

Rush Hour

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Programmation du jeu



Class

```
class grid():
    def __init__(self):
```

Objectif de la class :
Ajouter une configuration a une grille et l'afficher.

```
>>> g=grid()
>>> g.draw_grid()
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
```

```
class car():
    def __init__(self , head_x, head_y ,direction, taille, couleur):
```

Objectif de la class :
Creation de voiture pour former une configuration.

```
>>> C=car(2,5,"L",2,"F")
>>> conf5=[car(2,2,"R",2,"R"),car(3,2,"U",3,"I"),car(4,2,"U",2,"L")]
```

```
class game():
    def __init__(self,conf):
```

Objectif de la class :
Appliquer différentes opération sur la configuration.

```
>>> g=game(conf4)
>>> g.all_move_possible_grid()
['YU', 'YD', 'GR', 'CD', 'FL', 'PL', 'PR']
>>> config=g.start_moving('YU')
```

```
>>> g=grid()
>>> g.draw_grid()
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-
```

```
>>> g.add_car(car(5,5,"D",3,"N"))
>>> g.draw_grid()
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | |N|
*-*-*-*-*-*-*-*
| | | | | |N|
*-*-*-*-*-*-*-*
| | | | | |N|
*-*-*-*-*-*-*-
```

1

2

3

4

```
>>> g.clean_grid()
>>> g.draw_grid()
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-
```

```
>>> g.add_configuration_cars(conf5)
>>> g.draw_grid()
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| |R|R|I|L|
*-*-*-*-*-*-*-*
| | | |I|L| |
*-*-*-*-*-*-*-*
| | | |I| | |
*-*-*-*-*-*-*-
```

```
>>> gr=grid()
>>> gr.draw_grid()
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-*
| | | | | | |
*-*-*-*-*-*-*-
```

```
>>> gr.add_configuration_cars(conf4)
>>> gr.draw_grid()
*-*-*-*-*-*-*-*
|G|G| | | |C|
*-*-*-*-*-*-*-*
|I| | |Y| |C|
*-*-*-*-*-*-*-*
|I|R|R|Y| |C
*-*-*-*-*-*-*-*
|I| | |Y| | |
*-*-*-*-*-*-*-*
|O| | |F|F|
*-*-*-*-*-*-*-*
|O| |P|P|P| |
*-*-*-*-*-*-*-
```



```
>>> g=game(conf4)
>>> g.all_move_possible_grid()
['YU', 'YD', 'GR', 'CD', 'FL', 'PL', 'PR']
>>> config=g.start_moving('YU')
>>> gr.clean_grid()
```



```
>>> gr.add_configuration_cars(config)
>>> gr.draw_grid()
*-*-*-*-*-*-*-*
|G|G| |Y| |C|
*-*-*-*-*-*-*-*
|I| | |Y| |C|
*-*-*-*-*-*-*-*
|I|R|R|Y| |C
*-*-*-*-*-*-*-*
|I| | | | | |
*-*-*-*-*-*-*-*
|O| | |F|F|
*-*-*-*-*-*-*-*
|O| |P|P|P| |
*-*-*-*-*-*-*-
```




Solution


```

>>> g=grid()
>>> g.add_configuration_cars(conf5)
>>> g.draw_grid()
*-*-*-*-*
| | | | |
*-*-*-*-*
| | | | |
*-*-*-*-*
| |R|R|I|L|
*-*-*-*-*
| | | |I|L| |
*-*-*-*-*
| | | |I| | |
*-*-*-*-*
| | | | | | |
*-*-*-*-*

```

```

>>> ga=game(conf5)
>>> ga.is_finalist()
(False, '')

```

```

>>> co=ga.start_moving('ID')
>>> ga=game(co)
>>> co=ga.start_moving('LD')

```

```

>>> g=grid()
>>> g.add_configuration_cars(co)
>>> g.draw_grid()
*-*-*-*-*
| | | | |
*-*-*-*-*
| | | | |
*-*-*-*-*
| |R|R| | |
*-*-*-*-*
| | | |I|L| |
*-*-*-*-*
| | | |I|L| |
*-*-*-*-*
| | | |I| | |
*-*-*-*-*

