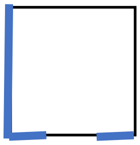
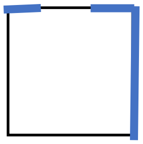
1. Distinct grids (percepts)
2. States of percepts
3. Actions: Forward, RightTurn, LeftTurn
4. All labels are necessary and sufficient.
5. The given maze with labels is isomorphic 1-1 corresponding with graph (a graph search space).
6. Design a state-action state search space
7. Design a program that transforms a given maze into a graph
8. Design a program that transforms a given maze with its isomorphic graph into state-action search space.
9. Use A* or IDA* to determine an optimal path.

Consider a percept obtained from a time interval the environment, 0 for wall with an entrance or exit gate; 1 for wall; and 2 for open.

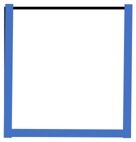
There are 6 distinct grids (percepts) which can be described in terms of [t, r, b, l] component.



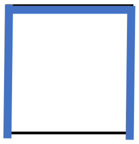
[2, 2, 0, 1]



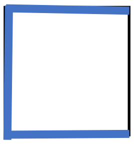
[0, 1, 2, 2]



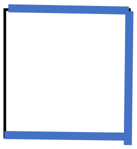
[2, 1, 1, 1]



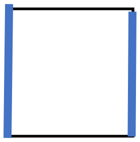
[1, 1, 2, 1]



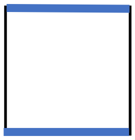
[1, 2, 1, 1]



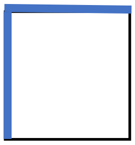
[1, 1, 1, 2]



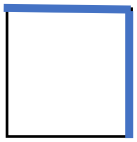
[2, 1, 2, 1]



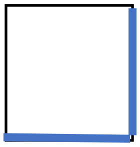
[1, 2, 1, 2]



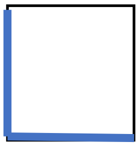
[1, 2, 2, 1]



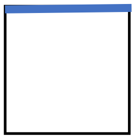
[1, 1, 2, 2]



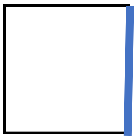
[2, 1, 1, 2]



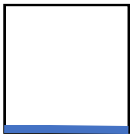
[2, 2, 1, 1]



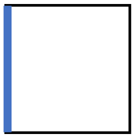
[1, 2, 2, 2]



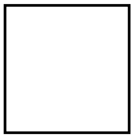
[2, 1, 2, 2]



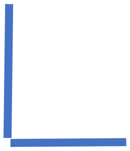
[2, 2, 1, 2]



[2, 2, 2, 1]



[2, 2, 2, 2]



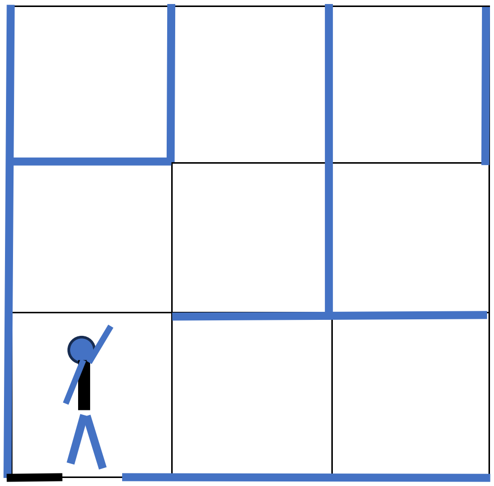
Let an agent be in a grid. Assume that Value = {0, 1, 2}. An element of {t, r, b, l, t’, r’, b’ l’} is assigned with a value of the set Value. A set of actions can be defined in the following:

RightTurn[t, r, b, l] yields [r, b, l, t], moving the value of the 1st component t to the 4th component.

