

Homework solution for chapter 7-12

HW 7: 2, 8, 15, 20, 21, 23, 32, 41, 46, 47

2. Incremental and iterative models sometimes make use of the trend in software development toward prototyping, in which incomplete versions of the proposed system, called prototypes, are built and evaluated.

8. Open-source development is an example of bottom-up design in that the final system is built by expanding a simpler system. In fact, the functionality of the final system is usually not known at the beginning of the project. Instead, it evolves according to the desires of the developers.

15. If an instance variable is private, no data coupling based on that variable can occur between objects. Therefore, declaring instance variables as private will reduce the potential for data coupling.

20. A UML class is drawn as a rectangle with three components separated by a horizontal line. The top compartment holds the class name, attributes are in the middle compartment, and the bottom compartment holds a list of operations.

21. A software development life cycle is a series of processes that, if followed, can lead to the development of a software application. The software processes describe how work is to be carried out to attain the original objective based on the system requirements.

Features of traditional software development methodologies –

- a. Tends toward writing a lot of code to do all the things that has to be done.
- b. It is either algorithm-centric or data-centric.

23. Answers will vary. Perhaps the simplest would should a "solicit payment" message being sent to the customer followed by a "make payment" message being returned. On the other hand, some students may get creative and follow a longer sequence showing the customer refusing to pay and perhaps having his or her service cut off. The point is for the students to indicate that they understand collaboration diagrams.

32. a. X = User, Y = Manufacturer, and Z = Tool. A major clue is that tools are used by users.

b. No

c. No

d. Yes

written. The methodology of CRC cards is that the software designer produces a card for each object in a proposed system and then uses the cards to represent the objects in a simulation of the system.

41. A CRC card is simply a card, such as an index card, on which the description of an object is

46. Black box-testing focuses on the functional requirements of the software. It is applied during the last stage of testing. This testing is suitable for the specifications which are described by a certain set rules.

47. In beta testing the tester is only allowed to test; in open-source development the "tester" is allowed to test and modify the software. Thus, beta testing is a black-box methodology whereas open-source development is a glass-box methodology.

HW 8: 5, 12, 13, 18, 19, 44

5. Use a contiguous block of memory cells in which the planes in the three-dimensional array are stored as consecutive two-dimensional planes in row major order. If each entry requires one memory cell and the first cell of the block is at address x , then the (i, j, k) th entry will be located at the address $x + (R \times C)(i - 1) + C(j - 1) + (k - 1)$, where R is the number of rows and C is the number of columns.

12. In either case the problem can be solved using the merge algorithm that the students will see applied to sequential files in Chapter 8. One solution, therefore, is to alter Figure 8-3 to refer to NIL pointers rather than EOF marks, list entries rather than records, and lists A, B, and C rather than transaction, old master, and new master files.

In the case of linked lists, however, the merge can be performed without producing a third list. That is, the entries can remain in the same places in memory while their pointers are altered.

13. Previous \leftarrow NIL;

Current \leftarrow value of the head pointer;

```

while (Current not NIL) do
  (Next ← value pointed to by Current;
   pointer in the current entry ← Previous;
   Previous ← Current;
   Current ← Next)

```

```

head pointer ← Previous

```

18. if (stack not empty) then

[repeat

```

  (Pop an entry from the original stack and
   push it on an auxiliary stack)

```

until (original stack empty)

Pop an entry from the auxiliary stack and save it as the target value

while (auxiliary stack not empty) do

```

(Pop an entry from the auxiliary stack and
 push it on the original stack)]

```

19. The term backtracking refers to the process of backing out of a system in the opposite order from which the system was entered. For example, the process of retracing one's steps in order to find one's way out of a forest.

44. One approach would be to attach children to a node as a linked list, with the head pointer contained in the parent node.

HW 9: 6, 12, 13, 17, 33, 34, 35

6. Both abstract data types and database models describe an abstract image of the data that simplifies the users interaction with the data. This interaction is supported by the procedures defined in the abstract data type or in the DBMS. In a sense, an instance of an abstract data type is a miniature database.

12

a. U	W	b. U	V	W	c. S
AA	50	AA	ZZ	50	JJ
BB	30	CC	QQ	50	KK
CC	50				

d.	X1.U	X1.V	X1.W	X2.R	X2.S
	AA	ZZ	50	30	JJ
	AA	ZZ	50	40	KK
	BB	DD	30	30	JJ
	BB	DD	30	40	KK
	CC	QQ	50	30	JJ
	CC	QQ	50	40	KK

13. a. TEMP ← SELECT from MANUFACTURER where PartName = "bolt 2Z";
 RESULT ← PROJECT CompanyName from TEMP.

b. TEMP ← SELECT from MANUFACTURER where CompanyName = COMPANY X;
 RESULT ← PROJECT PartName, Cost from TEMP.

c. TEMP1 ← JOIN PART and MANUFACTURER

```

    where PART.PartName = MANUFACTURER.PartName;
TEMP2 ← SELECT from TEMP1 where PART.Weight = 1;
RESULT ← PROJECT MANUFACTURER.CompanyName from TEMP2.

```

17. A good approach would be to use three relations: one containing information about Authors; one containing information about Titles; and another linking Authors to Titles.

33. Find the dates at which the current employee started his or her current position.

```

34. select Name, StartDate
    from EMPLOYEE, ASSIGNMENT
    where EMPLOYEE.EmplId = ASSIGNMENT.EmplID
    and TermDate = "*"

```

35. Find the names of that Employee who have the JobId F5.

HW10: 1, 6, 12, 20, 23, 32, 33, 77

1. Gouraud shading and Phong shading are more realistic than flat shading.

6. A frame buffer is a bit map representation of the image in a storage area.

12. A pyramid

20. Clipping. In clipping, a portion of the image is cut using the well-known clipping algorithm.

23. c

32. Key frames are used refine the storyboard, which is a sequence of two-dimensional images that tell the complete story in the form of sketches of scenes at key points in the presentation Artists would refine the storyboard into detailed frames, called key frames, that established the appearance of the characters and scenery at regular intervals of the animation.