```

```

>>> ga=game(co)
>>> ga.is_finalist()
(True, ['RR', 'RR', 'RR'])

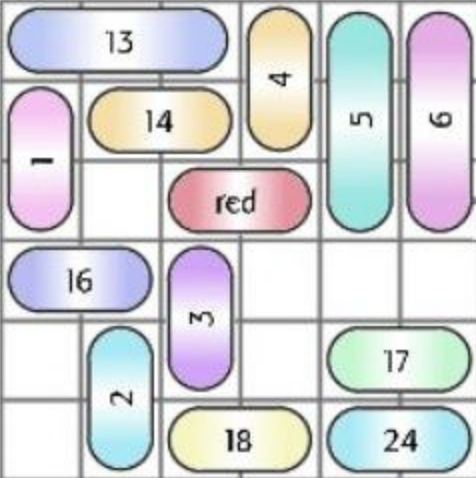
```

```
>>> g=grid()
>>> g.add_configuration_cars(conf1)
>>> g.draw_grid()
*--*--*--*--*--*
|  |  |  |  |  |Y |
*--*--*--*--*--*
|  |  |  |B |  |Y |
*--*--*--*--*--*
|  |R |R |B |  |Y
*--*--*--*--*--*
|  |  |  |B |  |  |
*--*--*--*--*--*
|  |  |  |  |S |S |
*--*--*--*--*--*
|  |  |K |K |K |  |
*--*--*--*--*--*

>>> ga=game(conf1)
>>> solution1(ga)
['SL', 'SL', 'SL', 'BD', 'KL', 'KL', 'BD', 'YD', 'YD',
'YD', 'RR', 'RR', 'RR']
```

THE HARDEST RUSH HOUR POSITION

It takes 93 moves to solve, per [this paper](#) by Collette, Raskin, and Servais. I tried it and got nowhere.



You can think of the space of all possible configurations of vehicles as, well, a configuration space, not unlike the configuration spaces of disks in a box. But here there is a bit less topology; the space is just a graph, with two configurations made adjacent if one can be reached from the other by making a single move. The connected component of configuration space containing the “hardest case” shown here has 24,132 vertices.

```
>>> g=game(confl)
>>> solution1(g)
['GD', 'OD', 'RL', 'XD', 'YR', 'YR', 'YR', 'XD', 'PU', 'JR', 'RL', 'VU',
'NL', 'NL', 'GD', 'JR', 'VU', 'KR', 'VU', 'RR', 'PD', 'PD', 'PD', 'PD',
'RL', 'KL', 'VD', 'YL', 'YL', 'OU', 'VD', 'JL', 'GU', 'GU', 'JL', 'XU',
'JL', 'VU', 'KR', 'PU', 'KR', 'KR', 'KR', 'XD', 'VD', 'JR', 'JR', 'DU',
'NR', 'VD', 'RR', 'PU', 'PU', 'PU', 'NR', 'XD', 'RR', 'DU', 'DU', 'FL',
'XD', 'KL', 'OD', 'FL', 'VD', 'KL', 'GD', 'YR', 'KL', 'XU', 'KL', 'VU',
'DU', 'RL', 'XU', 'RL', 'VU', 'NL', 'OD', 'NL', 'GD', 'NL', 'XD', 'NL',
'VD', 'HL', 'OD', 'HL', 'GD', 'RR', 'RR', 'RR', 'RR']
>>> l=solution1(g)
>>> len(l)
93
```



