

Design of graphic displays for driver information and communication systems.

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What makes a “smart graphic” and what distinguishes it from other design or graphic variants?

Up till now designers often employed the principle “more is better” so they included any kind of information they could think of together with the items they were tasked to include, then transferred it all in detail. The end-result was the incorporation of all available data without considering the characteristics of the medium or the user. A smart graphic, however, puts a greater challenge on the designer by including unique attributes. Smart graphics entice the user to interact with the display, the systems or the application and appealing to his aesthetic expectations while maintaining high quality appearance. It is totally user-friendly and uncomplicated thus avoiding misapplication. Smart graphic uses real time execution of all functions ensuring simple and fast interaction. Based on all of these attributes a limiting factor of performance is the capacity of the computer systems so a graphic has to adapt to the characteristics of the medium used. In the end, it also must satisfy high design expectations and user technical features.

A smart graphic integrates all of these aspects while optimally combining aesthetic qualities, user specific conditions and the environment it is used in (e.g. in a vehicle).

1. The driver information and communication system

Driver information and communication systems must strictly comply with these characteristics to effectively display accessible information in the vehicle.

CAA (Computer Aided Information) GmbH has developed such a system together with an interdisciplinary team of developers, designers and ergonomic scientists.

It is taken for granted that almost every car today has a radio, CD player and navigation system. This trend is steadily continuing. Increasingly, services which are used

in the office or at home, such as Internet or email, are being transferred and modified specifically to fit into the unique environment of a car. Even the integration of existing functions like seat adjustment, air conditioning and CD player into a single centralized communication and information system leads to an almost overwhelming concentration of confusing controls in an extremely tight space. The solution is to offer a logical and structured integration of the desired functions through the help of display technology.

Complex driver information and communication systems combine individual components like radio, CD, navigation, telephone, air conditioning, etc. into a single integrated unit enabling the user to interact using logical interface with high quality displays. As a general principle, all functions of the various components in an automobile are handle by a reduced number of controls, which require the driver’s close attention to operate and are often difficult to see. This restricts the overall interaction with the system.

In order to make driver information systems for vehicles safe and comfortable the technology of speech recognition is a very important factor. Using voice commands a driver doesn’t have to look away from the road or take his hand off the steering wheel to access the navigation system or the car telephone. Additionally, by using speech for system in and output new options can be integrated such as listening to incoming emails while driving. Unfortunately, the technology in speech recognition systems hasn’t been fully perfected and therefore, it can’t be used solely in operating driver information systems.

As mentioned above, complex situations are created when competing demands are placed on a driver of an automobile, which can only be resolved with an optimally configured smart graphic. The graphic design “user interface” is therefore devised by integrating the following aspects:

2. Demands of the medium, the surrounding and the graphic realization

Operating a vehicle in traffic always demands high concentration and quick reactions by the driver. This means crucial information, which should be taken in parallel to driving, must be quickly recognized, understood, and processed.

Even complex components and system applications like navigation, the air conditioning or the Internet in the future need to be operated using simple input elements. The frequently deeply branched out and involved menu structures, which are necessary to access all functions of the system, poses a unique challenge.

Since the interior design of the vehicle only permits a certain size for the display and the location cannot always follow optimal ergonomically demands, the information must also be absorbed from a limited viewing angle or from a certain distance. Extreme lighting situations, during the day or at night, can drastically reduce readability of the display. Varied lighting conditions greatly affect the display contrast resulting in poor readability of the display.

3. Demands of the driver

These restrictions conflict with the main desires of the driver for ease of operation and elegant design. The user expects a graphic design that follows logical rules, integrates and reflects his environment, expectations and thought processes as much as possible, that also encourages him to interact. Operating must be made to be simple and intuitive; the driver shouldn't have to concentrate when he asks for information in a timely manner.

Since such a system is built mainly into upper class automobiles, the design of the user interfaces must complement the high aesthetic standard of the rest of the car's interior that the driver is accustomed to.

The top priority for developing a graphic concept is to follow the design guide lines that the customer is used to having. The design of the interface must convey this message, such as representing the company's philosophy, and fitting into the respective vehicle.

Also, different drivers have distinct patterns of habit and action. It is therefore already essential to differentiate the users' specifics in the conceptional phase and the design of the interface. As an example: women expect totally different features from a navigation system than men. A large portion of technically inclined men, ages 18 to 35 years old, demand a high degree of decision making, interaction and games possibilities in and of the system. This kind of flexibility in operating the system can only be achieved by a design that the user can tailor to his specific desires.

4. The Design of the system's graphic display

The expectations of the driver as well as the demands of the system have to be combined using a smart graphic in order to satisfy the above mentioned needs.

The exterior and interior design create the individual statement of a vehicle type. In the interior of the vehicle the active communication surfaces are an important part of this statement even though they only take up a relatively small part of the interior. It is therefore essential to adhere to the established guidelines and to unify them.

