

EE3980 Algorithms

Homework 9. Coin Set Design

Due: May 15, 2021

Currently in Taiwan, we have \$1, \$5, \$10 and \$50 NTD coins. Thus, any dollar amount less than 100 must consist of a number of coins. For this assignment please write a function that determines the minimum number of coins to represent a integer D , $1 \leq D \leq 99$, using greedy algorithm.

```
int NCoinGreedy(int D, int NCoin, int Coins[]);
```

The function parameter `NCoin` represents the number of different coins and it is 4 for Taiwan's currency system. The array parameter `Coins[]` is the value of coins, arrange from small to large. And it is `Coins[] = {1, 5, 10, 50}` for Taiwan's system. Using this function, please calculate the average number of coins one needs to carry if the probabilities of carrying \$1 to \$99 coins are equal.

Suppose you are given the job of redesigning the coin set to minimize the average number of coins to carry. Please write a C program to find the following.

1. Coins \$1, \$5, and \$10 must be kept while \$50 can be changed. Please find what should be the value of coin replacing \$50 such that the average number of coins from \$1 to \$99 is minimum.
2. Coins \$1, \$5, and \$50 must be kept while \$10 can be changed. Please find what should be the value of coin replacing \$10 such that the average number of coins from \$1 to \$99 is minimum.
3. Coins \$1, and \$5 must be kept while \$10 and \$50 can be changed. Please find what should be the values of coins replacing \$10 and \$50 such that the average number of coins from \$1 to \$99 is minimum.

All those the capabilities above should be implemented in a single program and the output of the program should look like the following:

```
$ a.out
```

```
For coin set {1, 5, 10, 50} the average is d.ddddd
```

```
Coin set {1, 5, 10, dd} has the minimum average of d.ddddd
```

```
Coin set {1, 5, dd, 50} has the minimum average of d.ddddd
```

```
Coin set {1, 5, dd, dd} has the minimum average of d.ddddd
```

Notes.

1. One executable and error-free **C** source file should be turned in. This source file should be named as **hw09.c**.
2. A report file in **pdf** format is also needed. This file should be named as **hw09a.pdf**.
3. Submit your **hw09.c** and **hw09a.pdf** on EE workstations using the following command:

```
~ee3980/bin/submit hw09 hw09.c hw09a.pdf
```

where **hw09** indicates homework 9.

4. Your report should be clearly written such that I can understand it. The writing, including English grammar, is part of the grading criteria.

