Today's topics

Java
Implementing Decision Trees

Upcoming
More formal treatment of grammars

Reading
Great Ideas, Chapter 2

Implementing a Decision Tree

- Start with a very simple tree
  - Have just one level of decision
  - Need only one if statement
  - Have already done this kind of thing before
  - No new challenges

A decision tree
Selecting a textbook

1. A programming focus instead of theory
   - Yes: Oh! Pascal by D. Cooper
   - No: Algorithmics by D. Harel

2. Do you wish a Mathematical Approach?
   - Yes: Karel the Robot by R. Pattis
     - No: Great Ideas in CS by A. Biermann

3. A narrow focus instead of an overview of CS

Code for Simple Tree

```java
public class SimpBook extends java.applet.Applet
    implements ActionListener
{
    TextField mQuery, mAnswer;
    Button bYes, bNo;
    public void init()
    {
        mQuery = new TextField(70);
        mQuery.setText("Do you wish a mathematical approach?");
        bYes = new Button("Yes");
        bNo = new Button("No");
        mAnswer = new TextField(70);
        bYes.addActionListener(this);
        bNo.addActionListener(this);
        add(mQuery); add(bYes); add(bNo); add(mAnswer);
    }
}
```
public void actionPerformed(ActionEvent event) {
    Object cause = event.getSource();
    if (cause == bYes) {
        mAnswer.setText("Books by Harel or Cooper are nice.");
    } else // must have been the No button
    { mAnswer.setText("Books by Pattis or Biermann should do.");
    }
}

The Full Decision Tree

- Now have more levels to worry about
  ➢ Have picked up an additional problem
  ➢ Need to keep track of where we are (or have been)
  ➢ (Almost like exploring a cave)
- Add a variable which is used to record where we've been
  ➢ Use the numbers on our diagram for reference
    o (numbers are arbitrary; must be unique)
  ➢ Use variable named myLocation

public class BookPick extends java.applet.Applet implements ActionListener {
    TextField mQuery, mAnswer;
    Button bYes, bNo;
    int myLocation;
    public void init()
    {
        mQuery.setText("Do you wish a mathematical approach?");
        bYes = new Button("Yes");
        bNo = new Button("No");
        myLocation = 0;
        mAnswer = new TextField(70);
        bYes.addActionListener(this);
        bNo.addActionListener(this);
        add(mQuery); add(bYes); add(bNo); add(mAnswer);
    }
}

Code for the Decision Tree (p. 2)

public void actionPerformed(ActionEvent event) {
    Object cause = event.getSource();
    if (myLocation == 0) {
        if (cause == bYes) {
            myLocation = 1;
            mQuery.setText("A programming focus instead of theory?");
        } else if (cause == bNo) {
            myLocation = 2;
            mQuery.setText("Narrow focus instead of overview of CS?");
        }
    }
}
**Code for the Decision Tree**  (p. 3)

```java
else if (myLocation == 1)
{
    if (cause == bYes)
    {
        myLocation = 3;
        mAnswer.setText("I recommend 'Oh! Pascal' by D. Cooper.");
    }
    if (cause == bNo)
    {
        myLocation = 4;
        mAnswer.setText("'Algorithmics' by D. Harel is a fine book.");
    }
}
```

**Code for the Decision Tree**  (p. 4)

```java
else if (myLocation == 2)
{
    if (cause == bYes)
    {
        myLocation = 5;
        mAnswer.setText("Try 'Karel the Robot' by R. Pattis.");
    }
    if (cause == bNo)
    {
        myLocation = 6;
        mAnswer.setText("Enjoy A. Biermann's 'Great Ideas in CS'.");
    }
}
```

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**General Decision Trees**

- How can we can extend this to any size tree?
- Assume we can use *yes* or *no* answers all the way through
  - Notice that at each on the tree we have another tree
  - At each step we use code similar to our simple tree
  - Must keep track of where we’ve been
- For more general branching (not just *yes/no*) need a bit more
  - Not hard to adapt
  - General ideas the same