CSC376
Final Project

The final project will be a telnet based celebrity guessing game. In other words, you will be writing a server that users can connect to using telnet. This means you do not have to write a client, but you do have to make all I/O console based. You will not be able to open multiple windows or use any form of graphical interface. The server (computer) will try to guess the celebrity that the player is thinking of. The server does this by asking a sequence of yes/no questions until it can narrow down the choices to a celebrity that the server has encountered before. At that point, the server guesses the celebrity. If the server is wrong, it asks the user for the name of the celebrity as well as a yes/no question to distinguish that new celebrity from the guess the server made and adds this new information to its "database." In other words, the server is continuously learning.

The server begins with single celebrity, Barack Obama. Below is a sample transcript from a game played with the server. Server messages are in italics, player messages are in bold:

Would you like to play a celebrity guessing game?
yes

Is the celebrity you are thinking of Barack Obama?
no

Who are you thinking of?
Adam Sandler

Ask a yes/no question that would distinguish between Barack Obama and Adam Sandler
Is your celebrity a politician?

Would an answer of yes indicate Adam Sandler?
no

Thank you for adding Adam Sandler to the database.

Now the server has added information to use the next time someone plays (perhaps even the same player). For example, the next couple of games might look like:

Would you like to play a celebrity guessing game?
yes

Is your celebrity a politician?
no

Is the celebrity you are thinking of Adam Sandler?
no

Who are you thinking of?
Betty White

Ask a yes/no question that would distinguish between Adam Sandler and Betty White
Is your celebrity female?

Would an answer of yes indicate Betty White?
yes

Thank you for adding Betty White to the database.

Would you like to play a celebrity guessing game?
yes

Is your celebrity a politician?
yes

Is your celebrity Barack Obama?
no

Who are you thinking of?
Hillary Clinton

Ask a yes/no question that would distinguish between Hillary Clinton and Barack Obama
Has your celebrity ever been president of the United States?

Would an answer of yes indicate Hilary Clinton?
no

Thank you for adding Hilary Clinton to the database.

Every once in a while, the server will get lucky and will already have the celebrity in the database. The trace of such a game might look like:

Would you like to play a celebrity guessing game?
yes

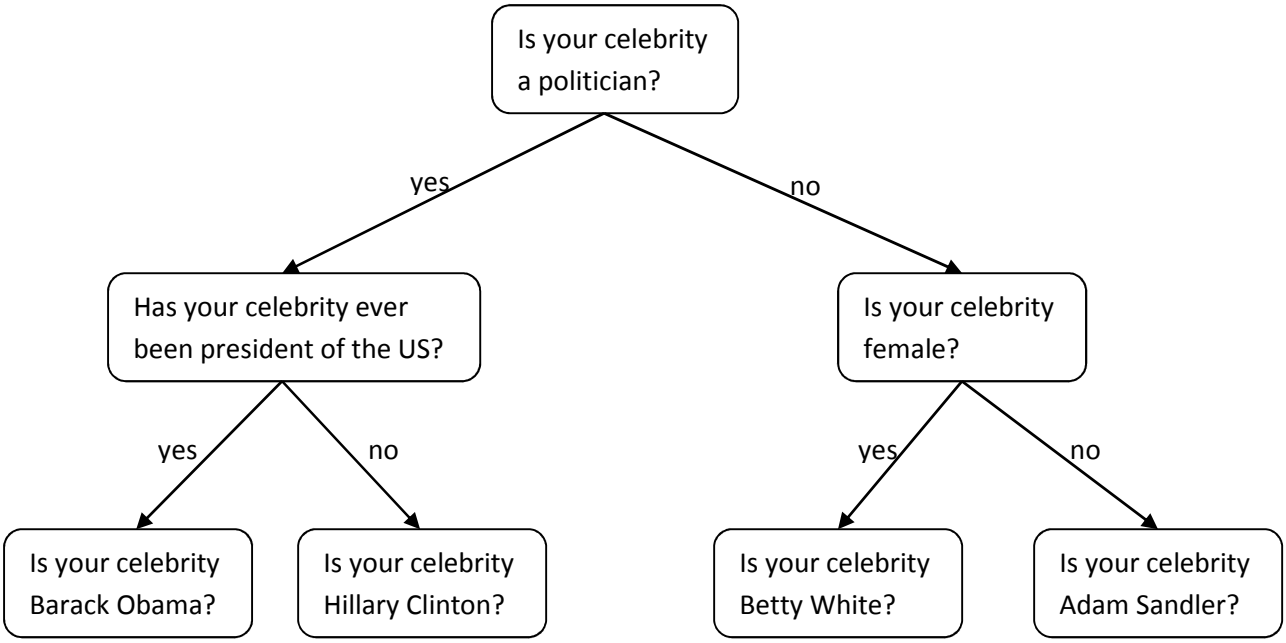
Is your celebrity a politician?
yes

Has your celebrity ever been president of the United States?
yes

Is your celebrity Barack Obama?
yes

I'm so smart!

As you can see, the server keeps learning new celebrities every time it guesses wrong. The game tree for the game so far is diagramed below. Also you can see a working example by opening a telnet session with wmarrerowww.cstcis.cti.depaul.edu:6001.