versions du jeu



La Version Textual

```
C:\Windows\py.exe
veuillez choisir le niveau (1:beginner 2:medium 3:expert )
```

```
C:\Windows\py.exe
veuillez choisir le niveau (1:beginner 2:medium 3:expert ) 1
*-*-*-*-*
| | | | |Y |
*-*-*-*-*
| | |B |Y |
*-*-*-*-*
| |R |R |B |Y |
*-*-*-*-*
| | |B | | |
*-*-*-*-*
| | | |S |S |
*-*-*-*-*
| | |K |K |K | |
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q
```

```
C:\Windows\py.exe
| | |B |Y |
*-*-*-*-*
| |R |R |B |Y |
*-*-*-*-*
| | |B | | |
*-*-*-*-*
| | | |S |S |
*-*-*-*-*
| | |K |K |K | |
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q SL
*-*-*-*-*
| | | |Y |
*-*-*-*-*
| | |B |Y |
*-*-*-*-*
| |R |R |B |Y |
*-*-*-*-*
| | |B | | |
*-*-*-*-*
| | |S |S | |
*-*-*-*-*
| | |K |K |K | |
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q
```

```
C:\Windows\py.exe
| | |R |R | |
*-*-*-*-*
| | |B |Y |
*-*-*-*-*
| |S |S |B |Y |
*-*-*-*-*
|K |K |K |B |Y |
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q rr
*-*-*-*-*
| | | | |
*-*-*-*-*
| | | | |
*-*-*-*-*
| | |R |R |
*-*-*-*-*
| | |B |Y |
*-*-*-*-*
| |S |S |B |Y |
*-*-*-*-*
|K |K |K |B |Y |
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q ru
le mouvement est impossible
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q
```



```
C:\Windows\py.exe

! !R !R !B ! !Y
*-*-*-*-*
! ! ! !B ! ! !
*-*-*-*-*
! ! ! !S !S !
*-*-*-*-*
