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Elektronik und
Feinwerktechnik GmbH
Module und Geräte zum Eingeben, Auswerten, Anzeigen und Ausdrucken analoger und digitaler Daten.

HMI Devices for OEM applications self correcting?
A good pathway to individual HMI Design

Nearly every complex technical device requires some form of user interface. There is a confusing multitude of such Human Machine Interfaces (HMI) solutions available in the market place. One of the basic functions of an HMI device is to process input and output data. The data can be supplied to HMI devices via interfaces such as USB, CAN, Ethernet etc. Another requirement is that output data can be sent via the same interfaces. Moreover, the device should be able to direct data based on predefined requirements or to react to data based on definitions.

The Status Quo: What the market offers to the OEM decision maker

A closer look at the HMI device market reveals the following: On the one hand there are many devices on the market that essentially resemble mini integrated PCs - mostly based on Windows CE. On the other hand there are devices featuring tools that enable the user to simply and without any prior programming knowledge to create their own applications. However, those devices are mostly optimized for an specific use which complicates their use in different applications greatly. Or the tools offered, for the sake of simplistic handling, only standard graphic elements which exclude advanced requirements and often look unappealing.

The Issue: The right way to individual HMI design

Whoever owns a new HMI device and is happy with CE Desktop like display - please don't read on.

For all other decision makers the true problems and costs may now just begin. The aforementioned mini PCs require software that actually make the device into an HMI device. Said software is typically used by a software developer. Right - powerful graphic libraries, such as QT, are available to the developer, but specific knowledge is required to develop the correct HMI design. In reality those HMI designs based on mini PCs will likely have to be re-designed over and over. In spite of extensive specifications the programmer will typically not know, and therefore not be able to match, the taste and expectations of the decision makers. The entire process consumes huge resources both in time and money only to be finally settled in a compromise. So the question is: How can the OEM create a self generated, uncompromising and feasible HMI solution that remains cost effective even in small and middle sized projects?

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The solution: Two Aspects in Focus

1. Graphical Presentation

In principle graphical standard elements should be used in the building of HMI interfaces. The simple reason is that such elements can be used quickly and without in depth knowledge of programming. The disadvantage of limited design individuality can be overcome by making standard graphic elements editable. DTP programs deploy the option to edit standard programming elements. Typical HMI elements are analog instruments, bar codes, one or multiple line text boxes, touch fields for input via touch screens, hot-key indicators for mechanical keys, or indicators such as virtual LED's, as well as static texts and logos. Additionally there are pictures, movies and slide shows.

2. The function of the display (i.e. measurement data processing)

Once the graphic design is created the actual element properties such as in and outputs etc. have to be defined. For a text field that means variable input data that could come from some interface, or metrology data from an analog port. For a keyboard the questions is wether the keystroke goes. At this point the possibility for a transparent operation would be sufficient since the controling inteligence resides in the host system. However, in many instances such a host system is none existing. Even a simple inteligence is required in the case of an HMI being utilized as a metrology device, that, for instance, is able to trigger an alarm.

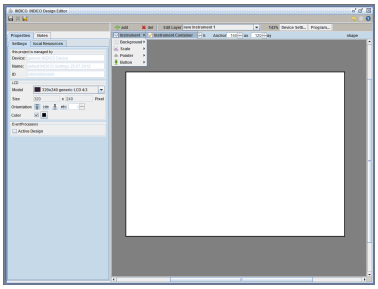
Superior results in just a few steps

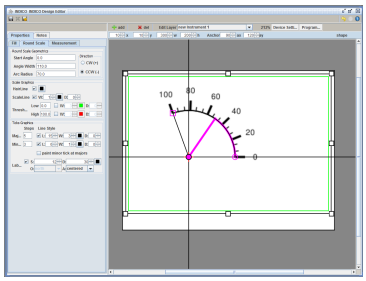
GeBE developed a PC based design tool that offers many options. The HMI device series GeBE-INDICO®, offers quickly deployable HMI solution for a multitude of applications. And all of it without having to write code. The graphical design tool is based on moving pictures, i.e. an indicator such, in front of a defined background such as chart. The user is able to create a complete analog instrument or use a pre-build background. The software tool loads the pictures together with a directory into the HMI device. The directory includes instructions on how pictures are to be used, which in - and out - put channels are utilized and which actions are to be executed. The tool also offers a multitude of basic shapes for graphical designs. The following is to illustrate how simple It is to create a an analog instrument. This instrument includes an analog input and an alarm that triggers a virtual LED as soon as a preset value is surpassed.