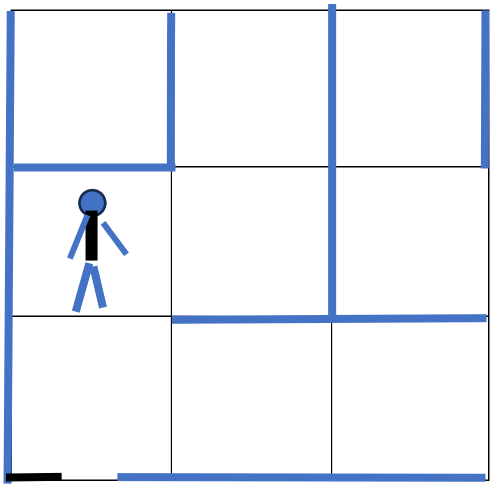
LeftTurn[t, r, b, l] yields [l, t, r, b], moving the value of the value of the 4th component to the 1st component .

Forward[t, r, b, l] yields [t’, r’, b’, l’], moving the agent in current grid [t, r, b, l] forward to an adjacent grid [t’, r’, b’ l’].

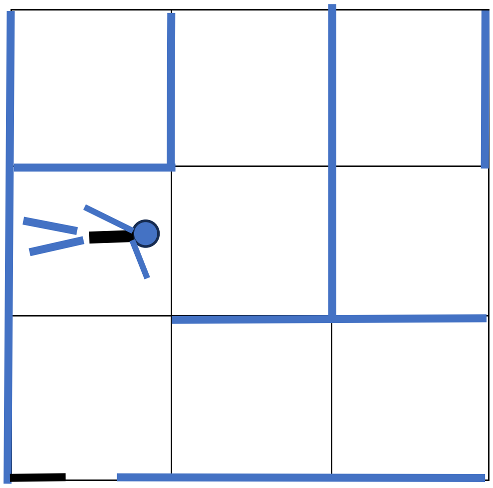
For instance,



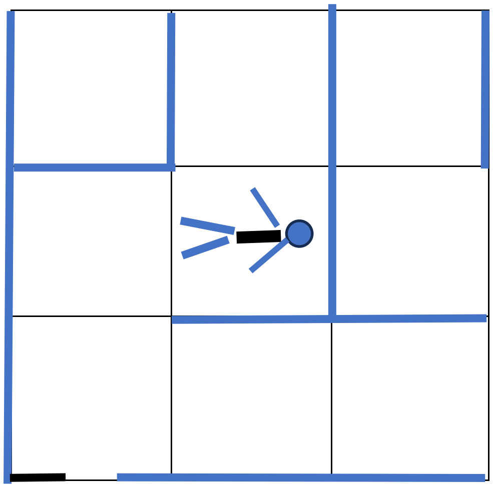
Forward[2, 2, 0, 1] yields [1, 2, 2, 1]



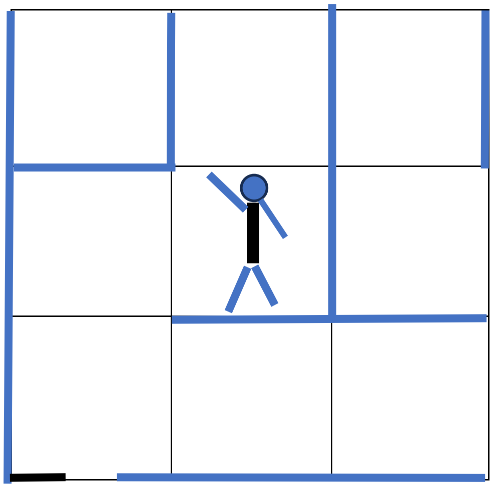
RightTurn[1, 2, 2, 1] yields [2, 2, 1, 1]



