

## EMOTION

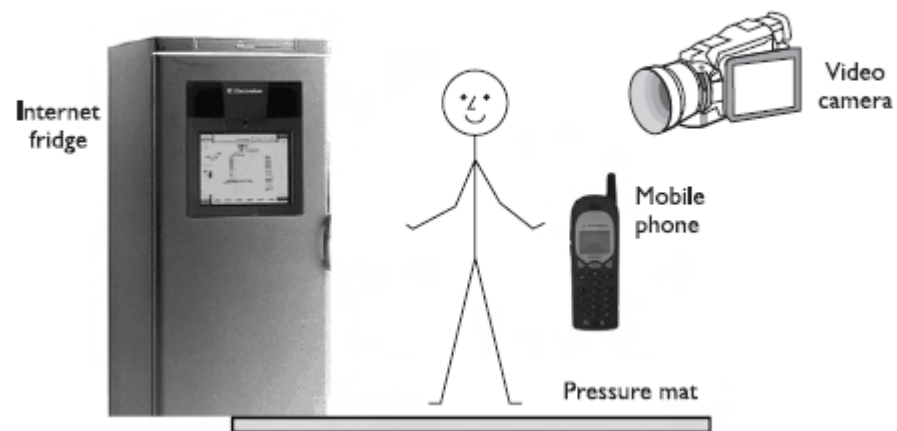
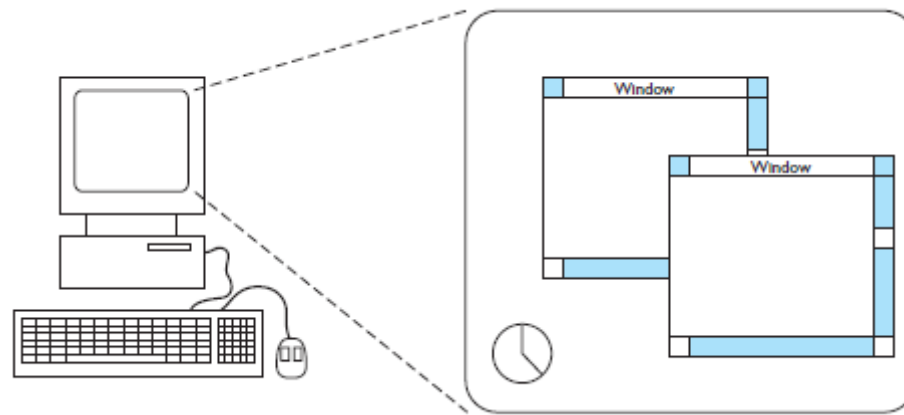
Our emotional response to situations affects how we perform. For example, positive emotions enable us to think more creatively, to solve complex problems, whereas negative emotion pushes us into narrow, focussed thinking. A problem that may be easy to solve when we are relaxed, will become difficult if we are frustrated or afraid.

It suggests that in situations of stress, people will be less able to cope with complex problem solving or managing difficult interfaces, whereas if people are relaxed they will be more forgiving of limitations in the design. This does not give us an excuse to design bad interfaces but does suggest that if we build interfaces that promote positive responses for example by using aesthetics or reward – then they are likely be more successful.

## INDIVIDUAL DIFFERENCES

We have made the assumption that everyone has similar capabilities and limitations and that we can therefore make generalizations. To an extent this is true: the psychological principles and properties that we have discussed apply to the majority of people. Notwithstanding this, we should remember that, although we share processes in common, humans, and therefore users, are not all the same. We should be aware of individual differences so that we can account for them as far as possible within our designs.

These differences should be taken into account in our designs. It is useful to consider, for any design decision, if there are likely to be users within the target group who will be adversely affected by our decision. At the extremes a decision may exclude a section of the user population.



