

Minimax

May 14, 2021

```
[1]: def nim(t, jug):  
    enc=False  
    for m in range(1, len(t)):  
        if t[m]>0:  
            enc=True  
    if enc:  
        mejor=(0,0)  
        vmj=-1000  
        for m in range(1, len(t)):  
            if t[m]>0:  
                for p in range(1, m+1):  
                    nt=t[:]  
                    nt[m]-=1  
                    nt[m-p]+=1  
                    (v, jg)=nim(nt, -jug)  
                    if v*jug > vmj:  
                        mejor=(m, p)  
                        vmj=v*jug  
        vmj=vmj*jug  
    else:  
        mejor=(0,0)  
        vmj=-jug  
    # print(t, jug, vmj, mejor)  
    return(vmj, mejor)
```

```
[2]: def nim(t, jug):  
    enc=False  
    for m in range(1, len(t)):  
        if t[m]>0:  
            enc=True  
    if enc:  
        mejor=(0,0)  
        vmj=-1000  
        for m in range(1, len(t)):  
            if t[m]>0:  
                for p in range(1, m+1):  
                    t[m]-=1
```

```

        t[m-p]+=1
        (v,jg)=nim(t,-jug)
        t[m]+=1
        t[m-p]-=1
        if v*jug > vmj:
            mejor=(m,p)
            vmj=v*jug

    vmj=vmj*jug
else:
    mejor=(0,0)
    vmj=-jug
# print(t,jug,vmj,mejor)
return(vmj,mejor)

```

[3]: nim([0,5],-1)

[3]: (-1, (1, 1))

[4]: nim([0,0,0,0,4],1)

[4]: (-1, (4, 1))

[5]: nim([0,0,1],-1)

[5]: (-1, (2, 2))

[6]: nim([0,0,1],1)

[6]: (1, (2, 2))

[7]: nim([0,2,2],-1)

[7]: (1, (1, 1))

[8]: nim([0,0,2],1)

[8]: (-1, (2, 1))

[9]: nim([0,0,2],-1)

[9]: (1, (2, 1))

[10]:

```

def nim(t,jug,num_part):
    enc=False
    for m in range(1,len(t)):
        if t[m]>0:
            enc=True
    if enc:
        mejor=(0,0)
        vmj=-1000
        for m in range(1,len(t)):
            if t[m]>0:
                for p in range(1,m+1):
                    nt=t[:.]

```

```

        nt[m] -= 1
        nt[m-p] += 1
        (v,jg)=nim(nt,-jug,num_part)
        if v*jug > vmj:
            mejor=(m,p)
            vmj=v*jug

        vmj=vmj*jug
    else:
        mejor=(0,0)
        vmj=-jug
    # print(t,jug,vmj,mejor)
    num_part[0] += 1
    return(vmj,mejor)

```

```

[11]: np=[0]
      print(nim([0,0,2],-1,np))
      np

```

(1, (2, 1))

[11]: [15]

```

[12]: np=[0]
      print(nim([0,1,1,1,1,1],1,np))
      np

```

(-1, (4, 1))

[12]: [6325471]

[]: