INSTRUMENTATION

TECHNICAL FIELD

[0001] The present invention relates generally to improvements to instrumentation.

BACKGROUND ART

[0002] Any potential improvements in the input speed, comprehension and/or retention of information gained from viewing instruments would clearly be beneficial. This is particularly so where the instrument(s) relay critical information such as alarm conditions would be clearly beneficial to a wide spectrum of users, especially in situations where high speed decision making is necessary e.g.: pilots, or other military personnel, drivers, navigators, air traffic control etc.

[0003] This is particularly important in situations such as alarm conditions or when critical parameters are being exceeded as any delay in comprehension of the situation can be catastrophic or even fatal in some circumstances. Currently the most effective way of bringing the viewers attention to these situations is by turning the information off and then on again to make it "flash". This flashing usually occurs on a visual display with a single focal plane."

[0004] The time taken for the viewer's brain to assimilate this information can substantially reduce the options available in some time-critical situations and any improvement in the speed of comprehension and hence response time would provide a great advantage in these situations.

[0005] It is believed that use may be made of the viewers subconscious to enhance the recognised conscious reading mechanisms typically employed during the reading of computer screens, visual displays and so forth.

[0006] The manner in which human beings process visual information has been the subject of extensive and prolonged research in an attempt to understand this complex process. The term preattentive processing has been coined to denote the act of the subconscious mind in analysing and processing visual information which has not become the focus of the viewer's conscious awareness.

[0007] When viewing a large number of visual instruments, certain variations or properties in the visual characteristics of the instruments can lead to rapid detection by preattentive processing.

[0008] This is significantly faster than requiring a user to individually scan each instrument, scrutinising for the presence of the said properties.

[0009] Exactly what properties lend themselves to preattentive processing has in itself been the subject of substantial research. Colour, shape, three-dimensional visual clues, orientation, movement and depth have all been investigated to discern the germane visual features that trigger effective preattentive processing.

[0010] Researchers such as Triesman [1985] conducted experiments using target and boundary detection in an attempt to classify preattentive features. Preattentive target detection was tested by determining whether a target element was present or absent within a field of background distractor elements. Boundary detection involves attempting to detect the boundary formed by a group of target elements with a unique visual feature set within distractors.

[0011] It maybe readily visualised for example that a red circle would be immediately discernible set amongst a number of blue circles. Equally, a circle would be readily detectable if set amongst a number of square shaped distractors.

[0012] In order to test for preattentiveness, the number of distractors as seen is varied and if the search time required to identify the targets remains constant, irrespective of the number of distractors, the search is said to be preattentive. Similar search time limitations are used to classify boundary detection searches as preattentive.

[0013] A widespread threshold time used to classify preattentiveness is 200-250 msec as this only allows the user opportunity for a single 'look' at a scene. This timeframe is insufficient for a human to consciously decide to look at a different portion of the scene. Search tasks such as those stated above maybe accomplished in less than 200 msec, thus suggesting that the information in the display is being processed in parallel unattendedly or pre-attentively.

[0014] However, if the target is composed of a conjunction of unique features, i.e. a conjoin search, then research shows that these may not be detected preattentively. Using the above examples, if a target is comprised for example, of a red circle set within distractors including blue circles and red squares, it is not possible to detect the red circle preattentively as all the distractors include one of the two unique features of the target.

[0015] Whilst the above example is based on a relatively simple visual scene, Enns and Rensink [1990] identified that targets given the appearance of being three dimensional objects can also be detected preattentively.

[0016] Thus, for example a target represented by a perspective view of a cube shaded to indicate illumination from above would be preattentively detectable amongst a plurality of distractor cubes shaded to imply illumination from a different direction.

[0017] This illustrates an important principle in that the relatively complex, high-level concept of perceived three dimensionality may be processed preattentively by the subconscious mind.

[0018] In comparison, if the constituent elements of the above-described cubes are re-orientated to remove the apparent three dimensionality, subjects cannot preattentively detect targets which have been inverted for example. Additional experimentation by Brown et al [1992] confirms that it is the three-dimensional orientation characteristic which is preattentively detected.

[0019] Nakaymyama and Silverman [1986] showed that motion and depth were preattentive characteristics and that furthermore, stereoscopic depth could be used to overcome the effects of conjoin. This reinforced the work done by Enns Rensink in suggesting that high-level information is conceptually being processed by the low-level visual system of the user.

[0020] To test the effects of depth, subjects were tasked with detecting targets of different binocular disparity relative