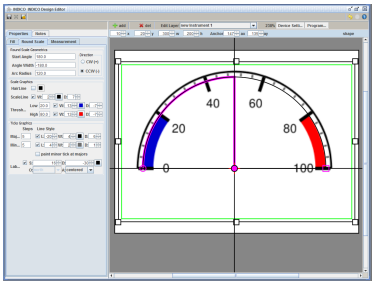
1. Choosing an instrument design

The first step is to choose a background for the new HMI project. Any background, colors

gradients, pictures, logos or text can be added or designed. Also, the desired round instrument can be chosen. Attributes such as type of instrument face, graphically define the surface used to display the analog type measurement data. Center point as well as beginning and ending angle can be defined to create a round or section of a round instrument face. Color, width, length, font...etc. can be customized. This process can be compared to a classical screen printing process creating an instrument dial.
(Picture 1, 2 and Picture 3 with Scale 0 bis 100°C)

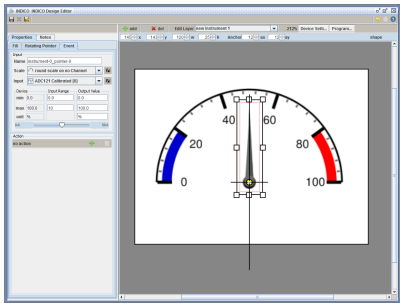






2. Choose the indicator

The design tool offers a diverse, editable graphics of dials as well as the option to import any number of picture files. The most interesting aspect of the dial is the assignment of a measurement to a graphically defined measurement range as defined by the scale. The dial is connected to the scale after the dial is created, and it's attributes are defined. Much like an hour hand is attached to the center axle of a clock. Hereby will be defined how data is displayed, where the center point, the max, the min and the zero. The design also defines whether the indicator moves around the center of the scale between angles or whether the indicator moves in a linear fashion between zero and the measured value. Numerical indicators cannot be animated, but font size, color and format can be adjusted.
(Picture 4)



3. What Data is Presented?

Every indicator can be assigned an input channel according to the data value that needs to be presented. Data can be supplied via RS232, USB or CAN-Bus, Modbus...etc. Because much of the data is initially supplied as RAW data, the kind type of data representation as well as the value itself can be calculated via the design software. For instance: an analog input of 0 - 10V measures a speed of 0 – 3m/s. Linear scales can simply be programmed right at the instrument. This type of data processing is the job of the signal processor.

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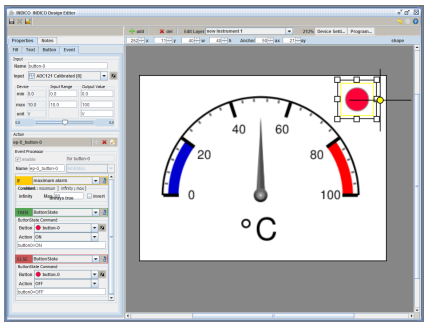
4. How is an Alarm Triggered?

An Event Processor tests whether arriving data from an input channel meats certain criteria and programs the HMI device to respond with a system command. For instance by sounding an alarm. In the picture below the triggering event is a data point of some value being > 80. In that case a virtual red LED will light up. **(Picture 5)**



5. Ready to go

Once the project is downloaded in to the HMI device the measuring instrument is deployable.

For OEM – Simplicity and Cost Savings

The above steps toward a simple but custom and functional OEM instrument underline one thing in particular: The handling and use of this design programs are applicable and simple even without a a technical degree. Thereby allowing the economical use of graphical HMI technology in small and medium size and budget projects. The functional range of this software offers go much past the example given. For instance analog/digital measurement instrumentation, automated parking gates, automated passenger displays, building automation or simply the replacement of text displays – all can be realized by the customer directly and without changes to the device firmware.

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Cover picture: Ilustration of different designs for display instruments via the design software in connection with GeBE-INDICO® in 7“ Format

picture 1 – 5: explanation through text

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