# KeyRight: Colour Coding the Computer Keyboard

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# Abstract

The computer keyboard is a vital input device, yet, in its present form has a flawed design. It is overwhelming due to its large number of visually similar keys, which are insufficiently distinguishable and insufficiently able to be grouped for memorising. The traditional method of learning correct fingering (and, ultimately, touch typing) is unnecessarily difficult. It is not suitable for experienced keyboard users who have learned in an *ad hoc* fashion.

The mouse has been a partial solution to difficulties with the keyboard. Unfortunately, overuse of the mouse causes a drop in productivity.

The keyboard needs rehabilitation as an input device, so that

- Users can more easily gain the motor skills for efficient data entry and
- It is not perceptually overwhelming and therefore of limited use as an input device.

A set of colours for the keys, one for each finger, enable users to group the keys for memorising and provide an alternative facility for learning correct fingering. The rainbow colours, red, orange, yellow, green, blue, indigo and violet form a universally familiar colour pattern. The colours are interrelated, form a complete set and are seven in number. These properties make them ideal as an aid to memory and understanding.

The KeyRight keyboard is a successful implementation of this concept, introducing significant enhancements to the computer keyboard as an input device.

Software can further encourage users to use the keyboard if it colours keystroke prompts to match a coloured keyboard. Displaying equivalent keystrokes during and after a mouse operation is an alternative method of teaching users about access keys and shortcut keys. There are strong psychological arguments for use of this method.

# Some problems with input devices

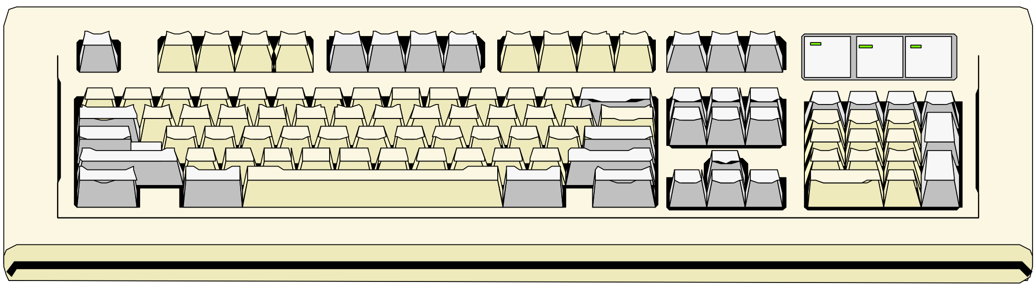
By any psychological standards of user interface, the keyboard in its present form has significant deficiencies. The mouse has made a big difference for beginning computer users, but has limitations and ultimately reduces productivity.

## If the keyboard were a new product, would you buy one?

Imagine that I want to sell you a new input device that I have invented. I tell you that it will be fundamental to your computer use. To use it properly, you must memorise the position, by touch, of 100 keys, so that you can use the device without looking. Moreover, during your sessions of learning to use this device, you must not look at it. The keys are each marked with a different symbol, spatially grouped to some extent, but otherwise identical and placed close together in rows.

Are you impressed?

**Try the latest input device– the Keyboard**



- 103 keys, each clearly marked with a symbol
- Has a major group of 58 keys
- Keys are best used with certain fingers
- Best learnt and used without looking
- Often shows feedback on the computer screen
- Great for people who know what they are doing
- Uses the historic QWERTY legend, in keeping with international convention

**Buy one today and increase your productivity!**

# The keyboard as a flawed user interface

Today's keyboard has an unfortunate history. Rather that compensating for this, the keyboard breaks basic rules for effective human visual perception, organisation and recall.

## The QWERTY heritage

In this paper we are not going to complain about the QWERTY keyboard legend, which is most likely here to stay. For those who don't know its history, the QWERTY legend was designed to slow down typing. Early typewriters jammed if you typed too quickly. Everyone agrees that this is a disaster and also that it would be difficult to change.

## Other design flaws

The other keyboard design faults centre around its 'complex blandness'.

### The keyboard is visually bland and the keys are only partly grouped

Any elementary psychology text will tell you that, in general, humans can only remember or communicate about seven things at a time. Miller (1956) found that we can remember about seven things ('chunks') at a time, but that, once we are very familiar with the components of an entity, we start treating the entity as one 'chunk' (e.g., a group of letters becomes a word). Take a look at a keyboard. Apart from the symbols, the keys look identical. The largest spatial group of keys has 58 keys undistinguished except for their symbol. The standard keyboard provides us with no visual basis on which we can start forming 'chunks'.

### There are no aids for searching or remembering

Undiversified masses of stimuli often at least have signposts or mnemonic aids to help you navigate. Keyboards have nothing that directs you in your search for a key or helps you remember a key's position.