! ! !K !K !K ! !
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q SL
*-*-*-*-*
! ! ! ! ! !Y !
*-*-*-*-*
! ! ! !B ! !Y !
*-*-*-*-*
! !R !R !B ! !Y
*-*-*-*-*
! ! ! !B ! ! !
*-*-*-*-*
! ! ! !S !S ! !
*-*-*-*-*
! ! !K !K !K ! !
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q Q
etes vous sur de vouloir faire sa (O:oui N:non) N
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q
```

```
C:\Windows\py.exe

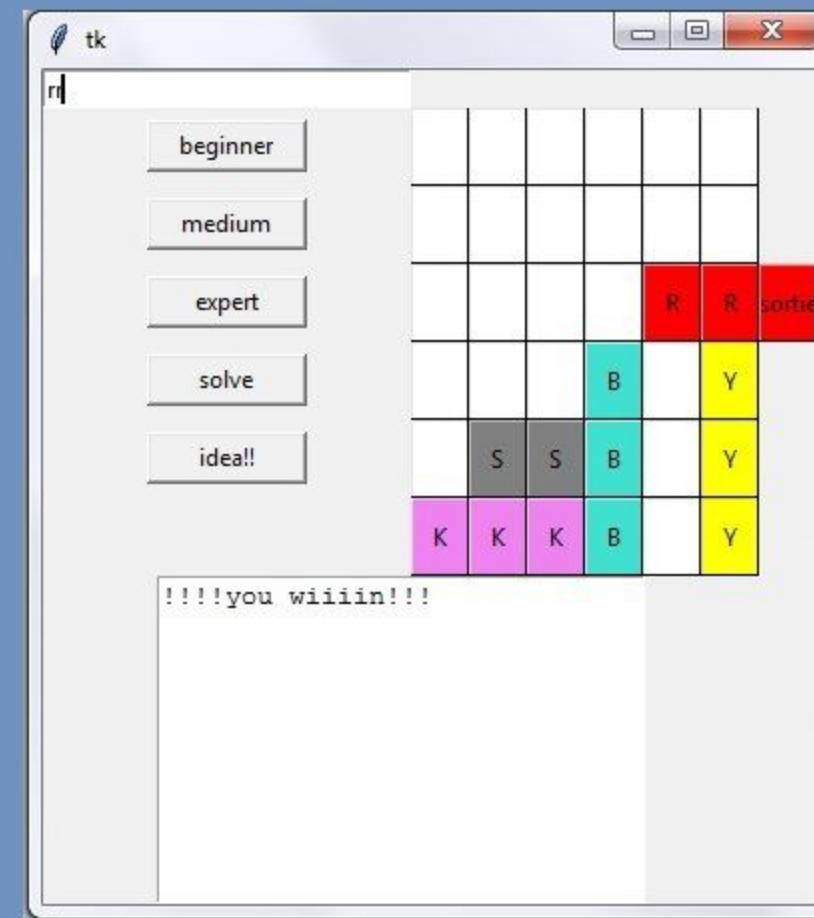
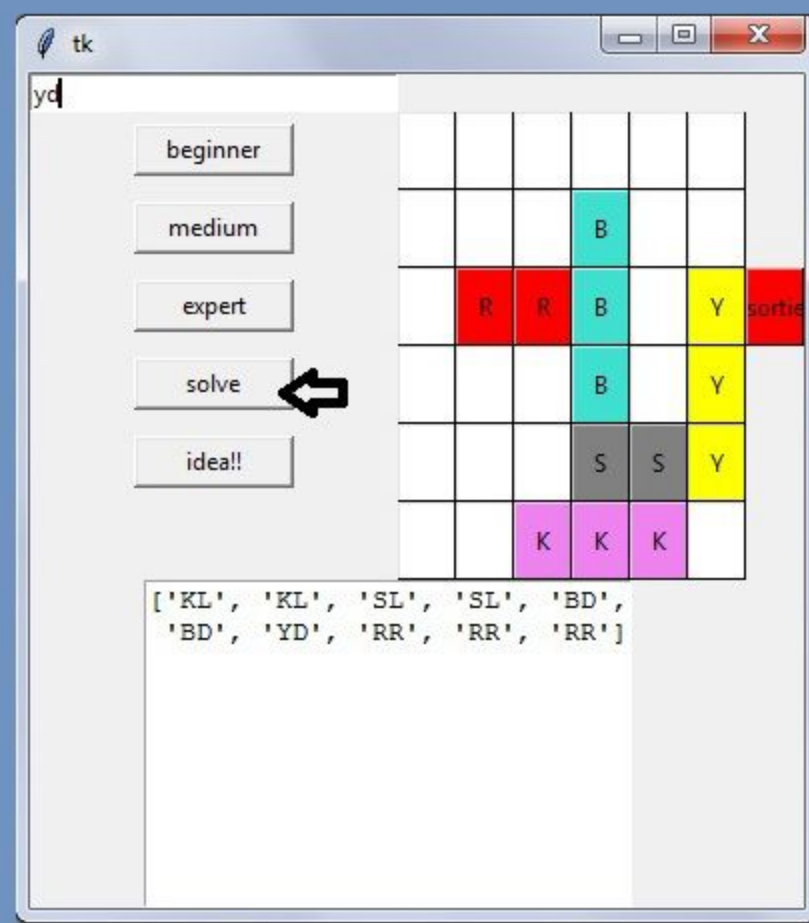
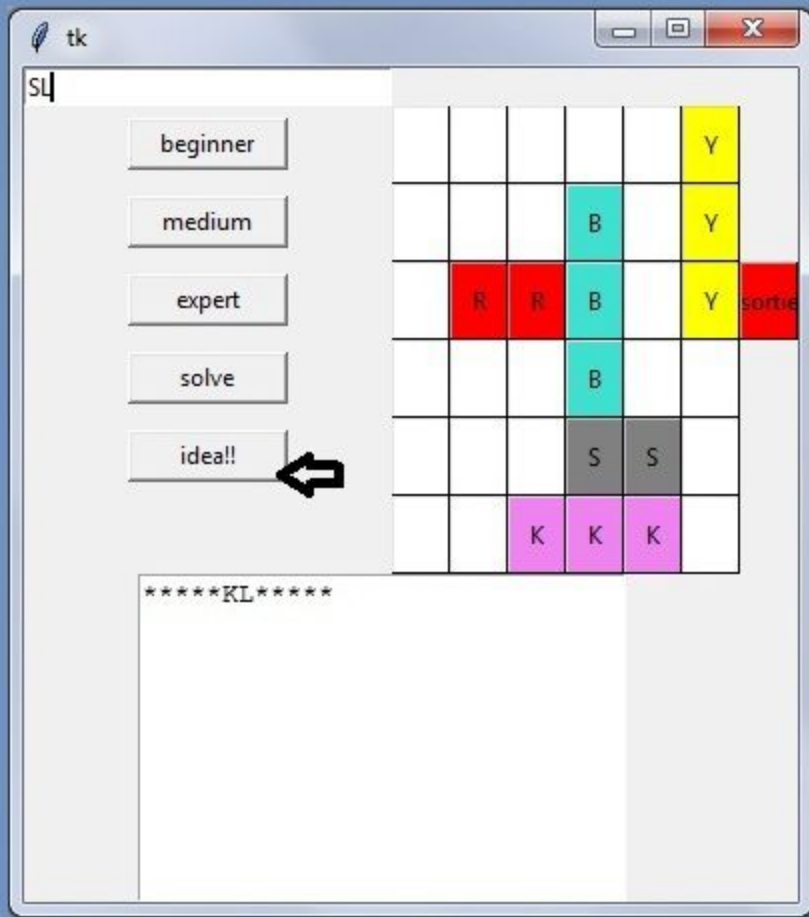
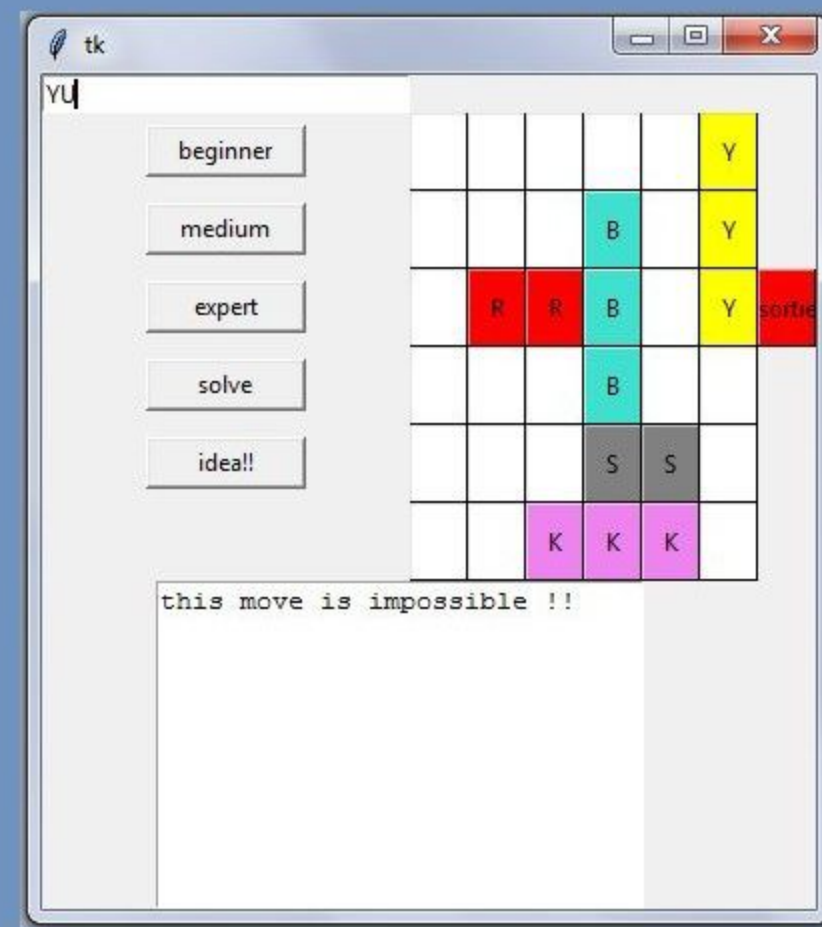
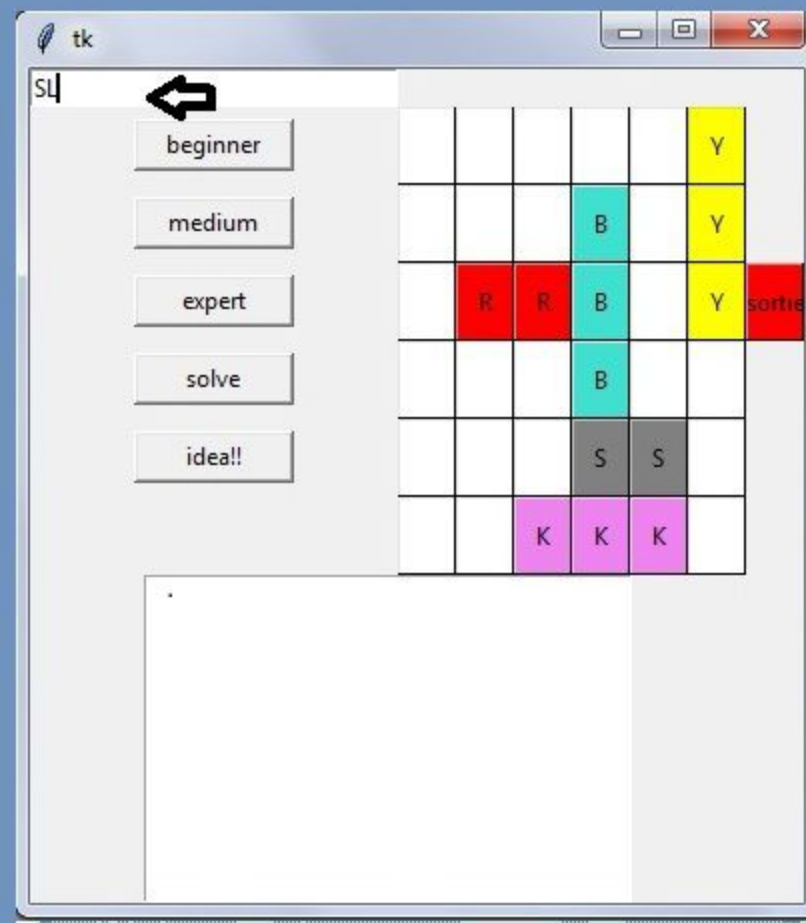
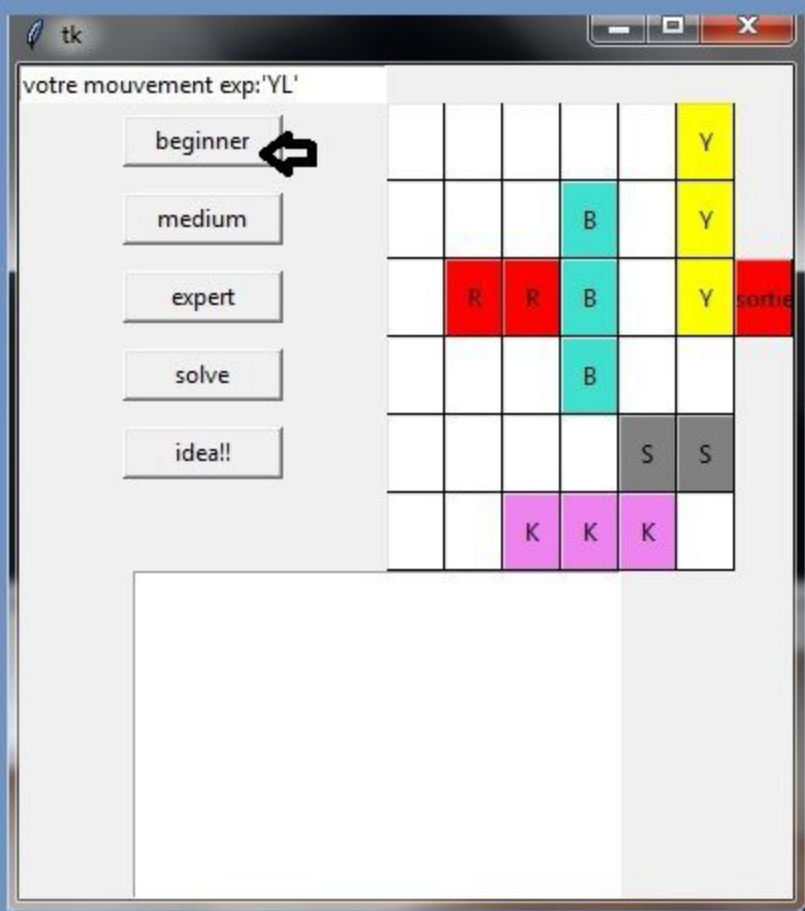
