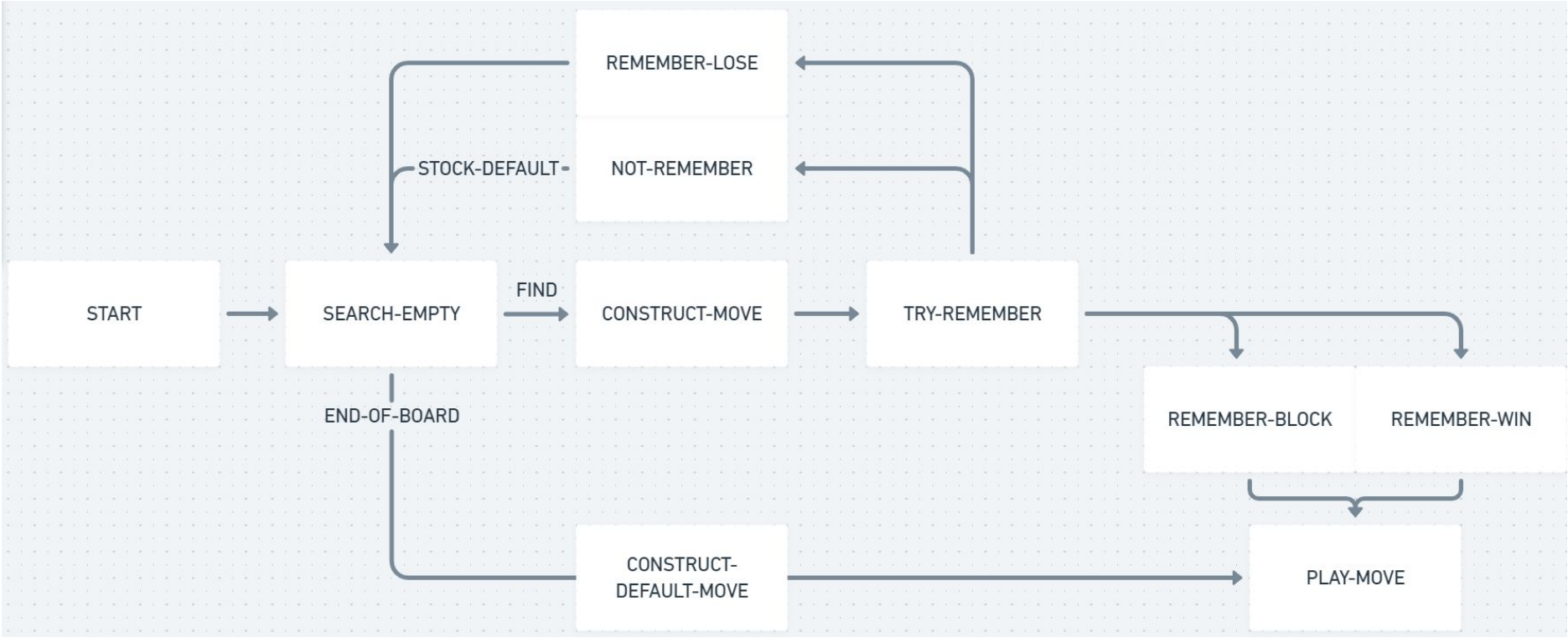
On modélise un seul coup

Hypothèses :

- On joue toujours les X
- Chaque joueur a joué 2 coups
- C’est à notre tour de jouer
- Il y a toujours une seule bonne solution



Description d’un scénario



Structure du modèle

(chunk-type board-state case1_1 case1_2 case1_3 case2_1 case2_2 case2_3 case3_1 case3_2 case3_3 nextLigne nextCol currentLigne currentCol firstEmptyLig firstEmptyCol goodAnswerLig goodAnswerCol type-move state)

Chunk goal du modèle**.**

- case1_1, 1_2…: cases du plateau (contient “X”, “O” ou “E”).
- nextLigne , nextCol : coordonnées de la case suivante.
- currentLigne, currentCol: coordonnées de la case actuelle.
- firstEmptyLig, firstEmptyCol: coordonnées de la première case vide où on peut jouer.
- goodAnswerLig, goodAnswerCol: coordonnées du bon coup à jouer
- type-move: type du bon coup à jouer (“gagnant” ou “bloquant”).
- state: état du modèle (“search-empty”, “create-move”, “try-remember”...).

Structure du modèle

(chunk-type pattern id case1 case2 case3)

Paternes des lignes du plateau.

- id: id du pattern
- case1, case2, case3: cases du pattern (contient “X”, “O” ou “E”).

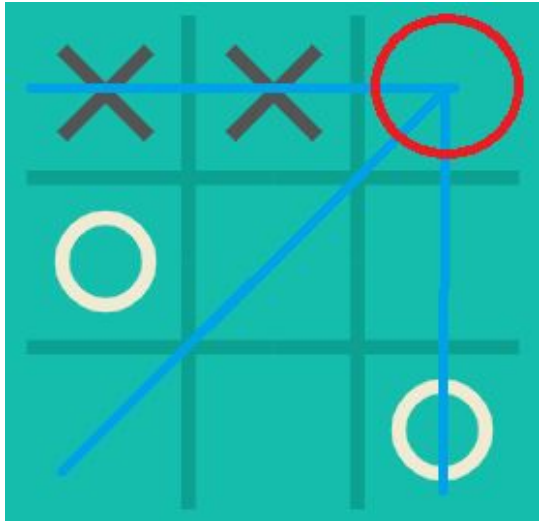
```
(XOE ISA pattern id 231 case1 "X" case2 "O" case3 "E")
(OXE ISA pattern id 321 case1 "O" case2 "X" case3 "E")
(XEO ISA pattern id 213 case1 "X" case2 "E" case3 "O")
```

Structure du modèle

(chunk-type learned-move ligne col diag1 diag2 type)

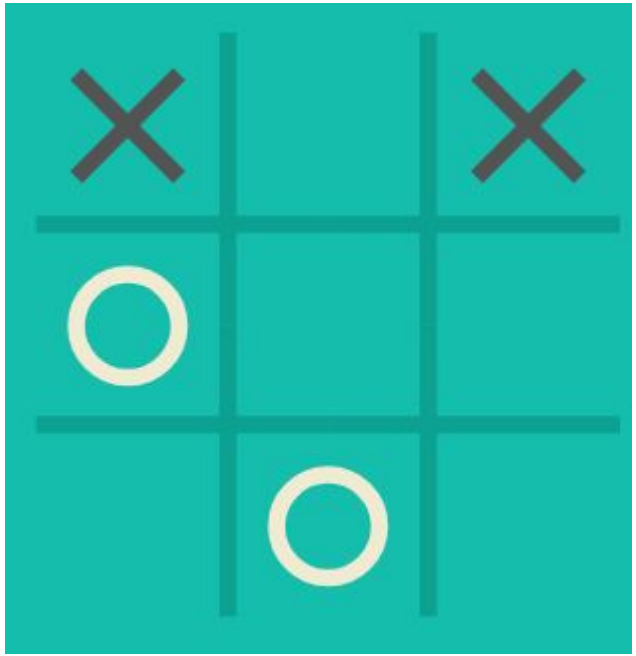
Information que le modèle apprend.

