FIZ425E FINAL EXAM

Bubblesort algorithm: A simple sorting algorithm that works by repeatedly stepping through the list to be sorted, comparing each pair of adjacent items and swapping them if they are in the wrong order. The pass through the list is repeated until no swaps are needed, which indicates that the list is sorted. The algorithm gets its name from the way smaller elements "bubble" to the top of the list. [Wikipedia]

Step-by-step example:
Let us take the array of numbers "5 1 4 2 8", and sort the array from lowest number to greatest number using bubble sort. In each step, elements written in **bold** are being compared.

First Pass:
(**5 1** 4 2 8) → (**1 5** 4 2 8), Here, compares the first two elements, and swaps since 5 > 1.
(1 **5 4** 2 8) → (1 **4 5** 2 8), Swap since 5 > 4
(1 4 **5 2** 8) → (1 4 **2 5** 8), Swap since 5 > 2
(1 4 2 **5 8**) → (1 4 2 **5 8**), already in order (8 > 5), algorithm does not swap them.

Second Pass:
(**1 4** 2 5 8) → (**1 4** 2 5 8)
(1 **4 2** 5 8) → (1 **2 4** 5 8), Swap since 4 > 2
(1 2 **4 5** 8) → (1 2 **4 5** 8)
(1 2 4 **5 8**) → (1 2 4 **5 8**)
Now, the array is already sorted, but our algorithm does not know if it is completed. The algorithm needs one **whole** pass without **any** swap to know it is sorted.

Third Pass:
(**1 2** 4 5 8) → (**1 2** 4 5 8)
(1 **2 4** 5 8) → (1 **2 4** 5 8)
(1 2 **4 5** 8) → (1 2 **4 5** 8)
(1 2 4 **5 8**) → (1 2 4 **5 8**)
No swapping in the third pass, so the array is sorted.

You will write a **main** program and **two** functions "**bubblesort**" and "**swap**":

- Enter **a numpy vector** to be sorted in the main program (your code should work for vectors in **any** length).
- Send the vector to the function "**bubblesort**" and print out the resulting (sorted) vector in the main program.
- Use a function "**swap**" to swap the elements where necessary. **The function "bubblesort" will call the "swap" function.**

GRADING:

"swap" function: 30 points
"bubblesort" function: 60 points
main program: 10 points
***** Adding GUI to a perfectly running code: 30 extra points (Taking the vector from the user and displaying the result in a window) *****

```
from numpy import *

def swap(i,j,myvector):
   firstone,secondone=myvector[i],myvector[j]
   myvector[i], myvector[j]=secondone,firstone
   return myvector

def bubblesort(myvec):
   issorted=0
   while issorted==0:
      timesswap=0
      for i in range (len(myvec)-1):
         j=i+1
         if (myvec[i]>myvec[j]):
            myvec=swap(i,j,myvec)
            timesswap=timesswap+1
      if timesswap==0:
         break
   return myvec


unsortedvector=array([54,26,93,17,77,31,44,55,20])
sortedvector=bubblesort(unsortedvector)
print(sortedvector)
```