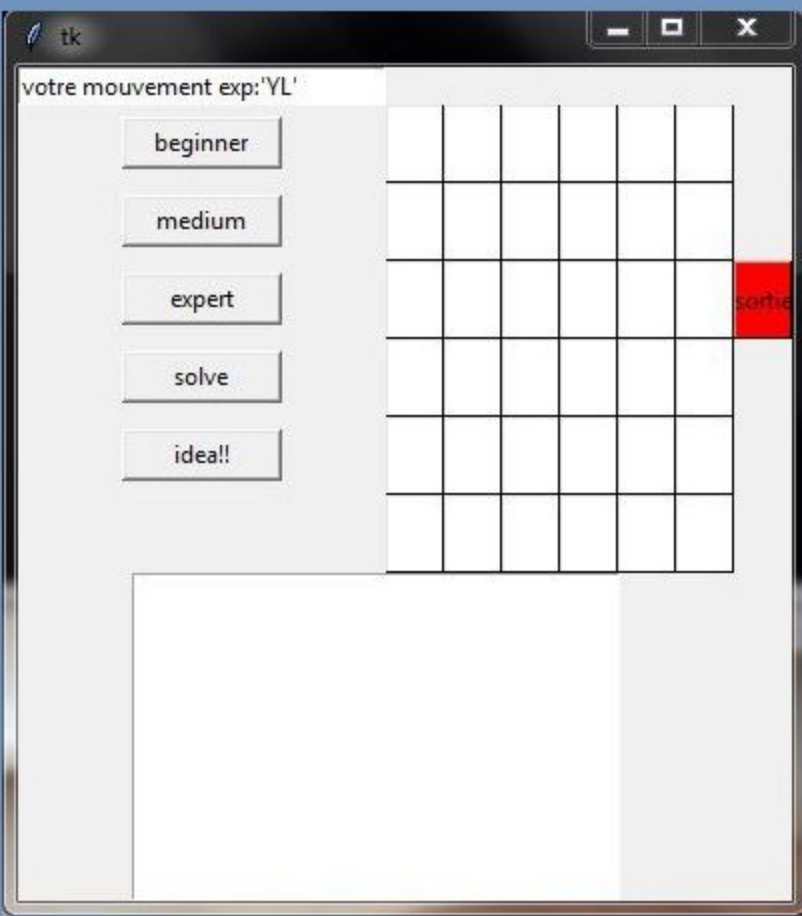
! ! ! !B ! ! !
*-*-*-*-*
! ! ! !S !S ! !
*-*-*-*-*
! ! !K !K !K ! !
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q Q
etes vous sur de vouloir faire sa (O:oui N:non) N
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q SL
*-*-*-*-*
! ! ! ! ! !Y !
*-*-*-*-*
! ! ! !B ! !Y !
*-*-*-*-*
! !R !R !B ! !Y
*-*-*-*-*
! ! ! !B ! ! !
*-*-*-*-*
! ! !S !S ! ! !
*-*-*-*-*
! ! !K !K !K ! !
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q ?
KL
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q
```

```
C:\Windows\py.exe

! ! ! !S !S ! !
*-*-*-*-*
! ! !K !K !K ! !
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q Q
etes vous sur de vouloir faire sa (O:oui N:non) N
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q SL
*-*-*-*-*
! ! ! ! ! !Y !
*-*-*-*-*
! ! ! !B ! !Y !
*-*-*-*-*
! !R !R !B ! !Y
*-*-*-*-*
! ! ! !B ! ! !
*-*-*-*-*
! ! !S !S ! ! !
*-*-*-*-*
! ! !K !K !K ! !
*-*-*-*-*
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q ?
KL
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q s
['KL', 'KL', 'YD', 'YD', 'YD', 'SL', 'BD', 'BD', 'RR', 'RR', 'RR']
mouvement:(exp : 'YD'), idea: '?' , solve: S ,quitter:Q
```

The background consists of a teal field with four red, rounded triangular shapes pointing towards the corners. The text is centered in the teal area.

La version graphique



Fin