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AUTONOMOUS AGENTS AND MULTIAGENT SYSTEMS

2019

EXERCISE: INPUT-OUTPUT EXAMPLES v1.2

1. RATIONAL AGENT

1.1 DECISION

```
1> decide-rational (T1=[A=(60%,3),B=(40%,-1)],T2=[A=(30%,0),B=(70%,1)]) 1
T1

2> decide-rational (T1=[A=(60%,3),B=(40%,-1)],T2=[A=(30%,0),B=(40%,[B1=(80%,
                    [X=(20%,1),Y=(80%,2)]),B2=(20%,3)]),C=(30%,2)],T3=[A=(100%,1)]) 1
T2

3> decide-rational (T1=[A=(60%,3),B=(40%,-1)],T2=[A=(3,2),B=(4,1)]) 1
T2

4> decide-rational (T1=[A=(1,1)],T2=[A=(30%,0),B=(70%,[B1=(3,2),B2=(2,0)])]) 1
T1
```

1.2 UPDATING BEHAVIOR

A successful implementation of the ahead behavior guarantees your code covers all major concerns related with updating behavior.

```
1> decide-rational (T1=[A=(60%,3),B=(40%,-1)],T2=[A=(30%,0),B=(70%,1)]) 4
T1
1> (1,T1.X)
//updated state (T1=[X=(1,1)],T2=[A=(30%,0),B=(70%,1)])
T1
1> (0,T1.Y)
//updated state (T1=[X=(1,1),Y=(1,0)],T2=[A=(30%,0),B=(70%,1)])
T2
1> (-1,T2.X)
//updated state (T1=[X=(1,1),Y=(1,0)],T2=[X=(1,-1)])
T1
1> (1,T1.X)
//updated state (T1=[X=(2,1),Y=(1,0)],T2=[X=(1,-1)])
```

```
2> decide-rational (T1=[A=(30%,0),B=(40%,[B1=(2,1),B2=(1,-1)]),C=(30%,-2)]) 2
T1
2> (1,T1.B.B1)
//updated state (T1=[B=(1,[B1=(3,1),B2=(1,-1)])])
T1
2> (2,T1.C)
//updated state (T1=[B=(1,[B1=(3,1),B2=(1,-1)]),C=(1,2)])

3> decide-rational (T1=[A=(30%,0),B=(40%,[B1=(2,1),B2=(1,-1)]),C=(30%,-2)]) 3
T1
3> (2,T1.C.C1)
//updated state (T1=[B=(0,[B1=(2,1),B2=(1,-1)]),C=(1,[C1=(1,2)])])
T1
3> (3,T1.C.C2)
//updated state (T1=[B=(0,[B1=(2,1),B2=(1,-1)]),C=(2,[C1=(1,2),C2=(1,3)])])
T1
3> (2,T1.B.B3)
//updated state (T1=[B=(1,[B1=(2,1),B2=(1,-1),B3=(1,2)]),C=(2,[C1=(1,2),C2=(1,3)])])
```

2. Risk-averse agent

```
1> decide-risk (T1=[A=(1,1)],T2=[A=(1,2)],T3=[A=(1,-1)])
(1.00,T2)

2> decide-risk (T1=[A=(75%,4),B=(25%,0)],T2=[A=(1,3)],T3=[A=(1,2)])
(0.50,T1;0.50,T2)

3> decide-risk (T1=[A=(1,-1)])
(1.00,T1)

4> decide-risk (T1=[A=(1%,-2),B=(99%,100)],T2=[A=(1,-1)])
(1.00,T2)

5> decide-risk (T1=[A=(1,1)],T2=[A=(1,-1),B=(1,5)])
(0.50,T1;0.50,T2)

6> decide-risk (T1=[A=(1,2)],T2=[A=(1,-1),B=(1,5)])
(0.00,T1)

7> decide-risk (T1=[A=(1,2)],T2=[A=(1,-1),B=(1,6)])
(0.33,T1;0.67,T2)

8> decide-risk (T1=[A=(1,1)],T2=[A=(1,1)],T3=[A=(1,-1),B=(1,5)],T4=[A=(1,-1),B=(1,5)])
(0.25,T1;0.25,T2;0.25,T3;0.25,T4)

9> decide-risk (T1=[A=(1,1)],T2=[A=(9,5),B=(1,-10)],T3=[A=(1,5),B=(1,-1)])
(0.50,T1;0.50,T3)
```