Requirements

(60 points) The minimal functionality consists of a server that a single person can connect to and play the game multiple times. Once that first player disconnects, a new player must be able to connect and play the game and make use of all the newly learned celebrities. The server must run on port **6001**. Also test your application thoroughly. In particular, check what happens if the user edits his/her reply (by using the backspace key) before hitting enter.

(10 points) In addition to the minimal functionality, your server should allow multiple players to connect simultaneously. This will require a multithreaded server. To get the 10 points, I need to be able to connect two separate telnet windows to your server and play the game simultaneously.

(10 points) In addition to the multiple connections listed above, you must protect the server against inconsistencies that could arise when two players enter a new celebrity into the database at the same time and at the same place in the game tree. For example, if two players have answered yes/no questions exactly the same way and both of them are about to be asked if they are thinking of say Lance Armstrong, then there could be a problem if they are thinking of different people. One might be told to come up with a question to distinguish between Lance Armstrong and Queen Elizabeth while the other is told to come up with a question to distinguish between Lance Armstrong and Mickey Mouse. You

won't be able to enter both celebrities into the database. To avoid this, you will need to add synchronization/locks to the server. But note, you should NOT restrict two people who are at different places in the game tree. Also to get the full 10 points, you should only restrict people who are about to modify the tree. In other words, only "leaf nodes" in the game tree need to be protected. It's better to be overprotective than to allow errors, but to get full credit, you should try to allow as much concurrency as possible. *(Hint: This is the trickiest part of the project. It is best to make sure you get yourself some points by being overly protective first. Synchronize/lock the game tree node you are at so that no only one person can execute at a tree node at a time. This will be overly protective, but at least it will prevent errors while still allowing some concurrency and getting you some points. Once you everything else working you might come back to this and try to improve on it.)*

(10 points) In addition to the minimal functionality, your server must save database information to stable storage (a disk file). Every time the game try is modified (new celebrities are added), you must modify the save file to reflect this change. Note that you should not use FileOutputStream since this will required you to write out the entire tree. You should use RandomAccessFile so that you can write out only the changed nodes/records. I will test this by killing the server and then starting it up again. You will need to modify the server code to look for the save file and use it to initialize the game tree. If the entire tree has to be written out to disk every time there is an update, you will get at most 5 points.

(10 points) In addition to the requirements above, whenever a player adds a new celebrity to the database, they should be alerted anytime someone else thinks of the same celebrity. This alert must include the other person's name. This needs only be done while the player is connected and the message can be delayed until the next time the server responds to the user. For example, if I add Adam Sandler to the database, then as long as I am connected, the server should display a message to my screen anytime another player thinks of Adam Sandler, but the message doesn't need to be displayed until my next interaction with the server. But once I disconnect, I will no longer get notifications about Adam Sandler. Note that you cannot do this unless you already allow multiple simultaneous connections! Also, this will require the server to ask the user for his/her name when they first connect so that if they think of someone already in the database, the "owner" will be told the player's name.

(Bonus 10 points) If you have time, you might consider adding code to prevent someone from locking out other players at a particular node in the game tree. When you add synchronization/locks to prevent two people from updating the same node in the game tree, you will necessarily lock out one of the two players. Add a timeout so that the player cannot be locked out indefinitely by the other player in this situation. If the client times out, have them start over at the beginning of the game again. Note that this can only be added if you have already added synchronization/locks to protect tree nodes.

Deliverables and Grading

Each of the pieces of this final project will be graded based on 3 deliverables.

- 20% of the points for each part will come from a detailed test plan. In a Word document or PDF file, describe how you will test each of the requirements. Be detailed enough that I could follow

it step by step. In other words, you should aim to provide something like the grading instructions I gave for HW1 and HW2. Due February 28 at 1:30PM (before class).

- 40% will come from the code itself. How well does it meet the requirements? Does it behave correctly in the demo? Due Sunday March 13 at 11:59PM
- 40% of the points will come from your explanation of your code during the demo. I will be asking you questions about how your code works and perhaps why you made certain implementation/design decisions. **You must be present at your team's demo time to get these points!** You must schedule a demo by email for a 30-minute time slot between 11AM and 4PM on Monday, March 14 or between noon and 5PM on Tuesday March 15. Demo times start on the hour or on the half-hour. Look at
  http://wmarrerowww.cstcis.cti.depaul.edu/csc376/DemoTimes.html
  to see what slots are available. I will try to update this every morning. Slots are reserved on a first come first served basis via email. You should send me multiple time slots in your email to maximize the chance of getting one of your choices. I will try to schedule you in the first slot you list that is available.

Teams

You may work in teams of at most 3 students. If you work on a team, all team members must be present at the demo time and all team members are responsible for the entire project, even the parts that your teammates coded up. Also, all team members must send me an email with the name of their partners.

You are not required to form a team. To get some idea, it took about 12 hours to complete my implementation and my solution includes 5 classes. You should definitely plan on spending more time than that on your solution. It is **extremely unlikely** that you will be able to finish the project in one weekend.