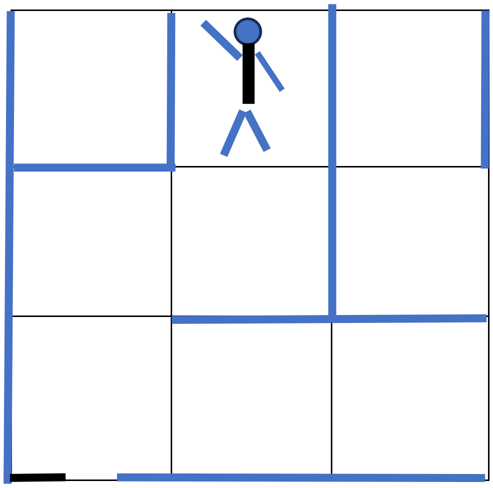
Forward[2, 2, 1, 1] yields [1, 1, 2, 2]



LeftTurn[1, 1, 2, 2] yields [2, 1, 1, 2]

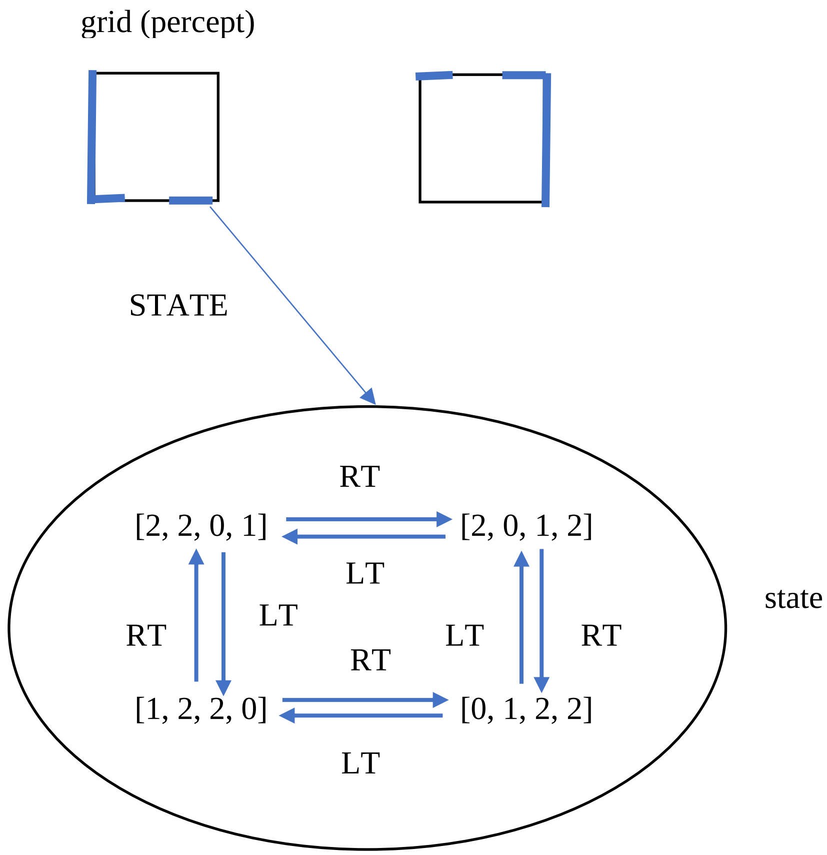


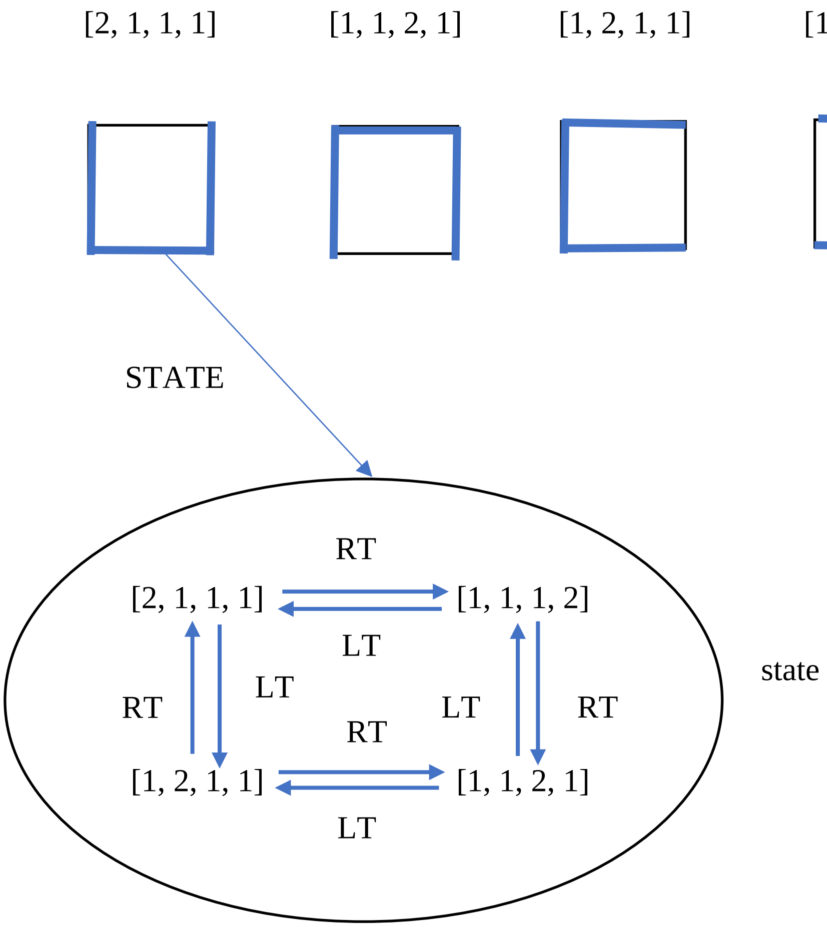
Forward[2, 1, 1, 2] yields [2, 1, 2, 1]