- ligne: pattern de la ligne du coup.
- col: pattern de la colonne du coup.
- diag1, diag2: pattern des diagonales du coup.
- type: type de coup(“bloquant” ou “gagnant” ou “lose”)

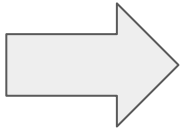


Exemple:
(move ISA learned-move 221 113 nil 111 “gagnant”)

Étapes du déroulement d’un scénario



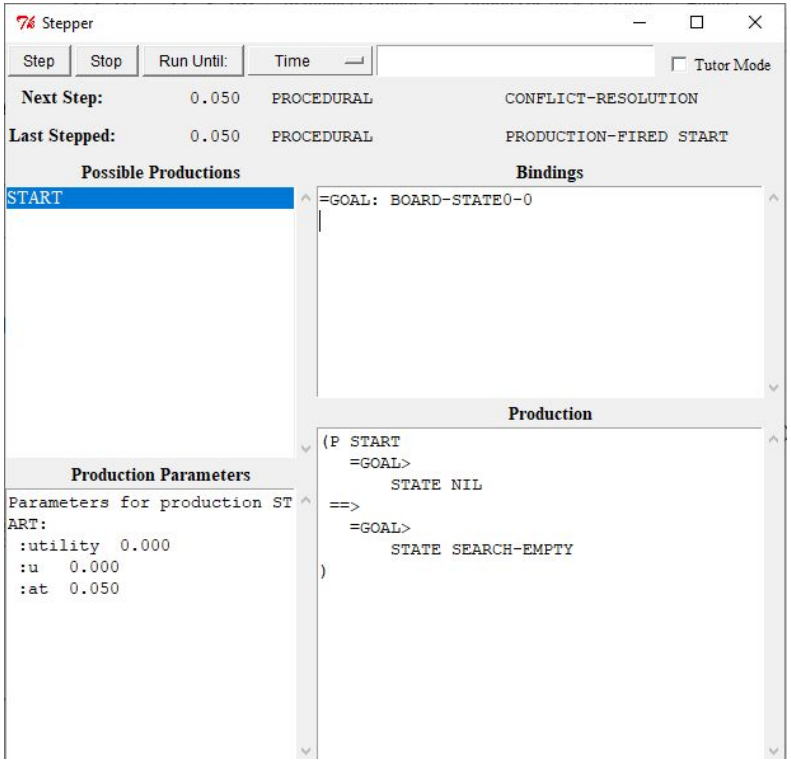
Plateau initial



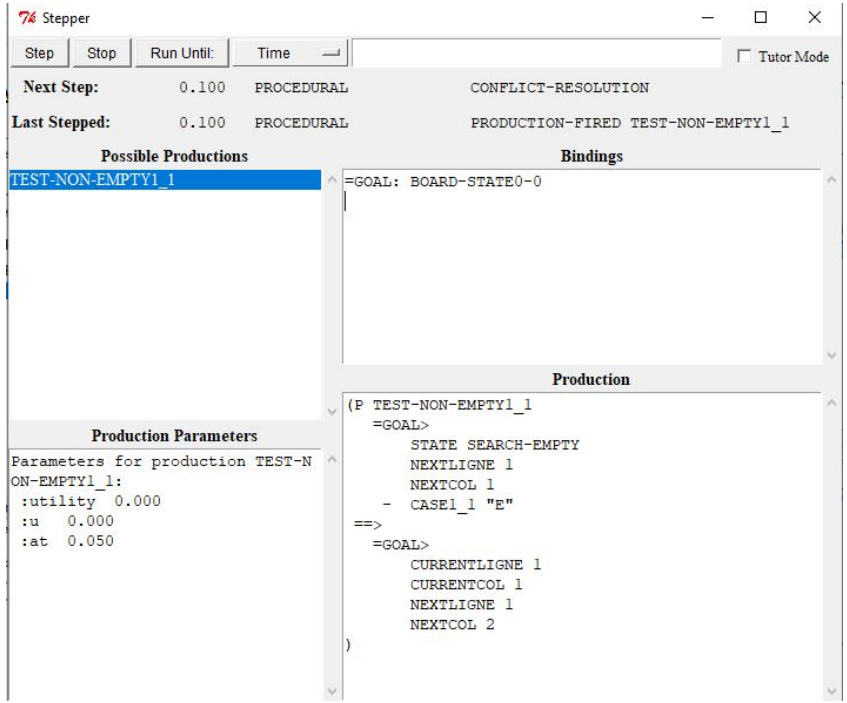
```
GOAL: BOARD-STATE0-0 [BOARD-STATE0]
BOARD-STATE0-0
   CASE1_1  "X"
   CASE1_2  "E"
   CASE1_3  "X"
   CASE2_1  "O"
   CASE2_2  "E"
   CASE2_3  "E"
   CASE3_1  "E"
   CASE3_2  "O"
   CASE3_3  "E"
   NEXTLIGNE  1
   NEXTCOL  1
```

buffer goal

P-START



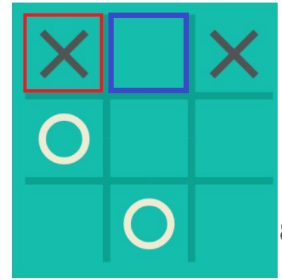
P-TEST-NON-EMPTY1_1



Rappel : Plateau

Current

Next



P-TEST-EMPTY1_2

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.150 PROCEDURAL CONFLICT-RESOLUTION

Last Stepped: 0.150 PROCEDURAL PRODUCTION-FIRED TEST-EMPTY1_2

Possible Productions

TEST-EMPTY1_2

Bindings

```
=GOAL: BOARD-STATE0-0
```

Production

```
(P TEST-EMPTY1_2
   =GOAL>
        STATE SEARCH-EMPTY
        NEXTLIGNE 1
        NEXTCOL 2
        CASE1_2 "E"
  ==>
   =GOAL>
        STATE CREATE-MOVE
        CURRENTLIGNE 1
        CURRENTCOL 2
        NEXTLIGNE 1
        NEXTCOL 3
)
```

Production Parameters

```
Parameters for production TEST-EMPTY1_2:
 :utility  0.000
 :u   0.000
 :at  0.050
```

P-CREATE-MOVE

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.200 PROCEDURAL CONFLICT-RESOLUTION

Last Stepped: 0.200 PROCEDURAL PRODUCTION-FIRED CREATE-MOVE

Possible Productions

CREATE-MOVE

Bindings

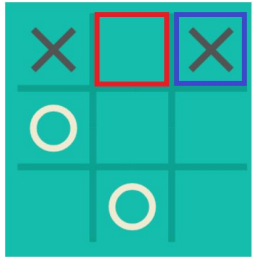
```
=GOAL: BOARD-STATE0-0
```

Production

```
(P CREATE-MOVE
   =GOAL>
        STATE CREATE-MOVE
  ==>
   =GOAL>
        STATE SELECT-LINE
)
```

Production Parameters

```
Parameters for production CREATE-MOVE:
 :utility  0.000
 :u   0.000
 :at  0.050
```



Current

Next

P-SELECT-LINE1

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.250 PROCEDURAL CLEAR-BUFFER RETRIEVAL

Last Stepped: 0.250 PROCEDURAL PRODUCTION-FIRED SELECT-LINE1

Possible Productions

SELECT-LINE1

Bindings

```
=C3: "X"
=C2: "E"
=C1: "X"
=GOAL: BOARD-STATE0-0
```

Production

```
(P SELECT-LINE1
   =GOAL>
        STATE SELECT-LINE
        CURRENTLIGNE 1
        CASE1_1 "X"
        CASE1_2 "E"
        CASE1_3 "X"
 ==>
   +RETRIEVAL>
        CASE1 "X"
        CASE2 "E"
        CASE3 "X"
   =GOAL>
        STATE CREATE-LIGNE
)
```

Production Parameters

```
Parameters for production SELECT
-LINE1:
 :utility  0.000
 :u   0.000
 :at  0.050
```

Retrieval

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.275 DECLARATIVE SET-BUFFER-CHUNK RETRIEVAL XEX

Last Stepped: 0.275 DECLARATIVE RETRIEVED-CHUNK XEX

Possible Chunks

XEX

Retrieval Request

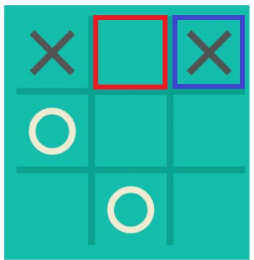
```
+retrieval>
    CASE1 "X"
    CASE2 "E"
    CASE3 "X"
```