## Result of design flaws

The keyboard design flaws make it hard to initially learn and hard to develop further abilities.

### Overwhelm for beginners

To a new user, 100 similar keys mostly with few signposts can only be described as overwhelming.

### Functional fixedness preventing further skill development

Functional fixedness is the "inability to perceive better ways of performing tasks and to realise that objects have functions other than the familiar ones" (Whitcroft 1998a).

The blandness of the keyboard discourages the exploration that is an antidote to functional fixedness.

Whitcroft found an experienced touch typist who had not noticed the right-hand SHIFT key, and another who had not noticed the INSERT DELETE HOME END PAGE UP PAGE DOWN keypad. He also tells an anecdote about a sports car with unmarked gearstick. The owner was dismayed to learn that the car had a fifth gear. (Whitcroft 1998b).

### *Why is the keyboard design so visually bland?*

Why does the keyboard break these psychological rules? An important reason is the die-hard industry convention that you aren't meant to look at it.

## Aspiring to touch type

Learning or failing to learn to touch type, or even to use correct fingering, is currently a major boredom, challenge or regret. It involves hard work.

### *Do people type without looking at the keyboard?*

How many extra keys has the keyboard acquired since typewriters? There are about fifty. Who looks at it? Everyone does. Whitcroft (1995) examined the keyboard use of a large number of users and gave up looking for people who did not look at the keyboard.

### *Learning correct keying the hard way*

Learning correct keying by memorising the position of keys without looking at them is a time-honoured tradition. Is it effective? Many people do, of course, master this.

For those that learn to type rapidly without using the correct fingers, however, the path to touch typing is very difficult.

Beginning typists do not naturally use the correct fingers. an instructor must direct them to do it. Learning correct keying and then to touch type is rather an ordeal for anyone. Many do not succeed.

## The mouse– has it become a drag?

It is no wonder that the mouse was invented to help avoid using the keyboard. This has been successful to a great extent. More people can certainly learn to use computers more easily. The mouse, unfortunately, lowers productivity for people after they have learnt what to do. Most software provides keyboard alternatives where possible. If you aren't motivated to use the keyboard, what use is that?

# Colour coding for the user interface

Colour coding to help people perform tasks and use software and equipment is not a new idea. Patterns are also very useful for organising, learning and remembering. Colour and pattern can make a powerful user interface combination if the combination is meaningful. The most universally known colour pattern is the spectral sequence (rainbow colours).

## WordPerfect 5.1: a little colour went a long way

Do you remember WordPerfect 5.1, one of the most popular word processors in history? An important element in its popularity was its function key system. Touch typists could feasibly extend their abilities to the 45 function keystrokes and control the entire package without touching a mouse. In the author's opinion, the small amount of colour coding was an important factor in the system's popularity. What WordPerfect 5.1 user can forget green for SHIFT, blue for ALT and red for CTRL? This colour system only went a short way, yet demonstrated how powerful colour can be at demystifying the keyboard.

Ctrl
Alt
Shift

## The KeyRight keyboard

There have been several attempts at colour coding the keyboard (Olsen 1970, Ladner and Williams 1990, Troudet 1994, kidBoard Inc. 1996). None have used a pattern where the colours

- Have a familiar sequence and are therefore interrelated,
- Form a familiar complete set.

The KeyRight keyboard uses the familiar spectral colour sequence. This multiplies the effectiveness of the colours by giving them a pattern.

You can read a full description of the theory and research behind the KeyRight colour system and keyboard in Whitcroft (1998a).

### *History*

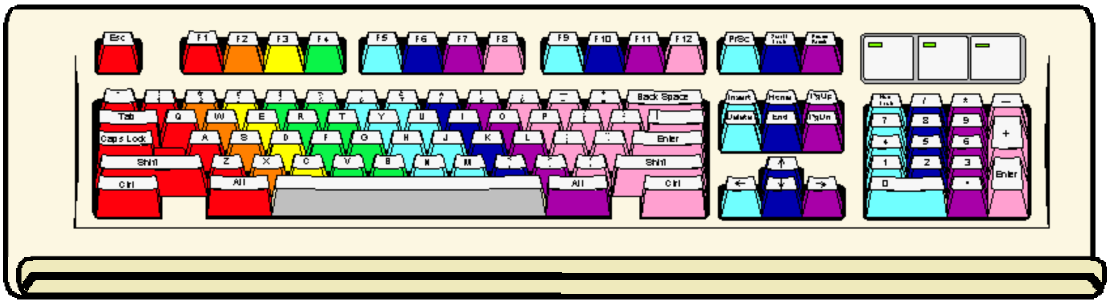
The inventor, Jerome Whitcroft, a student of psychology and fiction author, was seeking to become keyboard literate. He found the traditional method of learning correct keying did not suit him. On further investigation, he also found that it went against psychological research findings. He proceeded to devise a system that would enable him to ultimately learn to touch type. Following lack of interest by academics and manufacturers in the results of his work, he has developed the keyboard as a successful user-friendly product.