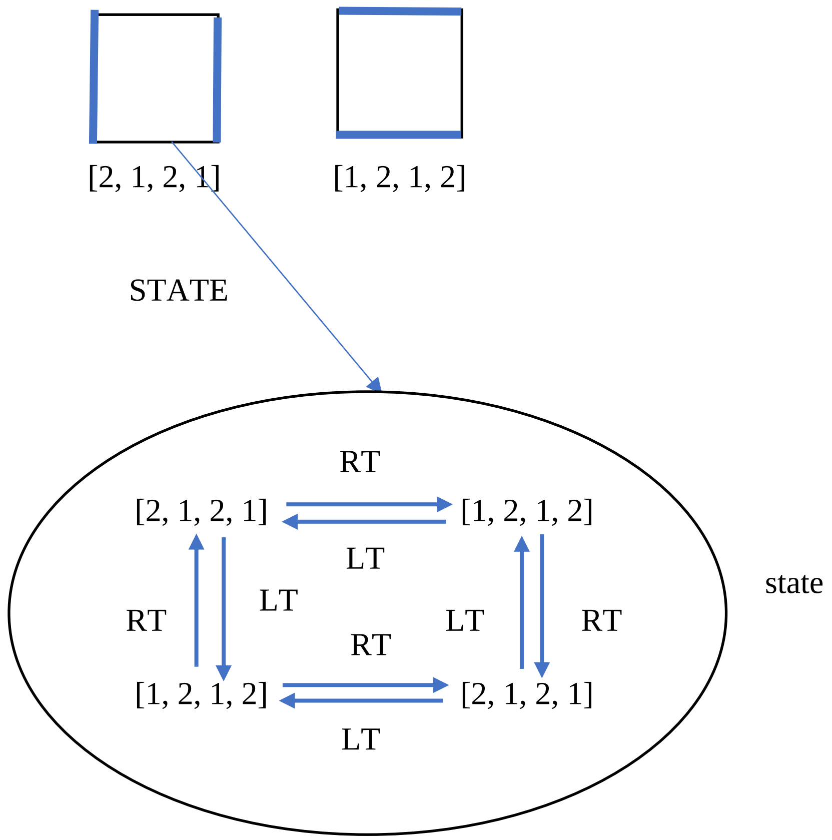


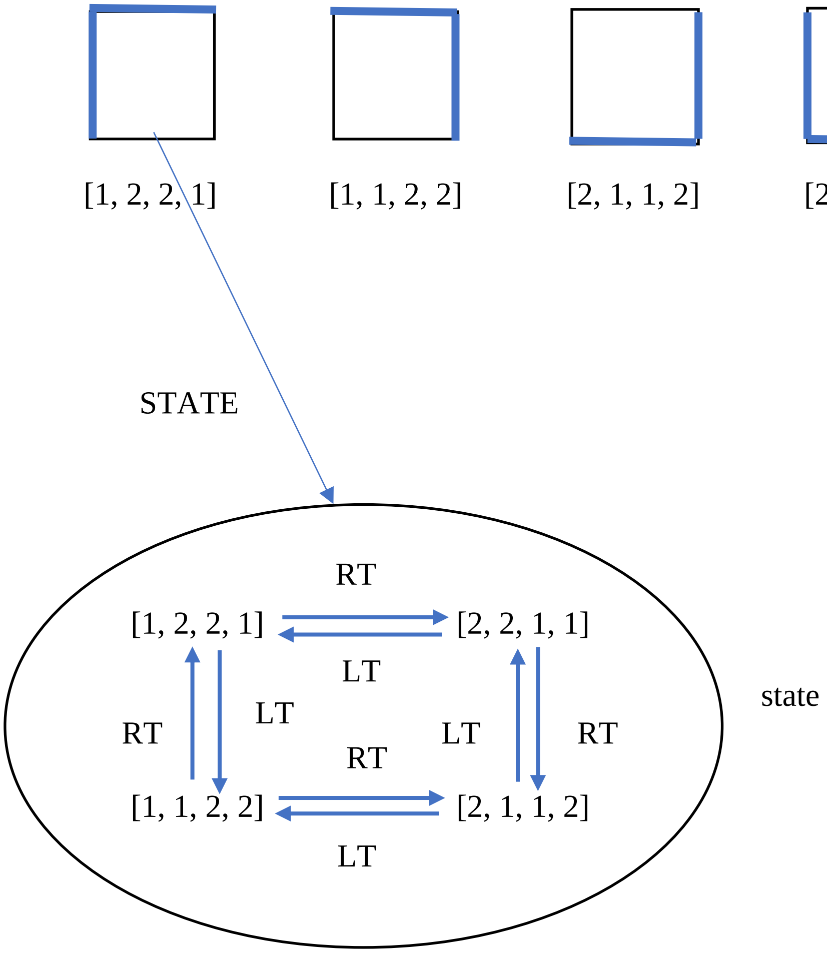
State of Percepts

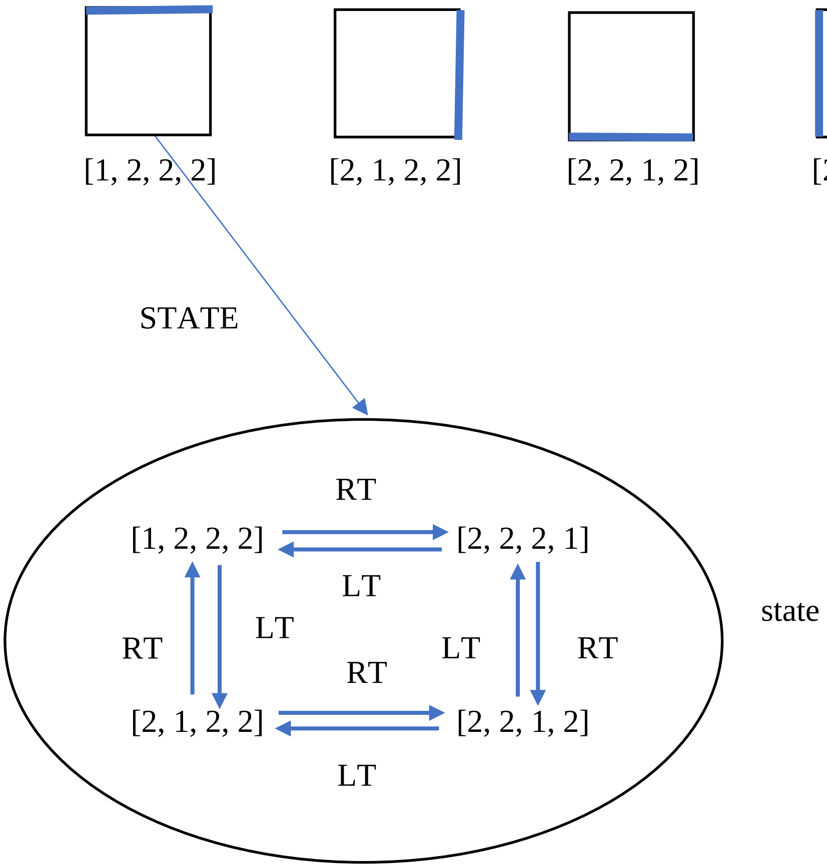