Chunk

```
XEX
    ID  212
    CASE1  "X"
    CASE2  "E"
    CASE3  "X"
```

Chunk Parameters

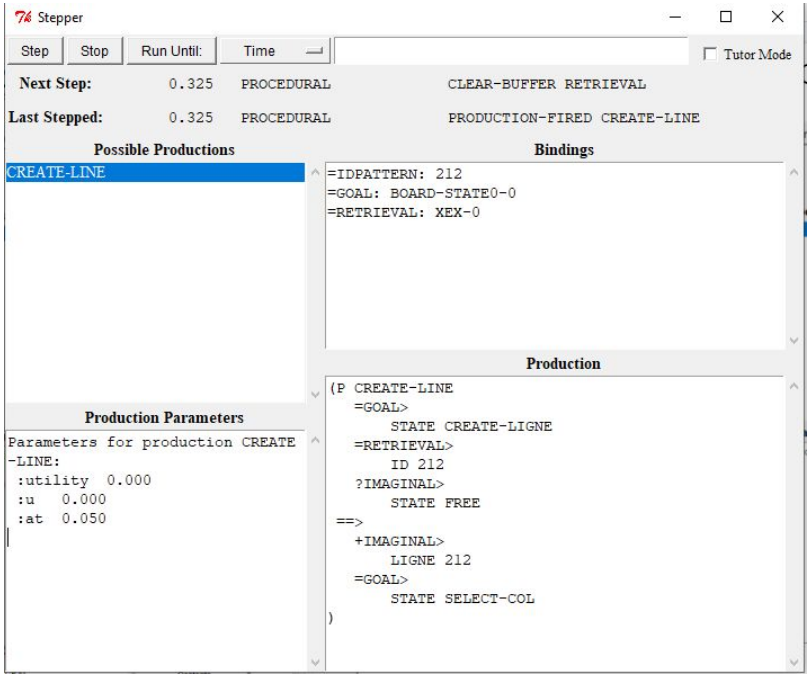
```
Declarative parameters for chunk
XEX:
 :Activation  1.339
 :Permanent-Noise  0.000
 :Base-Level  1.339
 :Creation-Time 0.000
 :Reference-Count  1
 :Last-Retrieval-Activation  1.3
97
 :Last-Retrieval-Time  0.250
```



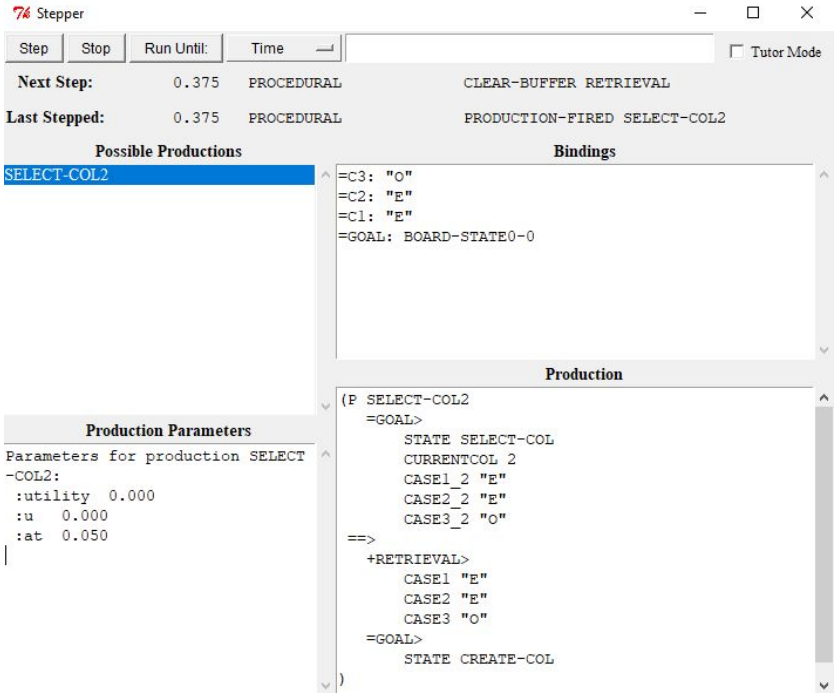
Current

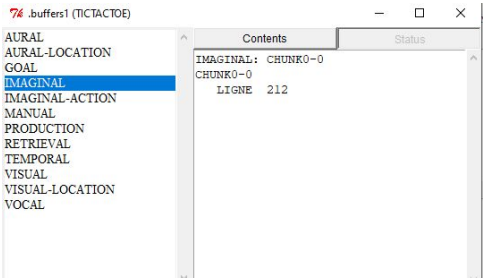
Next

P-CREATE-LINE

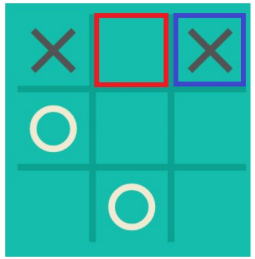


P-SELECT-COL2

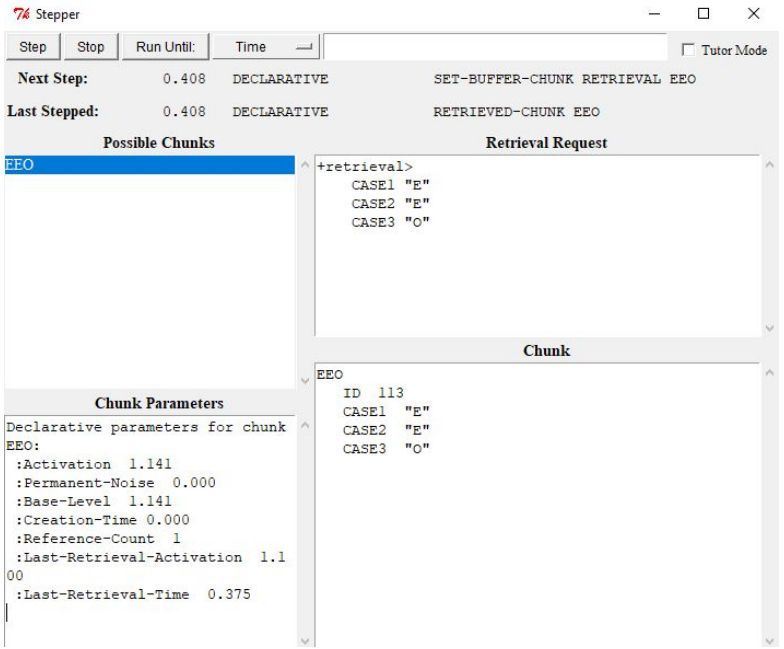




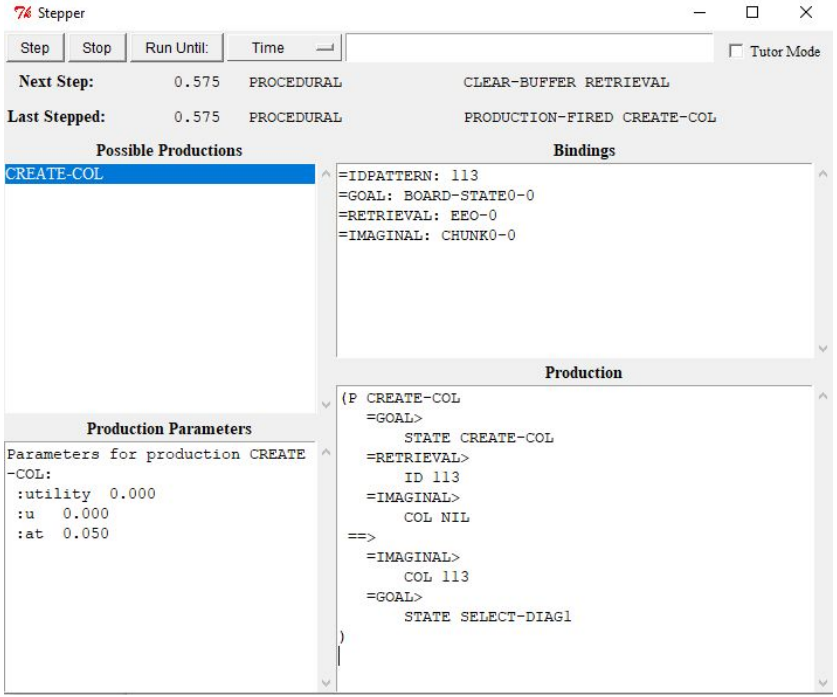
Buffer imaginal



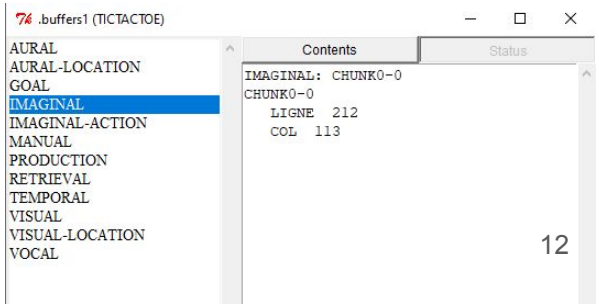
Retrieval



P-CREATE-COL



Buffer imaginal



P-NO-DIAG1

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.625 PROCEDURAL CONFLICT-RESOLUTION

