Lab/Homework 6

Deadline: 23:59 pm, Sunday, Dec 17.

What to submit:

A report with answers to each exercise and corresponding python program (.py file), packaged into a zip file. Named zip as ''class_name_HW6'',for example, ''AI1-jason-HW6''. Please submit TA (Jiashuo zheng)

Requirements on Coding:

1. Adding header to each .py file.

"""

xxxx.py

author:

date:

description:

"""

2. Please add a space around the operator and after the comma.

3. Add a blank line between code of different functions

4. Indent your code blocks with 4 spaces. Never use tabs or mix tabs and spaces.

Exercise 6.0 SecretMessages(50pts)

In this problem, we will use the 'pickle' module to save and load secret messages hidden in inconspicuous Python objects.

(a) Write a function named Genkey, which can generate a mapping dictionary representing a simple substitution cipher. Generated mapping dictionary should randomly map each of the 26 English letters [A-Z] and whitespace to a unique ciphertext number between 0 and 261. For example, the returned dictionary could encode the following mapping:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	
0	24	18	23	2	15	26	14	10	13	1	11	17	4	21	22	20	6	3	19	12	8	16	9	7	25	5

In function Genkey, you should use pickle to save the generated dictionary to a file, the function will also return the saved file path.

(b) Write a function, which takes as parameters a plaintext message and the path of file containing a simple substitution cipher, the function encodes the message in the following simple unary representation. The message is represented as a list and each element of the list represents a letter. Each letter is a list of objects of any type, such that the length of the list represents the ciphertext number for the letter (according to the mapping dictionary). For instance, the message 'MARY' encoded with the mapping above would look like this:

```
[ [ 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ] ,
[ ] ,
[ 1 , 1 , 1 , 1 , 1 , 1 ] ,
[ 1 , 1 , 1 , 1 , 1 , 1 , 1 ] ]
```

Write a function named Encode that reads in a plaintext message, uses mapping dictionary in part (a) to encode the message, and then uses pickle to save the encrypted message into a file, finally output file path.

(c) Write a function named Decode, which unpickles a file with encoded message as describe above and a file containing a simple substitution cipher, uses Decode function to decode the message and prints the plaintext.

Exercise 6.1 HandlingExceptions(50pts)

There are two problem-specific sources of errors in the encoder and decoder from Exercise 6.0.

(a) When encoding a message, the plaintext may contain symbols other than 26 letters or space. Modify the ‘Encode’ function to handle this exception (by asking the user to revise his input until a valid input was read).

(b) The object to be decoded is not a valid encrypted message. This can be case for a number of reasons.

1. The message object is not a list at all. In this case the ‘Decode’ function should handle the TypeError, so that the program prints an error message and terminates gracefully.

2. The outer list contains a non-list element. This cases you should handle the TypeError by just skipping the encoded symbol.

3. There are too many elements in one of the inner lists. Handle this case like case2. Implement this behavior and provide examples causing each type of exception.