Associated to each grid (percepts) there is a state.

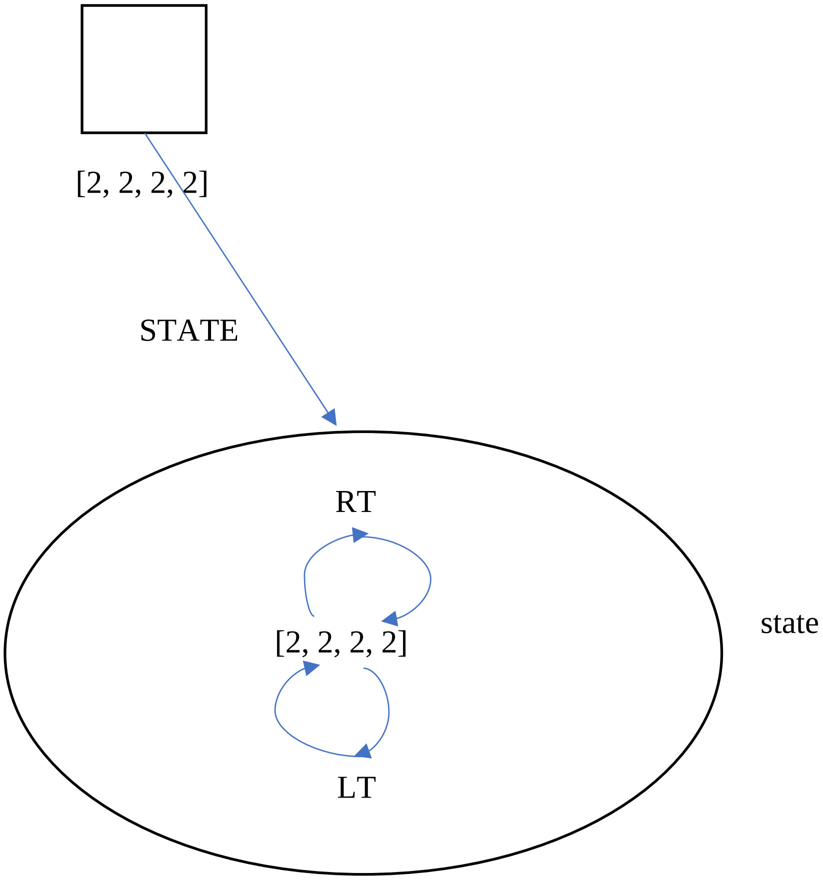



[2, 1, 1, 1]
[1, 1, 2, 1]
[1, 2, 1, 1]
[1, 1, 1, 2]
STATE
RT
[2, 1, 1, 1]
[1, 1, 1, 2]
LT
RT
LT
LT
RT
RT
state
[1, 2, 1, 1]
[1, 1, 2, 1]
LT