Last Stepped: 0.625 PROCEDURAL PRODUCTION-FIRED NO-DIAG1

Possible Productions

NO-DIAG1

Bindings

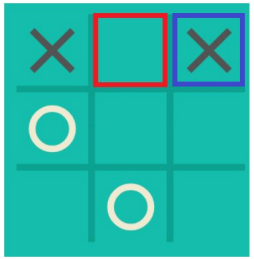
```
=C3: "E"
=C2: "E"
=C1: "X"
=NB: 1
=GOAL: BOARD-STATE0-0
```

Production

```
(P NO-DIAG1
   =GOAL>
       STATE SELECT-DIAG1
       CURRENTLIGNE 1
    -  CURRENTCOL 1
       CASE1_1 "X"
       CASE2_2 "E"
       CASE3_3 "E"
 ==>
   =GOAL>
       STATE SELECT-DIAG2
)
```

Production Parameters

```
Parameters for production NO-DIA
G1:
 :utility  0.000
 :u   0.000
 :at  0.050
```



P-NO-DIAG2

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.675 PROCEDURAL CONFLICT-RESOLUTION

Last Stepped: 0.675 PROCEDURAL PRODUCTION-FIRED NO-DIAG2_1_3

Possible Productions

NO-DIAG2_1_3

Bindings

```
=GOAL: BOARD-STATE0-0
```

Production

```
(P NO-DIAG2_1_3
   =GOAL>
       STATE SELECT-DIAG2
       CURRENTLIGNE 1
    -  CURRENTCOL 3
 ==>
   =GOAL>
       STATE TRY-REMEMBER-MOVE
)
```

Production Parameters

```
Parameters for production NO-DIA
G2_1_3:
 :utility  0.000
 :u   0.000
 :at  0.050
```

.buffers1 (TICTACTOE)

AURAL
AURAL-LOCATION
GOAL
IMAGINAL
IMAGINAL-ACTION
MANUAL
PRODUCTION
RETRIEVAL
TEMPORAL
VISUAL
VISUAL-LOCATION
VOCAL

Contents | Status

```
IMAGINAL: CHUNK0-0
CHUNK0-0
   LIGNE  212
   COL  113
```

TRY-REMEMBER-MOVE-NO-DIAG

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 0.725 PROCEDURAL CLEAR-BUFFER RETRIEVAL

Last Stepped: 0.725 PROCEDURAL PRODUCTION-FIRED TRY-REMEMBER-MOVE-NO-D

Possible Productions

TRY-REMEMBER-MOVE-NO-DIAG

Bindings

```
=ARG2: 113
=ARG1: 212
=GOAL: BOARD-STATE0-0
=IMAGINAL: CHUNK0-0
```

Production

```
(P TRY-REMEMBER-MOVE-NO-DIAG
   =GOAL>
       STATE TRY-REMEMBER-MOVE
    -  NEXTLIGNE NIL
    -  NEXTCOL NIL
   =IMAGINAL>
       LIGNE 212
       COL 113
       DIAG1 NIL
       DIAG2 NIL
 ==>
   =IMAGINAL>
   +RETRIEVAL>
       LIGNE 212
       COL 113
       DIAG1 NIL
       DIAG2 NIL
    -  TYPE NIL
   =GOAL>
       STATE REMEMBERING
)
```

Production Parameters

```
Parameters for production TRY-RE
MEMBER-MOVE-NO-DIAG:
 :utility  0.000
 :u    0.000
 :at  0.050
```

CANNOT-REMEMBER-MOVE-FIRST-EMPTY

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 1.514 PROCEDURAL CLEAR-BUFFER IMAGINAL

Last Stepped: 1.514 PROCEDURAL PRODUCTION-FIRED CANNOT-REMEMBER-MOVE-F

Possible Productions

CANNOT-REMEMBER-MOVE-FIRST-EMPT

Bindings

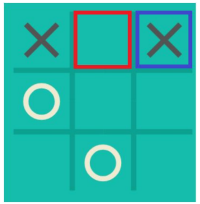
```
=COL: 2
=LIG: 1
=GOAL: BOARD-STATE0-0
```

Production

```
(P CANNOT-REMEMBER-MOVE-FIRST-EMPTY
   =GOAL>
       STATE REMEMBERING
       FIRSTEMPTYLIG NIL
       FIRSTEMPTYCOL NIL
       CURRENTLIGNE 1
       CURRENTCOL 2
   ?RETRIEVAL>
       BUFFER FAILURE
 ==>
   =GOAL>
       STATE SEARCH-EMPTY
       FIRSTEMPTYLIG 1
       FIRSTEMPTYCOL 2
   -IMAGINAL>
)
```

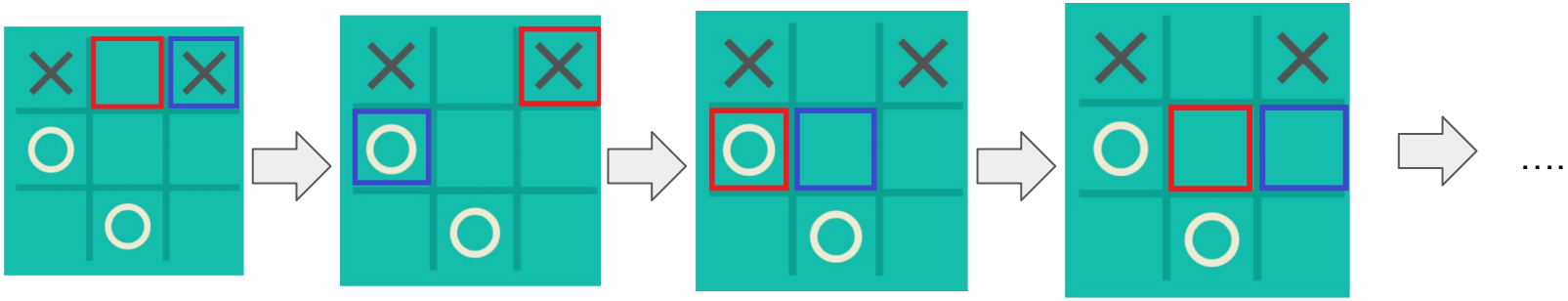
Production Parameters

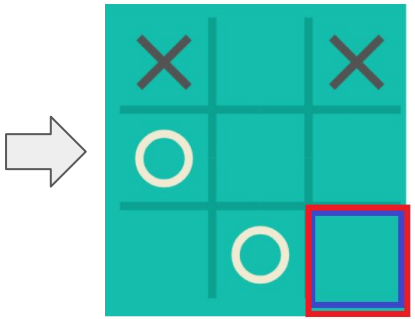
```
Parameters for production CANNOT
-REMEMBER-MOVE-FIRST-EMPTY:
 :utility  0.000
 :u    0.000
 :at  0.050
```



Scénario 1
Ne se rappelle pas

Continue à chercher des cases vides



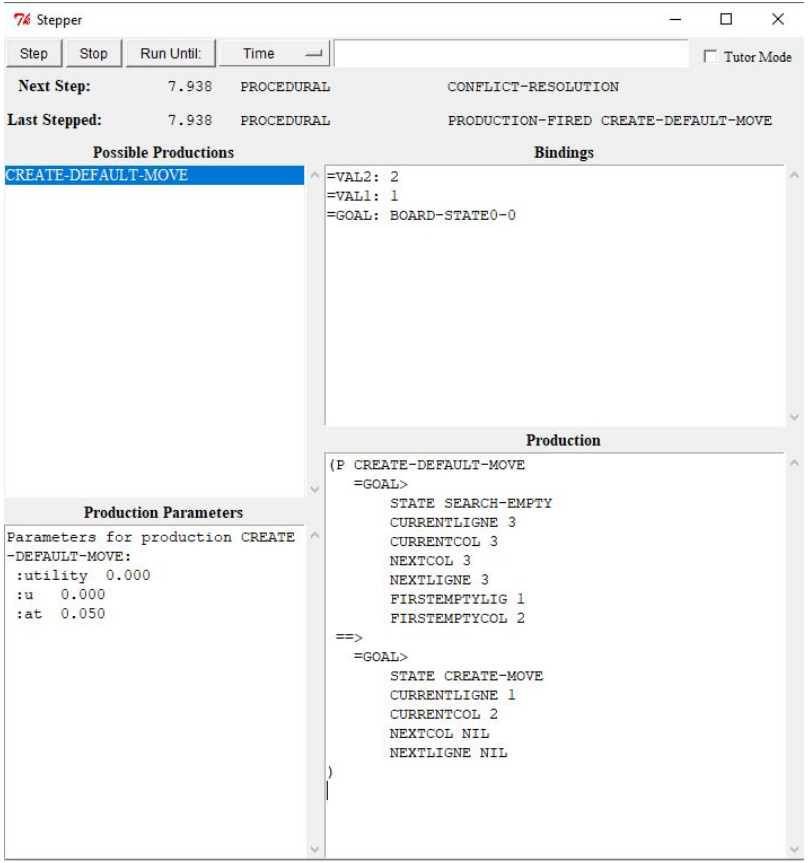


Applique stratégie FIRST-EMPTY

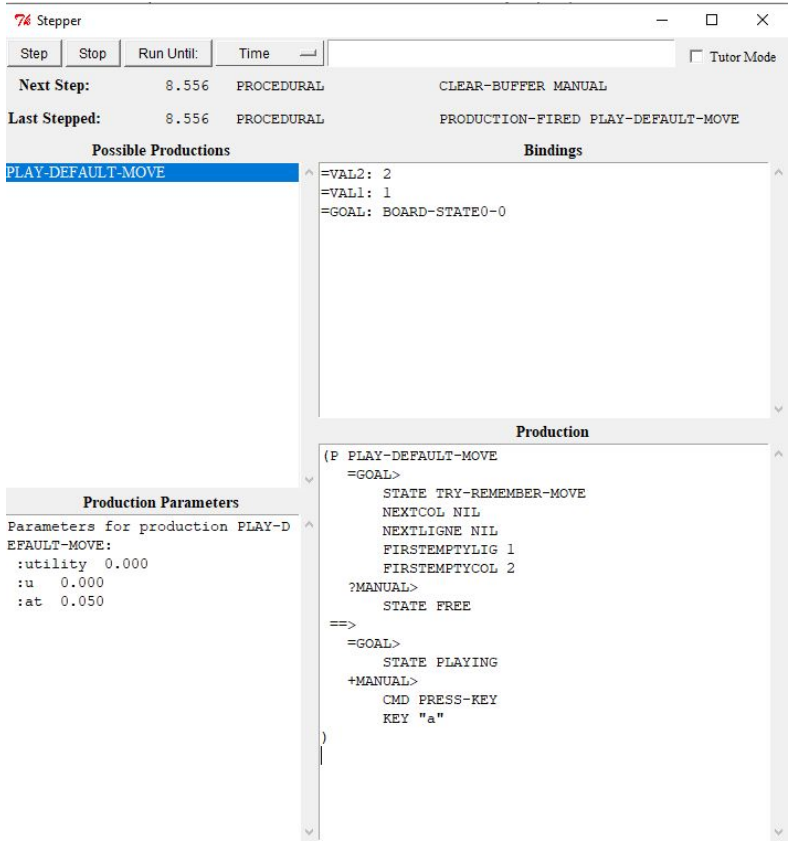
Current

Next

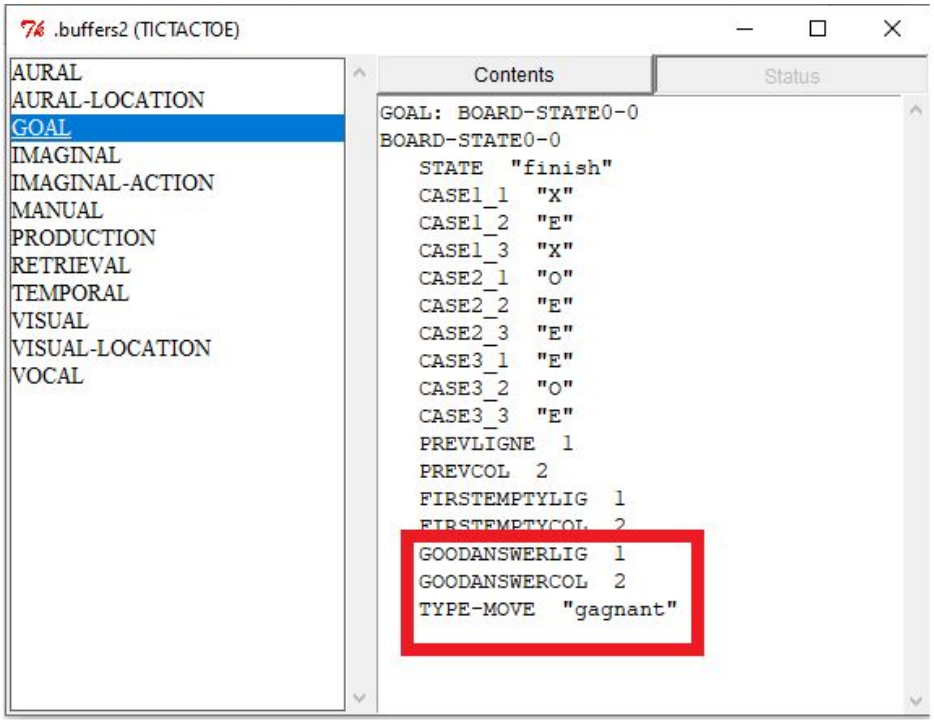
P-CREATE-DEFAULT-MOVE



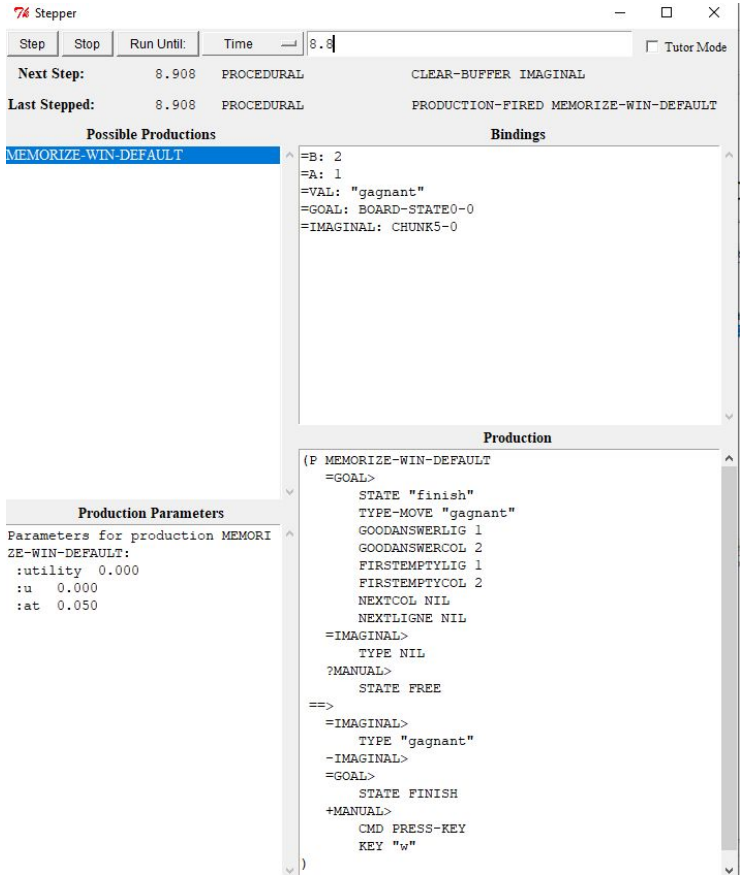
P-PLAY-DEFAULT-MOVE



GOAL-MODIFICATION



P-MEMORIZE-WIN-DEFAULT



P-TRY-REMEMBER-MOVE-NO-DIAG

Stepper

Step | Stop | Run Until: | Time | Tutor Mode

Next Step: 1.123 PROCEDURAL CLEAR-BUFFER RETRIEVAL

Last Stepped: 1.123 PROCEDURAL PRODUCTION-FIRED TRY-REMEMBER-MOVE-NO-DIAG

Possible Productions

TRY-REMEMBER-MOVE-NO-DIAG

Bindings

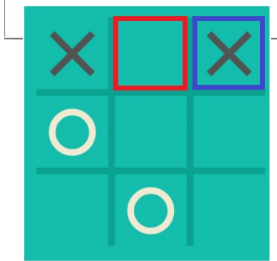
```
=ARG2: 113
=ARG1: 212
=GOAL: BOARD-STATE0-0
=IMAGINAL: CHUNK0-0
```

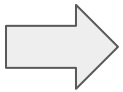
Production Parameters

```
Parameters for production TRY-REMEMBER-M
OVE-NO-DIAG:
 :utility  0.000
 :u   0.000
 :at  0.050
```

Production

```
(P TRY-REMEMBER-MOVE-NO-DIAG
   =GOAL>
       STATE TRY-REMEMBER-MOVE
