

Corrigé du TP Informatique 10

Exercice 1

1. On saisit :

```
def KP_rec(X,C):
    if len(X)==0:
        return 0
    X_extr=X[:-1]
    v,p=X[-1]
    if C>=p:
        return max(KP_rec(X_extr,C),KP_rec(X_extr,C-p)+v)
    else:
        return KP_rec(X_extr,C)
```

2. On saisit :

```
def KP_memo(X,C):
    def KP(X,C):
        if (X,C) not in memo:
            if len(X)==0:
                return 0
            v,p=X[-1]
            X_extr=X[:-1]
            if p>C:
                res=KP(X_extr,C)
            else:
                res=max(KP(X_extr,C),KP(X_extr,C-p)+v)
            memo[(X,C)]=res
        return memo[(X,C)]
    memo={}
    return KP(X,C)
```

3. On trouve

$$\forall j \in \llbracket 0; C \rrbracket \quad t_{0,j} = 0$$

$$\text{et} \quad \forall (i,j) \in \llbracket 1; n \rrbracket \times \llbracket 0; C \rrbracket \quad t_{i,j} = \begin{cases} t_{i-1,j} & \text{si } j < p_i \\ \max(t_{i-1,j}, t_{i-1,j-p_i} + v_i) & \text{sinon} \end{cases}$$

4. On saisit :

```
def KP_tab(X,C):
    n=len(X)
    tab=[[0]*(C+1) for i in range(n+1)]
    for i in range(1,n+1):
        v,p=X[i-1]
        for j in range(C+1):
            if j>=p:
                tab[i][j]=max(tab[i-1][j],tab[i-1][j-p]+v)
            else:
                tab[i][j]=tab[i-1][j]
    return tab
```

5. On saisit :

```
def KP_comp(X,C):
    tab=KP_tab(X,C)
    n=len(X)
    i,j,res=n,C,[]
    while i>0 and j>0:
        if tab[i-1][j]==tab[i][j]:
            i-=1
        else:
            v,p=X[i-1]
            i-=1
            j-=p
            res.append((v,p))
    return res
```

6. On saisit :

```
def KP_all(X,C):
    n=len(X)
    tab=KP_tab(X,C)
    file_KP=deque()
    res=[]
    file_KP.append([(n,C),[]])
    while len(file_KP)>0:
        coord,contenu=file_KP.popleft()
        i,j=coord
        if i==0 or j==0:
            res.append(contenu)
        else:
            v,p=X[i-1]
            if tab[i-1][j]==tab[i][j]:
                file_KP.append([(i-1,j),contenu])
            if j-p>=0 and tab[i-1][j-p]+v==tab[i][j]:
                # pas de append sur contenu qui est mutable
                file_KP.append([(i-1,j-p),contenu+[(v,p)]])
    return res
```