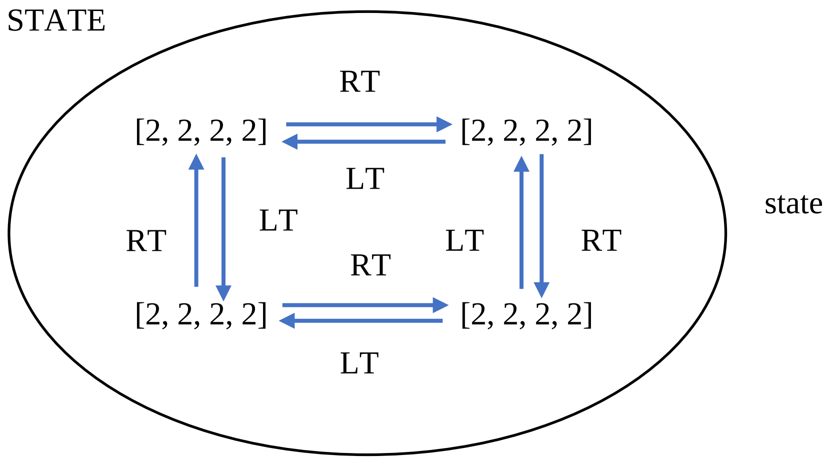

[2, 1, 2, 1]
[1, 2, 1, 2]
STATE
RT
[2, 1, 2, 1]
[1, 2, 1, 2]
LT
LT
RT
LT
RT
RT
state
[1, 2, 1, 2]
[2, 1, 2, 1]
LT

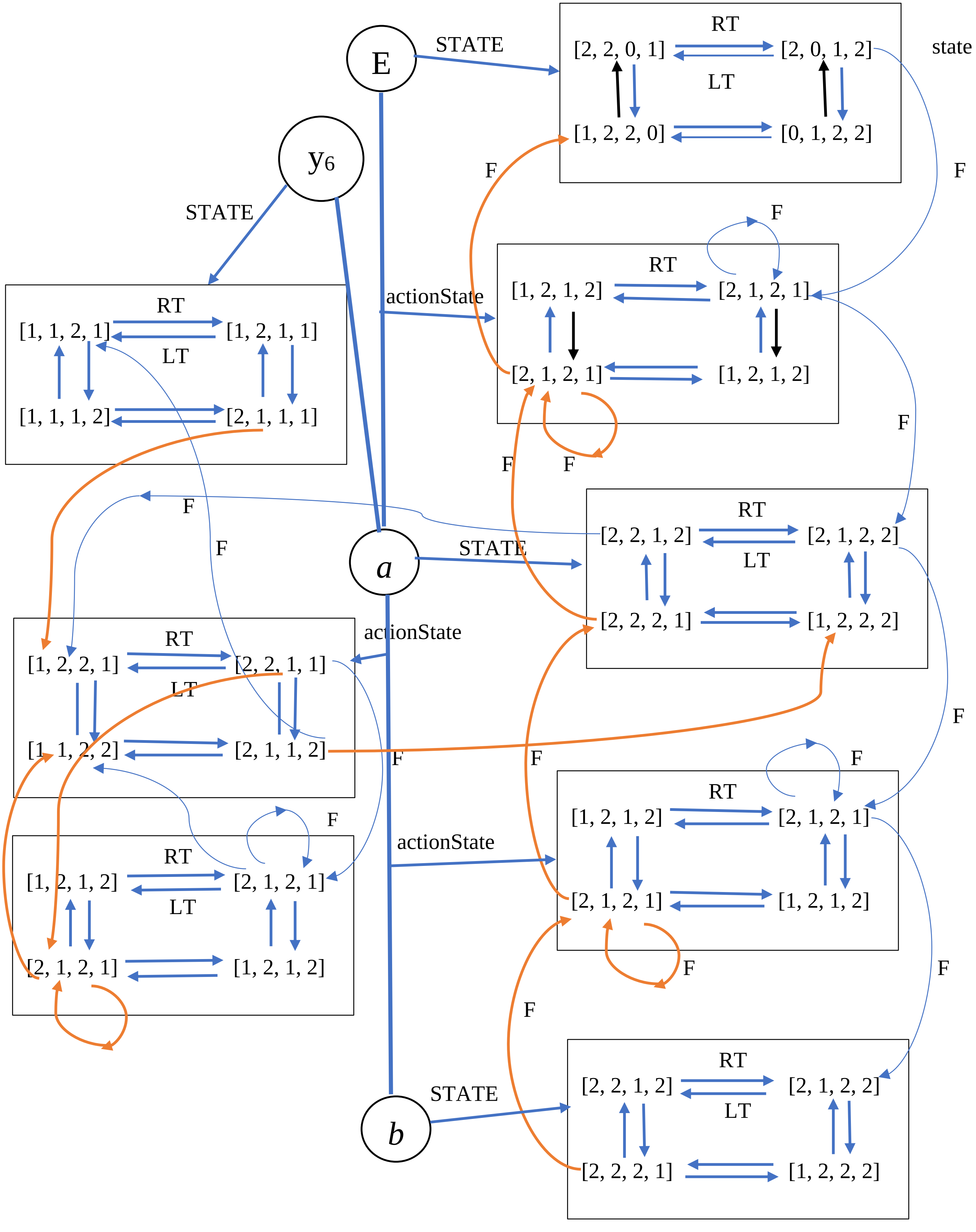

[1, 2, 2, 1]
[1, 1, 2, 2]
[2, 1, 1, 2]
[2, 2, 1, 1]
STATE
RT
[1, 2, 2, 1]
[2, 2, 1, 1]
LT
state
LT
RT
LT
RT
RT
[1, 1, 2, 2]
[2, 1, 1, 2]
LT


[1, 2, 2, 2]
[2, 1, 2, 2]
[2, 2, 1, 2]
[2, 2, 2, 1]
STATE
RT
[1, 2, 2, 2]
[2, 2, 2, 1]
LT
state
RT
LT
LT
RT
RT
[2, 1, 2, 2]
[2, 2, 1, 2]
LT


[2, 2, 2, 2]
STATE
RT
[2, 2, 2, 2]
state
LT

or


STATE
RT
[2, 2, 2, 2]
[2, 2, 2, 2]
LT
state
RT
LT
LT
RT
RT