    -  NEXTLIGNE NIL
    -  NEXTCOL NIL
   =IMAGINAL>
       LIGNE 212
       COL 113
       DIAG1 NIL
       DIAG2 NIL
 ==>
   =IMAGINAL>
   +RETRIEVAL>
       LIGNE 212
       COL 113
       DIAG1 NIL
       DIAG2 NIL
    -  TYPE NIL
   =GOAL>
       STATE REMEMBERING
```





Stepper

Step | Stop | Run Until: | Time | 8.8 | Tutor Mode

Next Step: 10.275 DECLARATIVE SET-BUFFER-CHUNK RETRIEVAL CHUNK5-0

Last Stepped: 10.275 DECLARATIVE RETRIEVED-CHUNK CHUNK5-0

Possible Chunks

CHUNK5-0

Retrieval Request

```
+retrieval>
    LIGNE 212
    COL 113
    DIAG1 NIL
    DIAG2 NIL
 -  TYPE NIL
```

Chunk Parameters

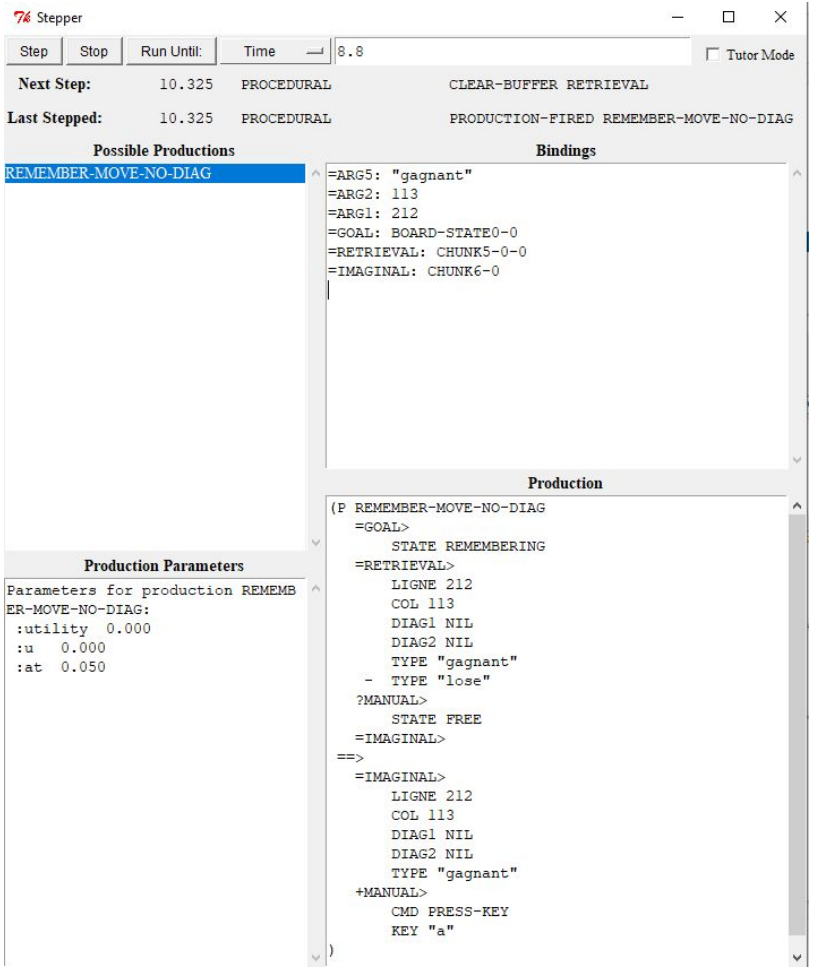
```
Declarative parameters for chunk
CHUNK5-0:
 :Activation  0.537
 :Permanent-Noise  0.000
 :Base-Level  0.537
 :Creation-Time 8.908
 :Reference-Count  1
 :Last-Retrieval-Activation  0.5
69
 :Last-Retrieval-Time 10.218
```

Chunk

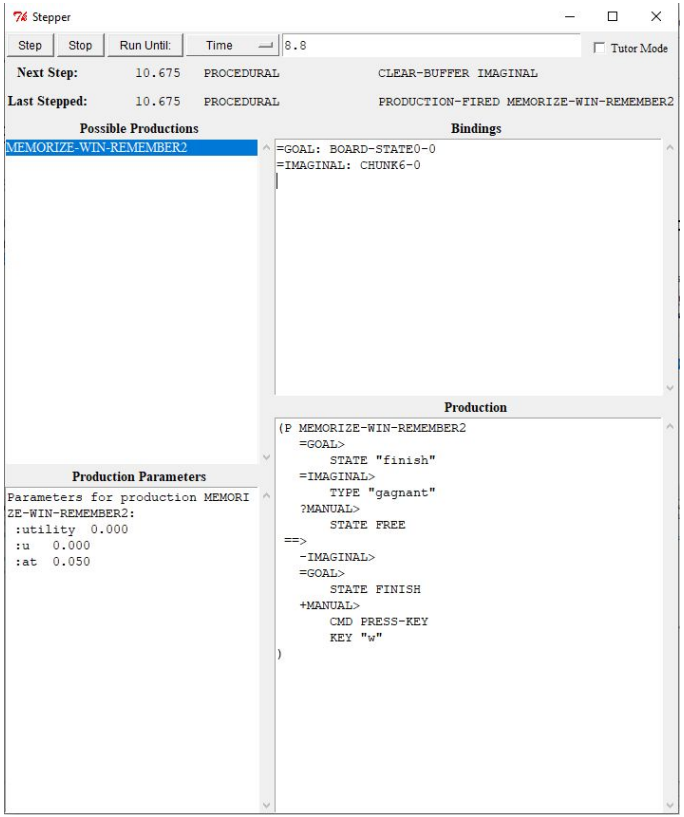
```
CHUNK5-0
   LIGNE  212
   COL  113
   TYPE  "gagnant"
```