33. Color bleeding is a characteristic of light where the color of one object affects the hue of other objects.

37. Procedural model is a software unit that uses an algorithm to generate a desired geometrical structure. It is used to create structures such as trees, mountain ranges, clouds, smoke, or fire.

HW11: 7, 11, 20, 25, 34, 36, 47, 49

7. a. performance oriented

b. simulation oriented

c. performance oriented

d. simulation oriented

e. performance oriented

11. If the corner is concave, the drawing would be interpreted as a single large block with a corner cut out of it. If the corner is convex, the drawing would be interpreted as a small block floating in front of a larger block.

20. The two main search techniques are: (i) Uninformed or Blind Search and (ii) Informed or Heuristic Search.

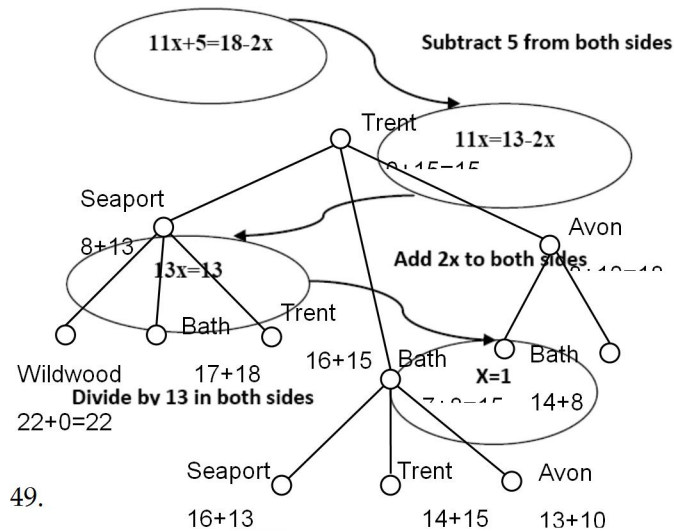
25. Player X should select move B. This means that X cannot win but assures X of a tie. Note that following the production system examples in the text, one would be inclined to pick move A since this leads to leaf nodes that are most advantageous to X. However, Y will not allow X to reach these nodes. This is an example of the mini-max search strategy common in searching game trees.

34. The position of X and 0 in the tic-tac-toe game in vertical, horizontal and diagonal positions can be used as a heuristic.

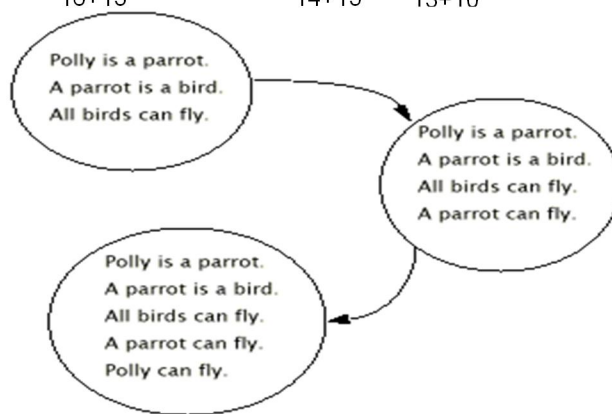
36.

The found path is Trent to Seaport, and then to Wildwood. It should be noted that cities occur multiple times in the search tree; however, each entry for a given city has a different actual cost (a different route was taken). Furthermore, the city with the least actual cost will be the first added to the search tree. Thus, an additional modification performed by the A* algorithm is not to add a node which represent states already present in the search tree. For example, the nodes below Bath for Seaport, Trent, and Avon would not be added. In any case the A* algorithm will find the shortest path whereas the best fit algorithm may not find the shortest path.

47. 16+15



49.



HW12: 6, 11, 24, 30, 40, 45, 49

6. It computes $X - Y$ when $X \geq Y$.

11. Begin with the results of the previous problem. Then, any loop of the form

```
while X not 0 do;
  B
end;
```

can be simulated by first copying all the variables involved into auxiliary variables. Then, increment the auxiliary copy of X and perform the loop

```
repeat
  S
until (AuxX equals 0);
```

where S is the sequence of statements that first copies all the auxiliary variables into their corresponding originals and then performs the original body using the auxiliary variables. (The overall effect is that the new body will be executed one more time than the original, but the effect on the original variables will be the same as the original pretest loop.)

24. A method of sending messages with different encryption and decryption keys, so that the encrypting keys can be widely distributed without violating the security of the system. Such cryptography systems are called public-key encryption systems, a term that reflects the fact that the keys used to encrypt messages can be public knowledge without degrading the system's security. The encrypting key are often called the public keys, whereas the decrypting keys are called the private keys.

30. Mary's solution is much better. Given a committee of size $2n$ (an even value), Charlie's solution would require generating $(2n)!/(n!n!)$ subcommittees, which is more than 2^n . Thus, Charlie's solution would require exponential time. On the other hand, Mary's solution involves little more than a sorting algorithm and can therefore be performed in polynomial time. Consequently, the problem itself is a polynomial problem.

40.

a. Matrix multiplication: $O(n^3)$

b. Bubble sort: $O(n^2)$

c. Linear search: $O(n)$

d. Binary Search: $O(\log n)$

45. $1723 = 257 + 771 + 391 + 304$

49. The RSA algorithm is strong because of its keys. Computer science research suggests that if N is a 100-digit number then finding P and Q from N might take more than 70 years.