ERGONOMIC DATABASE FOR VISUAL DISPLAYS AND VDUs

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INTRODUCTION

This paper will survey the current data and knowledge in the human factors/ergonomics literature pertaining to the design and evaluation of visual displays and visual displays units (VDUs). The discussion will be broken into several critical areas of current concern and activity. For each such area, existing data and knowledge will be generally summarized, data gaps will be indicated, current activity in research will be defined, and future problems or requirements will be suggested. Much of the discussion will pertain to activities within the United States, although some technological developments from other countries will be noted. In addition, since much of the emphasis on VDUs emanates from European countries, these driving considerations will also be described.

It is certainly beyond the scope of this paper to define all potential problem areas and existing data, nor would the author be presumptuous enough to suggest he is capable of doing so. At the same time, there appear to be consistent threads of common issues across many nations, and these elements are the ones considered to be most critical for future display design and development, as well as for future applied visual research.

No emphasis will be placed upon the standardized databases which relate to the design of simple printed materials, individual alarm indicators, simplified alphanumeric readouts, and the like. It is considered that an existing database is quite adequate in this regard, as represented by the usual human engineering data sources (e.g., Van Cott and Kinkade, 1963; Woodson, 1981). Rather, emphasis will be placed upon those areas considered more contemporary and
critical, especially insofar as newer technological developments appear to be causing problems with human visual interaction. Accordingly, the areas to be discussed in this paper are the newer technological display hardware areas, the emphasis upon color displays, the recently increasing emphasis upon interface units such as touch panels, the entire area of VDUs and standards, 3-dimensional displays, and visual system research and quantification. Each of these areas is discussed below, and final summary comments are offered.

NEW TECHNOLOGIES

The traditional cathode-ray tube (CRT) has been in existence for many years, is improving annually in its capability, is extremely inexpensive, and can do virtually everything required in most display systems other than perform for lengthy periods of time with small power supplies. For example, CRTs can be obtained in quantity purchases for as little as $80, including all driving electronics. Resolution can be as great as 130 lines per centimeter. Nearly full color can be obtained, with the exception of only moderate saturation in the green area of the spectrum. And fairly high intensities can be obtained for outdoor viewing, although this is at the expense of resolution. While most persons have expected various solid-state, or flat panel, displays to replace the CRT gradually during recent years, each year the growing use of solid-state displays is matched or bettered by an increasing number of applications and sales of CRTs. In one respect, the continued development of CRT technology has in fact exceeded the rate of development of solid-state display technology.

Of the solid-state displays which have seen considerable development, only three seem to be significant contenders for the dominant position of the CRT. Yet, it appears that these contenders will fall far short of the wide variety of applications of the CRT and will only substitute for the CRT in particularly limited applications and circumstances.

Gas Discharge (Plasma) Displays

The gas discharge display, available in both AC and DC versions, is an orange-emitting, neon gas display which can be obtained in many sizes and is only a couple of centimeters deep. It requires, however, voltage supplies on the order of 500 volts and uses a fair amount of current. Thus, battery powered operation is not feasible. As such, it is not a contender to replace the CRT in applications that require large mobility and small power supplies. While this technology permits good resolution (up to 50 or more elements per centimeter) it is extremely limited in the amount of luminance it can exhibit under any circumstances. Its maximum luminance is on