Scénario 2
On se rappelle

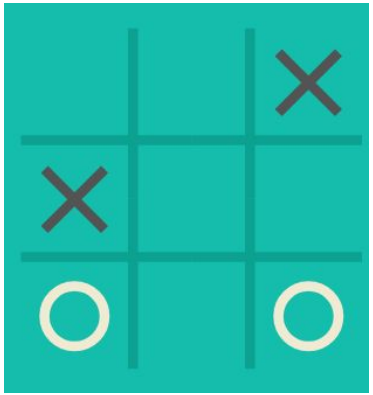
P-REMEMBER-MOVE-NO-DIAG



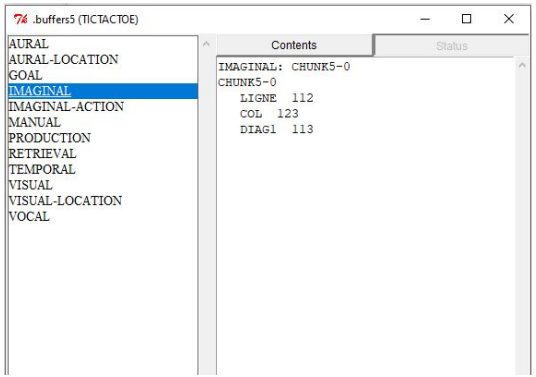
P-MEMORIZE-WIN-REMEMBER2



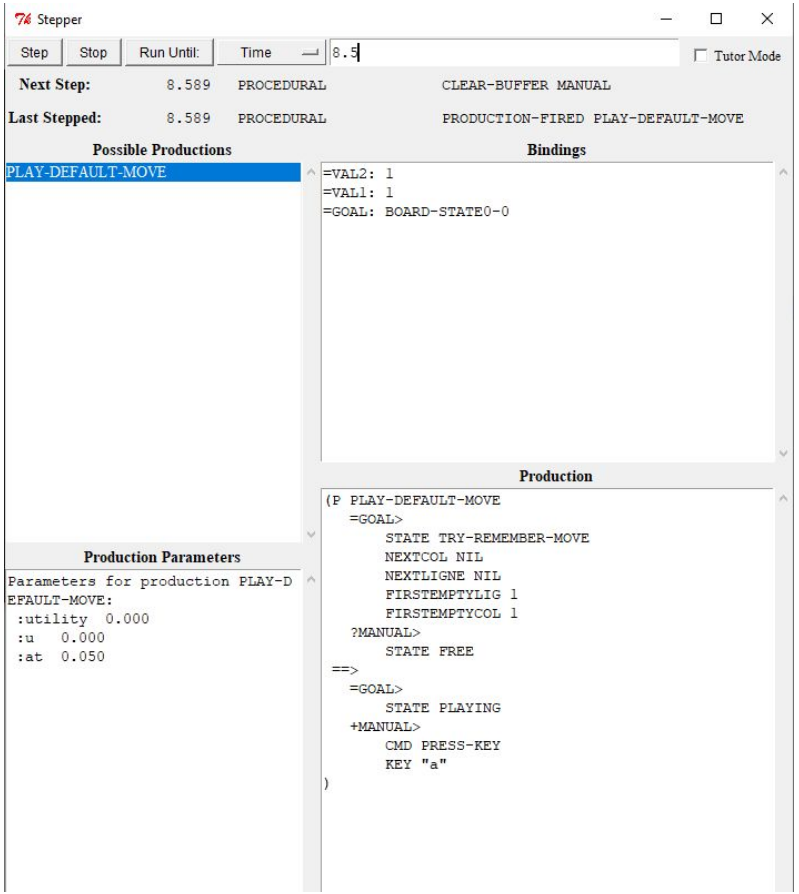
Coup Perdant



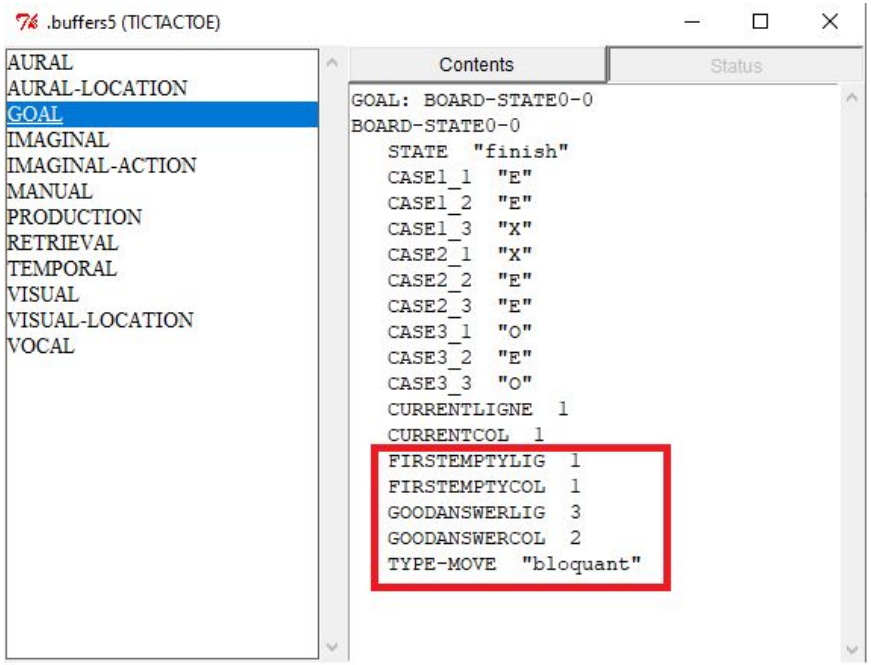
buffer Imaginal



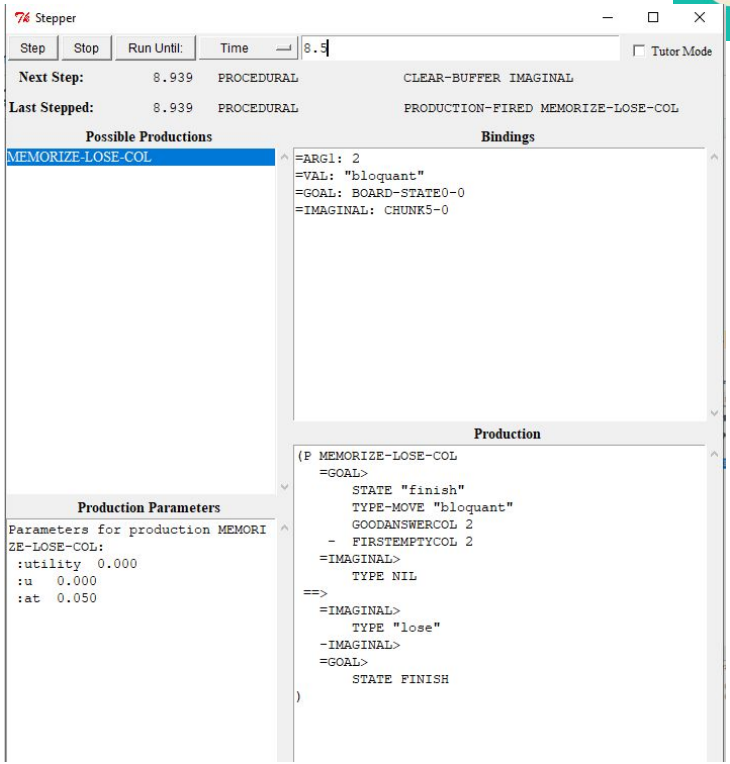
P-PLAY-DEFAULT-MOVE



Goal buffer



P-MEMORIZE-LOSE-COL



Apprentissage

1er méthode:

- Génération plateau.
- Présentation au modèle.

Le modèle apprend les coups gagnants et bloquants.