In order to simplify the menu guide, flat menu hierarchies are being developed that demonstrate clearly separated menu points and distribution of the various functions. The contents of the individual categories is dependent on the different components in the vehicle and the needs of the user, such as the division of the main menu into media, online, navigation, comfort functions and telephone.

It is essential that the menu structure is consistent and well organized. Only in this way intuitive operation is possible and therefore an effortless orientation of the driver is guaranteed. The need for an easily understandable graphic is required to make up for limiting the main menu and greatly reducing structure logic.

The driver's information and communication system developed by CAA uses a LCD-display in a 16 to 9 format to present all information. This format is accommodating to the visual habits of the human eye. Working the user elements, located on the bottom of the display, the driver or the passenger can activate functions or make different entries.

To enable intuitive use, the designed form of the user elements is embodied into the design of the graphic display of the user interface. That means that the input elements are reflected in the design and give the driver the feeling that he initiates actions directly in the display. If a user element is turned to the right the cursor on the screen also moves to the right. Basically, the direction of movement of the user element and the screen can't conflict, instead they should correspond with each other.

Next to the formal design, another deciding factor is the color-coding of the different main menus. Using bright and different color choices create easy orientation even under unfavorable viewing conditions. The user knows immediately which menu he is viewing. This is the reason why the cursor, used to mark the actual position of the input element, is identified clearly by color and significant contrast with the background making it immediately visible

no matter what the lighting conditions are. The cursor is simply the navigation tool, marking the current position on the screen and is the reference point for the next action of the user. The cursor can change into different forms that express different statements, informing the user of the next possible step.

The manipulation of light and shadow, such as use of

Driver information and communication system, to read. Since the eyes aren't strained by uneven lighting conditions, less fatigue is observed than with a dark screen during daylight. Uncomfortable light reflections are also avoided by using a bright screen background. At night darker colors are more appropriate so the driver isn't blinded. The contrasts can be reduced in the night screen design since a screen designed for daylight tends to be too bright under dark conditions.



contrast values, enable optimal readability even in unfavorable light conditions like the sun shining through the back window. One option in this area is to create a day and night design. Depending on the function of system and variations in brightness an optimal graphic display is offered to the driver, which is adapted to the specific characteristics of the incoming light conditions. During daylight a brighter screen is considered more comfortable

Next to a rich contrast display, the typographics on the display play an important role. Due to the more difficult sensory environment encountered in a vehicle, the font used in the display has to adhere to stringent rules in order to achieve the primary goal of optimal readability. Important criteria for the suitable typographic is the font type, cut, size and running width. Fonts without serifs

(Arial, Helvetia, Univers, Frutiger) are preferred over those having serifs (like Times and Bodoni). Regular or bold font cut is best suited, while cursive or condensed fonts should be avoided. The font size depends on a number of factors such as viewing distance, form, contour or contrast. Having chosen an optimal font type for form, contour and contrast a font size of at least 5 mm for capital letters is required when viewing from a 70 cm distance. Smaller font sizes are acceptable for non-critical messages or status indications, which do not need to be viewed while driving. Besides the criteria of readability the font should also reflect the corporate identity of the brand and accent the appearance.

A decisive factor is also the differentiation between an information display, which shows status information and that of an active display elements that are triggered when initiating a certain action. Menu levels are set in theme-related backgrounds and therefore, the function lying behind it visualized. For totally new functions a new symbolic system must be developed that intuitively makes sense without having to refer to an operator's manual.

In order to be able to use the symbolic system successfully it has to be absolutely indisputable.

Icons have to always be recognizable and readable and to the greatest degree adhere to the common standard or DIN norms. The meaning of the icons has to be universally recognized. Many symbols with an established meaning in Europe may be interpreted differently by other cultures. Example: In Europe the analog clock is the symbol for the dimension of "time", in Asia this is the symbol for "death".

In order to be able to understand the statically displayed information with minimal effort, small and very reduced animations are used that provides direction to the user, thus permitting easier navigation. An example for this application is the visualization (animation) of a telephone call by a moving telephone symbol. This informs the user of an incoming telephone call.

The arrangement of the graphic elements in a linear fashion throughout all hierarchy levels is the basic requirement for all screens of the system. Even though the layout configuration is strictly fixed, the arrangement of information along with text fields must be flexible enough in order to conform to other language variants requiring a different number of symbols. Here, the system will look for the smallest common denominator in flexibility between the number of the symbols and retaining the page arrangement.

As a final point I would like to mention the adaptability of the screen design into the high quality surrounding that the display will be used in. The surface of the display is part of

the vehicle's interior and therefore, must add to the expression of a car model's marketing philosophy the same as exclusive leather seats or an elegant covering. The design has to integrate itself seamlessly into its surrounding and complement the elegance and high quality of the vehicle's interior.

The uniqueness of the above described graphic is that it not only considers the specific factors of the environment it is being used in but places great emphasis on aesthetic expectations and being user friendly. All these unique characteristics and distinctions make for a optimally sized graphic that is logical and to the point, but at the same time not boring or unimaginative- just a smart graphic.

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