## Description

The KeyRight system is very simple, but has been verified with careful research. The keys belonging to each finger have their own colour. Each key is coloured on the sides, but remains the standard colour on top to maintain optimum contrast. The tapering shape of the keys reveals a sufficient area of colour around each key to be clearly seen. Since the colour is on the sides only of the keys, you can clearly see the colour of each key without compromising the readability of the key's symbol.

The colours are seven colours of the rainbow (red, orange, yellow, green, blue, indigo, and violet) arranged from left to right for the left hand and four fingers of the right hand. This choice of colours is a universally known sequence. It enables us to make mental connections between colours and locate them at the ends or middle of the range.

The colour for the little finger on the right hand is pink. You can think of this as appropriate for the 'pinky' or, if you have a scientific bent, corresponding to the colour of sunburn. (Sunburn results from too much ultra-violet (UV) radiation. UV comes next above violet visible light on the electromagnetic spectrum.)



### Advantages of the KeyRight keyboard

The advantages of the keyboard include the following

- The seven colour divisions
    - Allow you to construct 'chunks' and memorise the keyboard more easily,
    - Encourage you to explore the keyboard and discover further features.
- Both beginners and experienced two finger typists can immediately start using the correct fingers, continuing to look at the keyboard as they type for as long as they need while memorising it.
- The keyboard provides a constant and permanent reminder of the correct means of use
- Users can experience the ergonomic benefits of correct keyboard use earlier in the process of learning to use the keyboard.

# Access and shortcut key markings with colour

The Microsoft Windows user interface provides for **access keys** for menu options and dialog box controls. The software underscores a single letter in the name of an option or control. You can use this letter or number with the ALT key to select the corresponding option or control.

Software can also provide **shortcut** keys for operations, which are specified by the software designers or the users. The best-known shortcut keys are CTRL+X, CRTL+C and CTRL+V for the Cut, Copy and Paste operations.

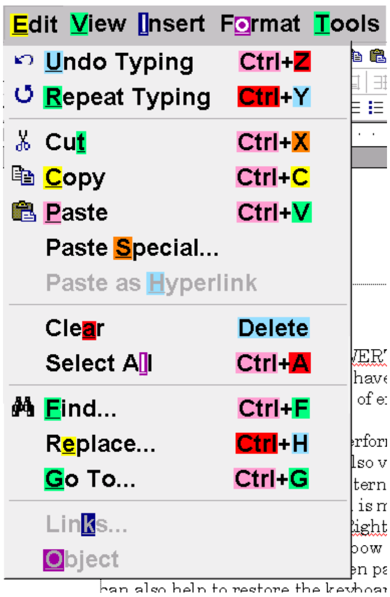
Users who are fluent in these keystrokes and use them instead of the mouse will obviously be more productive. If we can find a better method of educating users about keystrokes, we can increase productivity.

## *Enhancements to the current access key and shortcut key education methods*

Traditionally, software communicates access keys or shortcut keys to users in two ways

- Software underscores the letters and numbers in menus and dialog boxes to show access keys. This assumes that the user knows to use the ALT key with them. They are often difficult to see, especially with the minuscule fonts that appear to be standard since Windows 95. We can improve visibility by adding key colour as shown in the illustration below.
- Software shows shortcut keys at the right of menu options. We can improve the current display of these by adding colour. They are of limited benefit in their present form, however. Before you see them, you will have already started a mouse operation and will be unlikely to abandon that and use the keystroke instead. The display is passive, and sometimes not noticed. If you want to find out the keystroke in order to use it, you must view the menu in order to find out the keystroke. This is a separate and unproductive operation, and requires additional motivation before you will perform it.

Here is an illustration of the Microsoft Word Edit menu with KeyRight colours. Notice that you can further encourage good keyboard practice by showing the recommended CTRL key for the letter key concerned.