(run-blocks 50 20)

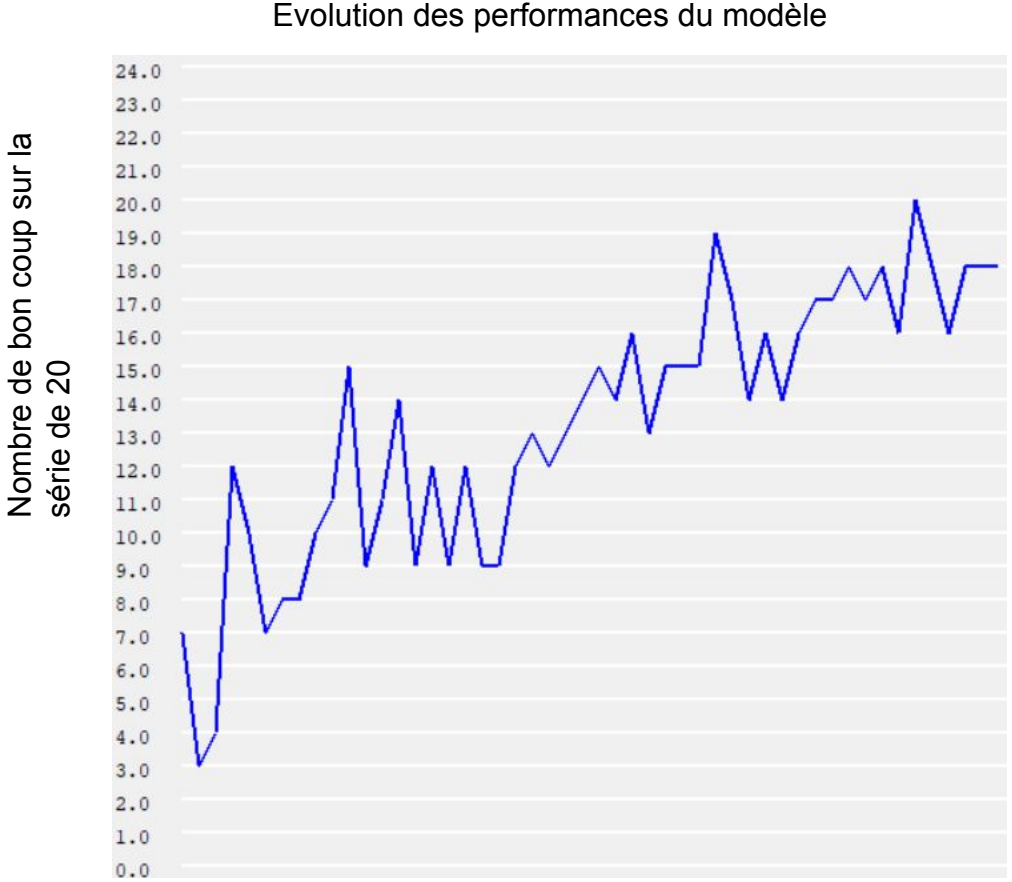
Apprentissage

2è méthode:

- Génération plateau.
- Présentation au modèle.

Le modèle apprend les coups gagnants, bloquant mais aussi les mauvais coups

(run-blocks 50 20)

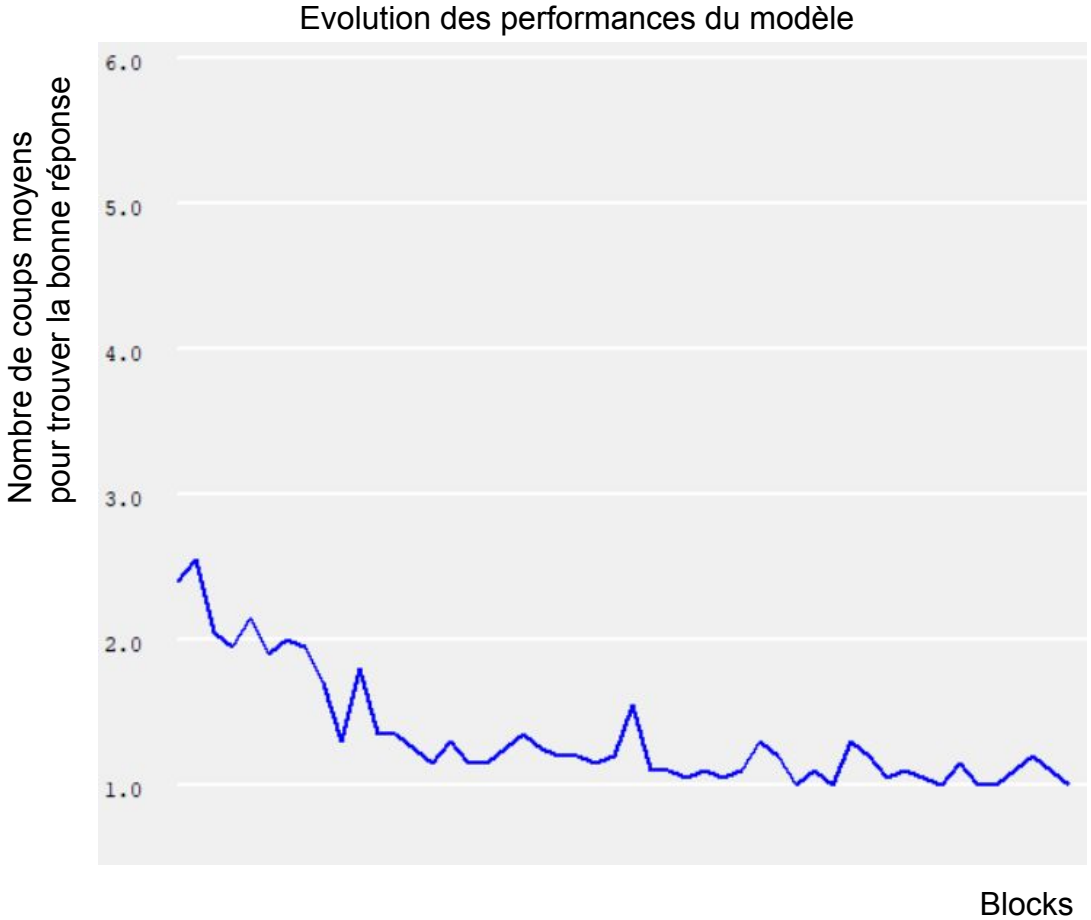


Apprentissage

3è méthode:

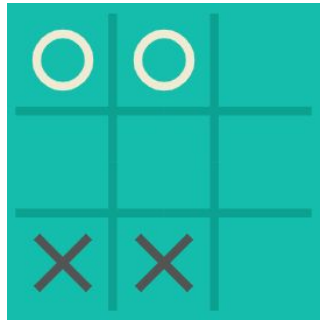
- Génération plateau.
- Présentation au modèle.
- Bon coup : nouveau plateau.
- Mauvais coup : même plateau.

(run-blocks 50 20)



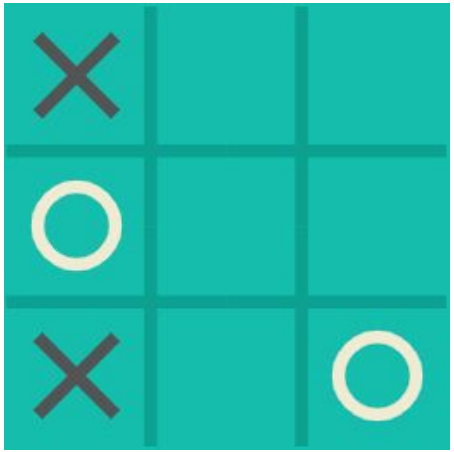
Limites du modèle

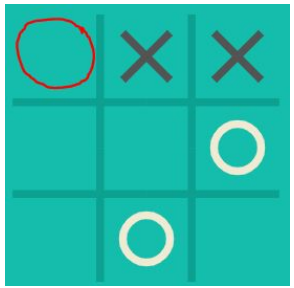
- Le modèle ne fonctionne pas sur les configurations à deux coups possibles.
- Le modèle semble un peu lourd (1000 lignes d’ACT-R, chunk goal à 19 slots).
- Le modèle est très spécifique.

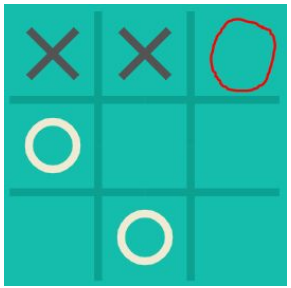


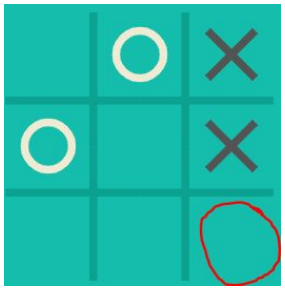
Extensions possibles

- Plusieurs cas en même temps.
- Victoire au prochain tour.
- Réduire la taille du code/ le nombre de règles de production.
- Prendre en compte la symétrie.









Questions ?