[2, 2, 2, 2]
[2, 2, 2, 2]
LT


E
STATE
RT
[2, 2, 0, 1]
[2, 0, 1, 2]
LT
[1, 2, 2, 0]
[0, 1, 2, 2]
state
F
F
y6
STATE
F
RT
[1, 2, 1, 2]
[2, 1, 2, 1]
[2, 1, 2, 1]
[1, 2, 1, 2]
actionState
RT
[1, 1, 2, 1]
[1, 2, 1, 1]
LT
[1, 1, 1, 2]
[2, 1, 1, 1]
F
F
F
F
F
RT
[2, 2, 1, 2]
[2, 1, 2, 2]
a
STATE
LT
[2, 2, 2, 1]
[1, 2, 2, 2]
actionState
RT
[1, 2, 2, 1]
[2, 2, 1, 1]
LT
[1, 1, 2, 2]
[2, 1, 1, 2]
F
F
F
F
RT
[1, 2, 1, 2]
[2, 1, 2, 1]
[2, 1, 2, 1]
[1, 2, 1, 2]
F
actionState
RT
[1, 2, 1, 2]
[2, 1, 2, 1]
LT
[2, 1, 2, 1]
[1, 2, 1, 2]
F
F
F
b
STATE
RT
[2, 2, 1, 2]
[2, 1, 2, 2]
LT
[2, 2, 2, 1]
[1, 2, 2, 2]