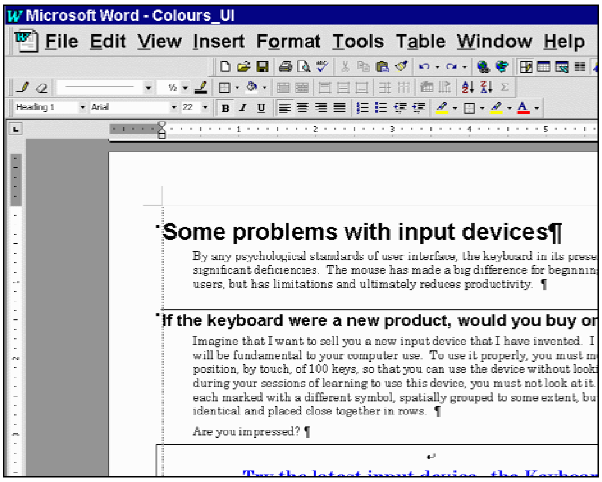


## *Access and shortcut key popup prompts during after a mouse operation*

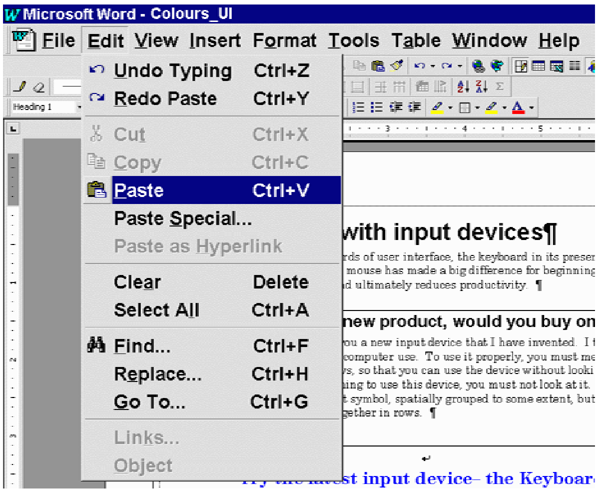
This paper suggests a third method of communicating keystrokes to users as they work.

- After you perform a mouse operation, display the shortcut key (or access key if there is no shortcut key) in an 'instant tip' window, which will appear briefly after the operation. This has the following advantages.
  - The keystroke display is an active display, which gets the user's attention.
  - The display informs the user in context, when the experience of the operation is fresh in the user's mind. This must happen after the event, of course, because the computer cannot predict which operation will be performed.
  - The display is an irritant. Some users will go out of their way to avoid 'being told' and this can motivate them to use the keyboard. The irritation, of course, is self-inflicted. Users would be able to switch off this system altogether if desired.

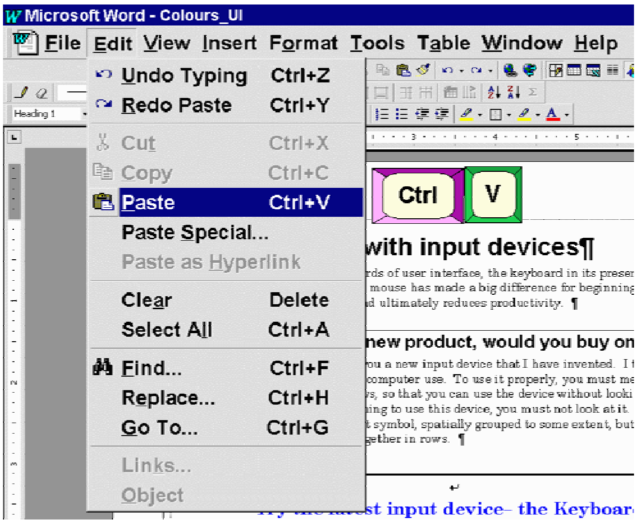
The illustrations below show a mockup of the proposed system.



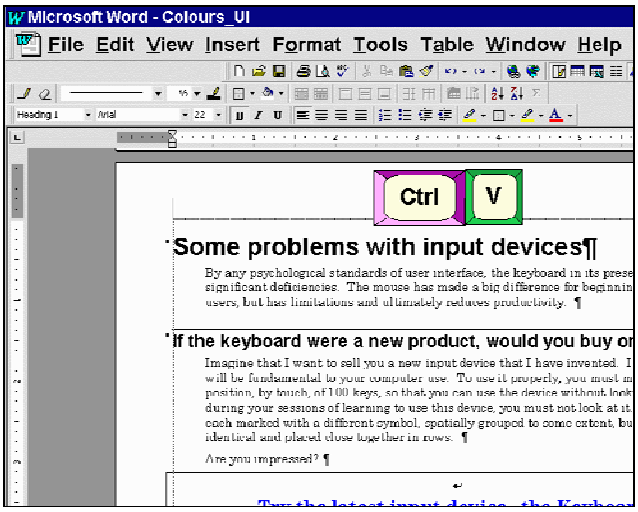

**1 Word Processor window**




**2 Select Paste using mouse**




**3 Keystroke popup appears**




**4 After operation, keystroke popup lingers**

# Conclusion

Much can be done to improve learning and productivity by applying colour in the user interface. In particular, the keyboard has design problems and the mouse provides ease of use at great cost to productivity. The KeyRight keyboard and the provision of matching coloured keystroke prompts will make the keyboard more useable, promoting faster data entry and software operation.

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