Computers that work to our strengths?

One important thing about computer programs is the way that they present information to the people using them. In the early days of computing, people interacted with computers by typing commands and getting written results. Nowadays computers use 'GUIs' (Graphical User Interfaces) to represent information with graphics. Used well, GUIs make a big difference to the ease of a particular job. To see how much difference the way that information is organised and presented can make, lets play a game called Spit-Not-So. Write down the words:

SPIT NOT SO AS IF IN PAN FAT FOP

1 The first player chooses a word that is on the list and crosses it out.

2 The first player writes the word down in front of them.

3 The second player then does the same thing choosing a different word.

4 The players take turns to do this until one person wins.

The winner is the first player to hold three words containing the same letter.

An example game might go:

Player 1 takes NOT Player 2 takes SPIT

Player 1 takes FAT Player 2 takes PAN

Player 1 takes FOP Player 2 takes IF

Player 1 takes SO …and wins holding NOT, FOP and SO – 3 words with 'O'.

Play a few games to get the idea, then go to the cs4fn website for some sneaky tips and to see the link to GUIs!

Numbers game 2

The number of letters transmitted over the Internet before it crashed for the first time. The Internet was born on 20 October 1969 with the first transmission of data. The letters L and O were transmitted but the system crashed when the G of LOGIN was entered from a computer at the University of California and sent to another one at a research centre at Stanford, near San Francisco.

Mathemagic

Magic, maths and computer science

Pulling a rabbit out of a hat or making the Statue of Liberty vanish are impressive feats of magic. Magicians are in many ways like computer scientists: a magician must find a method to solve a problem, that problem being, say, making the rabbit appear or the Statue vanish, but without the audience realising how its done. A good magic trick is a combination of method and presentation, in some ways like a computer program: the computer software must have a method to solve the problem (in computer science we call this method, or series of steps, an algorithm), but, unlike magic, software must present the results to the user so they can understand them.

A mind reading trick with a pocket calculator

Here is a mind reading trick to try with a pocket calculator. Remember that the method (the secret algorithm) and the calculator (the hardware) do the work for you, but you are the one who needs to provide the presentation (you're the 'user interface' here) to make it mysterious and magical.

1 Have someone secretly select a three-digit number and enter it twice into his or her pocket calculator. (For example: 123123) Have them concentrate on the display. You will try to discern their thoughts. (Magic Presentation User Interface needed here!)

2 From across the room (or even over the phone if you want), announce that you predict this number is exactly divisible by 11. Have them verify this by dividing by 11 to find a new whole number with no fractions. Magic!

3 Announce that you feel this new number now on the calculator display is exactly divisible by 13. Have them verify it. More Magic.

4 Now with the number left on the display have them divide by their original three-digit number.

5 Mysteriously announce that the final answer is 7. The Magical Finale.

The secret mathematical algorithm revealed

For your audience hopefully, if you presented magically, this will all look inexplicable, but as a computer scientist you should ask 'But why does this work?' When you look at the mathematics, the answer jumps out. Entering a three-digit number twice (123123) is equivalent to multiplying the three-digit number by 1001 (123 x 1001 = 123123 – try it. It works for any number). Since 1001 = 7 x 11 x 13, their original six-digit number will be divisible by 7, 11, 13, and their originally selected three-digit number.

Understanding how the trick works means that you can come up with your own variations, if rather than have the final prediction come out as 'lucky 7', you want it to be 'unlucky 13' what would you do?

Magic and computer software

It's not surprising that many mathematicians and computer scientists are interested in magic tricks. Working out ways to solve problems, whether predicting a chosen card in a trick or how to reduce the amount of digital data in an MP3 music file without the listener noticing, are very similar. The difference is that computer scientists want to tell the user how it's done. Magicians must keep the method a secret, never revealing it to the audience.