3. Agent Encounters

3.1 Nash-based Encounters

```
1> decide-nash
   mine=(T0|T0=[A=(1,2)],T0|T1=[A=(1,0)],T1|T0=[A=(1,0)],T1|T1=[A=(1,4)]),
   peer=(T0|T0=[A=(1,2)],T0|T1=[A=(1,0)],T1|T0=[A=(1,0)],T1|T1=[A=(1,4)])
mine=T1,peer=T1

2> decide-nash mine=(T0|T0=[A=(1,2)],T0|T1=[A=(1,1)],T1|T0=[A=(1,1)],T1|T1=[A=(1,2)]),
   peer=(T0|T0=[A=(1,1)],T0|T1=[A=(1,2)],T1|T0=[A=(1,2)],T1|T1=[A=(1,1)])
blank-decision

3> decide-nash
   mine=(T0|T0=[A=(1,0)],T0|T1=[A=(1,25)],T0|T2=[A=(1,5)],T1|T0=[A=(1,40)],T1|T1=[A=(1,0
   )],T1|T2=[A=(1,5)],T2|T0=[A=(1,10)],T2|T1=[A=(1,15)],T2|T2=[A=(1,10)]),
   peer=(T0|T0=[A=(1,0)],T1|T0=[A=(1,40)],T2|T0=[A=(1,10)],T0|T1=[A=(1,25)],T1|T1=[A=(1,
   0)],T1|T2=[A=(1,15)],T0|T2=[A=(1,5)],T1|T2=[A=(1,5)],T2|T2=[A=(1,10)])
mine=T0,peer=T1
```

Note: we will guarantee that tasks will appear in the right order (such as in 1 and 2)

3.2 Mixed-based Encounters

```
1> decide-mixed mine=(T0|T0=[A=(1,0)],T0|T1=[A=(1,6)],T1|T0=[A=(1,1)],T1|T1=[A=(1,3)]),
   peer=(T0|T0=[A=(1,0)],T1|T0=[A=(1,1)],T0|T1=[A=(1,6)],T1|T1=[A=(1,3)])
mine=(0.75,0.25),peer=(0.75,0.25)

2> decide-mixed mine=(T0|T0=[A=(1,2)],T0|T1=[A=(1,1)],T1|T0=[A=(1,1)],T1|T1=[A=(1,4)]),
   peer=(T0|T0=[A=(1,-3)],T1|T0=[A=(1,2)],T0|T1=[A=(1,1)],T1|T1=[A=(1,-1)])
mine=(0.29,0.71),peer=(0.75,0.25)

3> decide-mixed
   mine=(T0|T0=[A=(1,-1)],T0|T1=[A=(1,-10)],T1|T0=[A=(1,0)],T1|T1=[A=(1,5)]),
   peer=(T0|T0=[A=(1,-1)],T0|T1=[A=(1,0)],T1|T0=[A=(1,-10)],T1|T1=[A=(1,-5)])
blank-decision
```

3.3 Conditional Encounters

```
1> 1> decide-conditional
   mine=(T0|T0=[A=(100%,2)],T0|T1=[A=(50%,-1),B=(50%,1)],T1|T0=[A=(1,0)],T1|T1=[A=(3,4)]),
   peer=(T0|T0=[A=(1,1),B=(1,3)],T0|T1=[A=(3,0)],T1|T0=[A=(100%,0)],
         T1|T1=[A=(60%,10),B=(40%,-5)])
mine=T1,peer=T1
```