

CS1356 Introduction to Information Engineering

Homework 4

Due: Dec 9, 2009 in class

Remember to write your name and student ID

1. Alice is writing Christmas cards to her friends. She has 60 cards to send, so she asks two friends to help with that. To make the work more efficient, she divides the work into four tasks, and the time for each task is given as follows.
 - (1) Sign the card (20 seconds)
 - (2) Put the card into an envelope (15 seconds)
 - (3) Write receiver's address (25 seconds)
 - (4) Stamp and seal the envelope (20 seconds)Alice needs to do the first task (sign the cards) in person. **(30%)**
 - (a) If Alice does task (1) and (2), and her friends do task (3) and (4) in pipeline, how fast can they finish the work? Justify your answer.
 - (b) Can you think a method that is faster than the pipeline in (a)? Can your strategy be used to speed-up the instruction execution on computers? Justify your answer.

2. TAs want to compute the average of midterms by hand. There are 64 students in the class, and each TA needs 30 seconds to add two numbers, and 60 seconds to do division. **(40%)**
 - (a) If there are 16 TAs, how fast can they finish the calculation? Justify your answer.
 - (b) What is the speedup of 16 TAs comparing to just one TA? Can you modify the Amdahl's law to explain the speedup?

3. *iPlayer* is a new MP3 player with wirelessly communication ability. It works as follows
 - (1) When user selects a song, *iPlayer* will check if the song is in the local memory.
 - (2) If the song is in the local memory, *iPlayer* will play it.
 - (3) If not, *iPlayer* will download it from a server, store the song, and play it.
 - (4) If the local memory has no space to store the downloaded song, *iPlayer* will randomly delete one or more songs until the downloaded song can be stored. **(30%)**
 - (a) Can you show the analogies between how *iPlayer* works and how virtual memory works? And what are the differences between them?
 - (b) For task (4), can you think a better way than random deletion, such that the chance of performing task (3) can be reduced? What is your assumption? And what kind of information need be kept track of?