# TEXT ENTRY DEVICES

## How keyboards work



Current keyboards work by a keypress closing a connection, causing a character code to be sent to the computer. The connection is usually via a lead, but wireless systems also exist. One aspect of keyboards that is important to users is the 'feel' of the keys. Some keyboards require a very hard press to operate the key, much like a manual typewriter, whilst others are featherlight. The distance that the keys travel also affects the tactile nature of the keyboard. The keyboards that are currently used on most notebook computers are 'half-travel' keyboards, where the keys travel only a small distance before activating their connection; such a keyboard can feel dead to begin with, but such qualitative judgments often change as people become more used to using it. By making the actual keys thinner, and allowing them a much reduced travel, a lot of vertical space can be saved on the keyboard, thereby making the machine slimmer than would otherwise be possible.

Some keyboards are even made of touch-sensitive buttons, which require a light touch and practically no travel; they often appear as a sheet of plastic with the buttons printed on them. Such keyboards are often found on shop tills, though the keys are not QWERTY, but specific to the task. Being fully sealed, they have the advantage of being easily cleaned and resistant to dirty environments, but have little feel, and are not popular with trained touch-typists. Feedback is important even at this level of human-computer interaction! With the recent increase of repetitive strain injury (RSI) to users' fingers, and the increased responsibilities of employers in these circumstances, it may be that such designs will enjoy a resurgence in the near future. RSI in fingers is caused by the tendons that control the movement of the fingers becoming inflamed owing to overuse and making repeated unnatural movements.

## DESIGN FOCUS



### Numeric keypads

Alphanumeric keyboards (as the name suggests) include numbers as well as letters. In the QWERTY layout these are in a line across the top of the keyboard, but in most larger keyboards there is also a separate number pad to allow faster entry of digits. Number keypads occur in other contexts too, including calculators, telephones and ATM cash dispensers. Many people are unaware that there are two different layouts for numeric keypads: the calculator style that has '123' on the bottom and the telephone style that has '123' at the top.

It is a demonstration of the amazing adaptability of humans that we move between these two styles with such ease. However, if you need to include a numeric keypad in a device you must consider which is most appropriate for your potential users. For example, computer keyboards use calculator-style layout, as they are primarily used for entering numbers for calculations.

One of the authors was caught out by this once when he forgot the PIN number of his cash card. He half remembered the digits, but also his fingers knew where to type, so he 'practiced' on his calculator. Unfortunately ATMs use telephone-style layout!



calculator



ATM



phone

# Handwriting recognition

## Signature authentication



Handwriting recognition is difficult principally because of the great differences between different people's handwriting. These differences can be used to advantage in *signature authentication* where the purpose is to identify the user rather than read the signature. Again this is far easier when we have stroke information as people tend to produce signatures which *look* slightly different from one another in detail, but are formed in a similar fashion. Furthermore, a forger who has a copy of a person's signature may be able to copy the appearance of the signature, but will not be able to reproduce the pattern of strokes.

## POSITIONING, POINTING AND DRAWING

The mouse, Touchpad, Trackball and thumbwheel, Joystick and keyboard nipple, Touch-sensitive screens (touchscreens), Stylus and light pen, Digitizing tablet, Eyegaze, Cursor keys and discrete positioning

## DISPLAY DEVICES

Bitmap displays – resolution and color, Cathode ray tube, Liquid crystal display, Large displays and situated displays, Digital paper,

### Health hazards of CRT displays



Most people who habitually use computers are aware that screens can often cause eyestrain and fatigue; this is usually due to flicker, poor legibility or low contrast. There have also been many concerns relating to the emission of radiation from screens. These can be categorized as follows:

- X-rays which are largely absorbed by the screen (but not at the rear!)
- ultraviolet and infrared radiation from phosphors in insignificant levels
- radio frequency emissions, plus ultrasound (approximately 16 kHz)
- electrostatic field which leaks out through the tube to the user. The intensity is dependent on distance and humidity. This can cause rashes in the user
- electromagnetic fields (50 Hz to 0.5 MHz) which create induction currents in conductive materials, including the human body. Two types of effects are attributed to this: in the visual system, a high incidence of cataracts in visual display unit (VDU) operators, and concern over reproductive disorders (miscarriages and birth defects).

