Guidelines for the Use of Colour in ATC Displays

Submitted by superadmin on Mon, 10/22/2012 - 14:45

HP Activity Categories:
Design of working environment and human-machine interfaces [1]

Resource Type:
Guideline

Abstract:

Colour is probably the most effective, compelling, and attractive method available for coding visual information on a display. However, caution must be used in the application of colour to displays for air traffic control (ATC), because it is easy to do more harm than good. The only thing that is truly obvious about the use of colour on displays is that its benefits and drawbacks depend upon the task. This paper offers general guidelines on how colour should, and should not, be used, but does not define a specific colour-coding scheme. These guidelines are based on what is known about human vision, display capabilities, the knowledge gained from the lessons learned from the uses of colour in the cockpit and ATC environments, and human factors "best practices."

The report also discusses a series of experiments that examined colour production capabilities within and across five Sony DDM- 2801C monitors and selected and validated an "ideal" colour set for this monitor.

References

Developer and source:


Year of development / publication, updates etc:

1999

General Description

Purpose:

The primary purpose of this document is to provide general guidance to the STARS (Standard Terminal Replacement System) and DSR (Display System Replacement) program offices on the use of color on air traffic control (ATC) displays. However, the information in these guidelines will also be useful to any program considering the use of color on its displays.
Color is an effective and attractive tool for coding information on a display. It can help to organize and categorize complex information and can also have a profound effect on our ability to search for specific information. Color is both attractive and functional. However, caution must be used in the application of color to displays because it is easy to do more harm than good. The only thing that is truly obvious about the use of color on displays is that its benefits and drawbacks depend upon the task.

Type (e.g. observation, questionnaire, interview, checklist, measurement instrument, etc.):

Guidance material

**Technical description of method or tool etc**

**Description of the content/study:**

The report discusses how the effectiveness of colour displays can be assessed and provides an update on studies in progress about specific uses of colour on ATC displays. Finally, the report summarizes what is known about the general benefits and limitations of the use of colour on displays, the guidelines for use of colour in the cockpit, and the existing recommendations about using colour in ATC displays from air traffic organizations in other countries.

The guidelines presented in the report relating to the use of colour in ATC displays are as follows:

- Displays must be designed for the tasks they need to support and the environment in which they will be used.
- Whenever color is used to code critical information it must be used along with another method of coding.
- When color is used to assign a unique meaning to specific colors (such as red for emergencies or green for aircraft under my control), it is imperative that no more than six colors be used.
- Care must be taken to ensure all color-coded text and symbols are presented in sufficient contrast.
- Cultural color conventions (such as red for danger and yellow for warning) should not be violated.
- Pure blue should not be used for text, small symbols, other fine detail, or as a background color.
- Bright, highly saturated, colors should be used sparingly.
- Color use needs to be consistent across all of the displays that a single controller will use.
- The specific colors that are selected for a display must take into account the ambient environment and the capabilities of the specific monitor.
- The entire set of displays that a controller will use must be designed and evaluated as a whole and not as a combination of parts.
- Any implementation of color needs to be tested in the context of the tasks that it is designed to support and the environment in which it is intended to be used.

The guidelines describe a series of experiments that examined the variability in the colour producing characteristics of five monitors, and defined and validated an ideal colour set for the Sony 20 x 20 monitor.

**Technical requirements for using the method, tool, etc:**

n/a

**Measure/Response Type:**

n/a

**Results obtained and interpretation:**
Evaluation

Advantages:

The document condenses helpful human factors guidelines for using colour and offers recommendations and broad requirements.

It provides a set of agreed-upon human factors DO?s and DON'Ts that designers should apply when designing colour palettes for display systems.

Disadvantages:

The guidelines are not tailored or specific enough to be included as requirements in a specification for acquisition programs. In particular do not provide specific colour values for most elements appearing on ATC displays.

Alternative Methods:


ISO Publications:

ISO 9241-1 Ergonomic requirements for office work with visual display terminals (VDTs): - Part 3: Visual display requirements

ISO 9241-1 Ergonomic requirements for office work with visual display terminals (VDTs): - Part 7. Display requirements with reflections

ISO 9241-1 Ergonomic requirements for office work with visual display terminals (VDTs): - Part 8. Requirements for displayed colours

ISO 13406-2 Ergonomic requirements for work with visual display terminals employing flat panel technology - Part 2: Ergonomic requirements for flat panels

DIN EN 29 241 Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs). (Same as ISO 9241)

Usability (ease of use, efficiency, effectiveness)

Ease of use:
high

Efficiency:
high

Effectiveness:
high

Constraints concerning conditions of use:
None

Reliability:
not available

Validity:
not available

Required effort (to conduct & to analyse):
Low effort

**Level of HF expertise needed (required user qualification)**

High: high level of expertise required, only for experts, lots of training required

Other expertise needed (required user qualification):

n/a

**Cost Information**

Very low: (<100 €) low costs to purchase or free license, no special devices necessary

Experiences of use by SESAR partners (including references):

C. Mertz; S. Chatty; J.L. Vinot -2000-Pushing the limits of ATC user interface design beyond S&M interaction: the DigiStrips experience. CENA 1, CENA 7 CR2A-DI 32 France

Reported and/or published experiences of use (including references):

M.L. Cummings; C. G. Tsonis Partitioning Complexity in Air Traffic Management Tasks -- Massachusetts Institute of Technology, Cambridge, MA

FAA Publications:


Applicability to lifecycle phase (E-OCVM):

V1, V2, V3

Application Area:

ATC display technologies.

The guidelines can be applied particularly in the aviation field. They provide general guidance to the STARS (Standard Terminal Replacement System) and DSR (Display System Replacement) program offices on the use of colour on ATC displays. However, the information will be useful to any program considering the use of colour on its displays.

Keywords:

Colour displays, air traffic control displays, colour guidelines, colour coding

Short Description:

The primary purpose of this document was to provide general guidance to the STARS (Standard Terminal Replacement System) and DSR (Display System Replacement) program offices within FAA (as of 1999) on the use of color on air traffic control (ATC) displays. However, the information in these guidelines will also be useful to any system development considering the use of color on its displays.

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