Research into the potentially harmful effect of these emissions is generally inconclusive, in that it is difficult to determine precisely what the causes of illness are, and many health scares have been the result of misinformed media opinion rather than scientific fact. However, users who are pregnant ought to take especial care and observe simple precautions. Generally, there are a number of common-sense things that can be done to relieve strain and minimize any risk. These include

- not sitting too close to the screen
- not using very small fonts
- not looking at the screen for a long time without a break
- working in well-lit surroundings
- not placing the screen directly in front of a bright window.

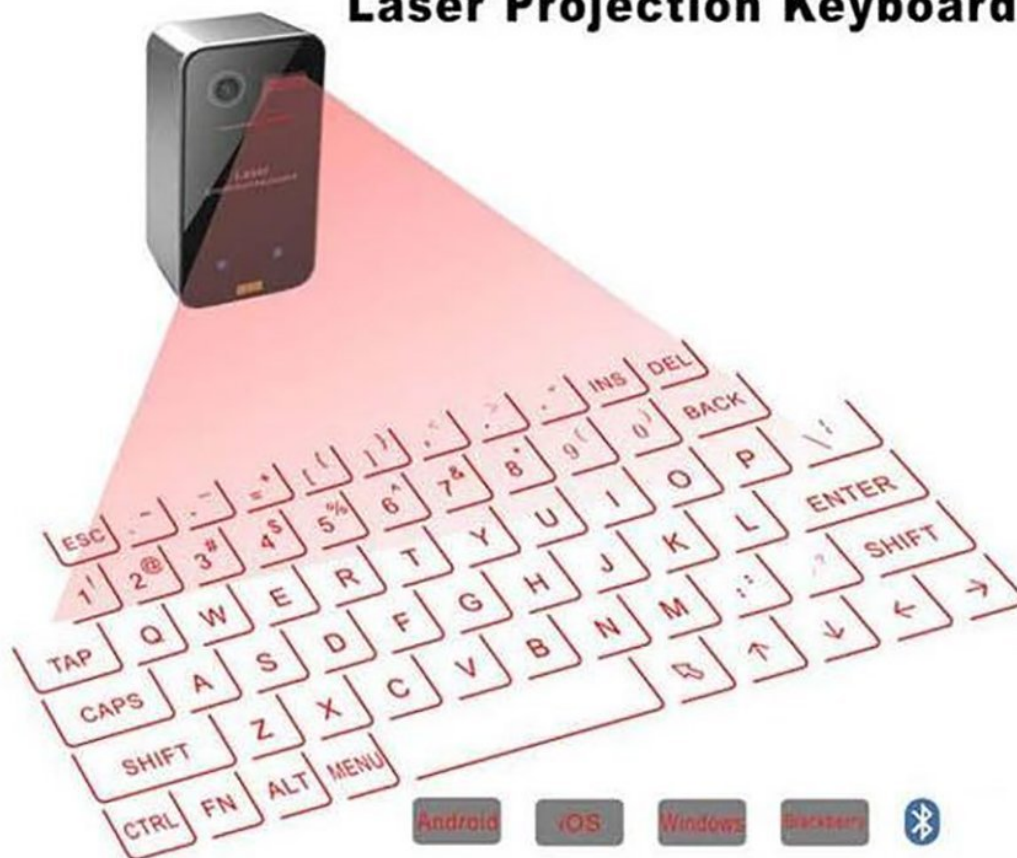


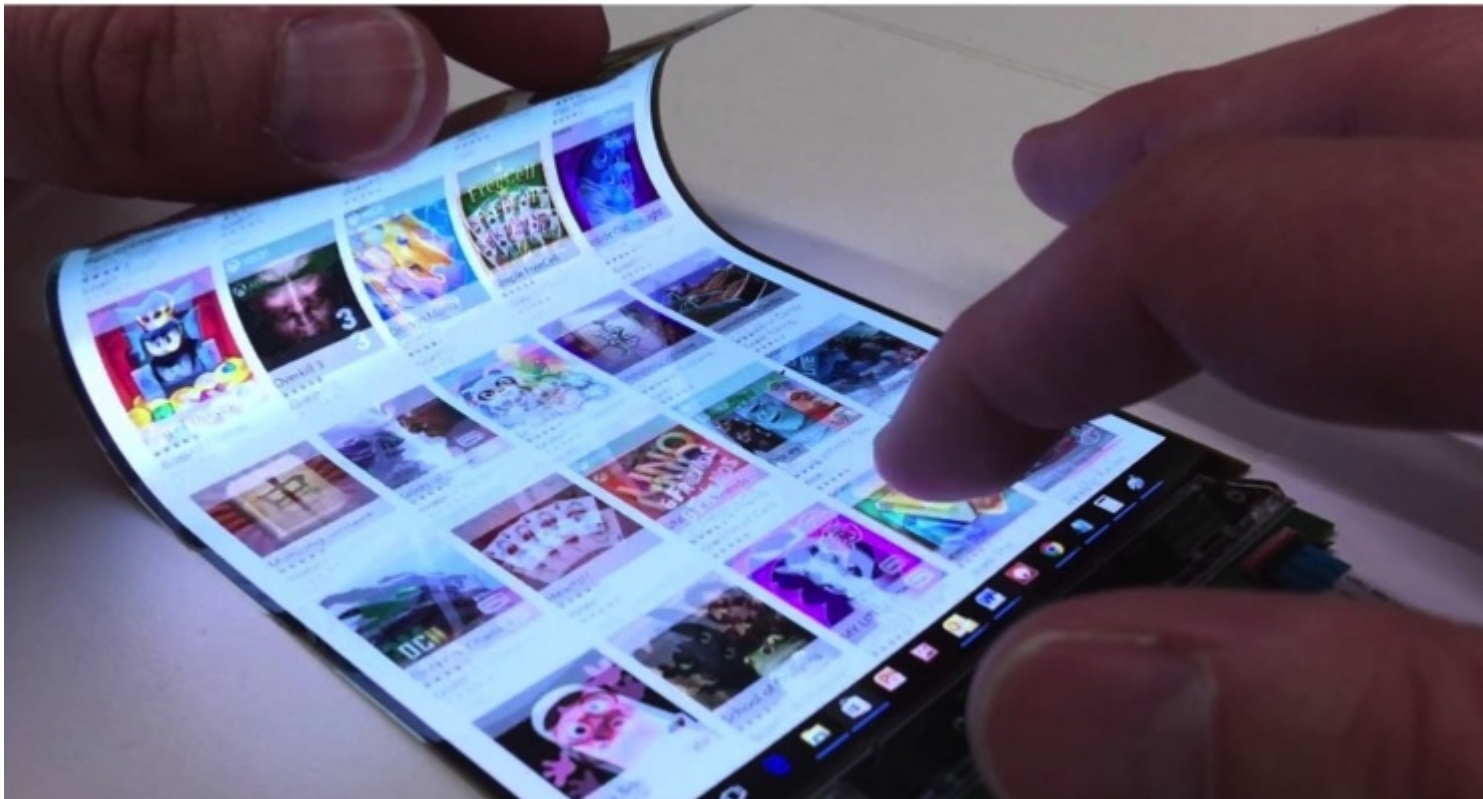






## Laser Projection Keyboard





<https://cis.unimelb.edu.au/hci/projects>

<https://hcii.cmu.edu/summer-research-program/projects>

<https://www.inf.uni-hamburg.de/en/inst/ab/hci/projects.html>

<https://infosci.cornell.edu/information/news/newsitem384/these-6-hci-projects-tackle-everyday-challenges>

[https://www.youtube.com/watch?v=J\\_oPtEjiVuA](https://www.youtube.com/watch?v=J_oPtEjiVuA)

<https://www.youtube.com/watch?v=fABc88g0erA>