Developing an industrial-grade EMC-certified HMI in 4 weeks

By Pierre Leveugle

THE MEDICAL AND PARAMEDICAL sector is constantly evolving. Customers from this area innovate in order to offer equipment that combines both technological performances (advanced main boards) and quality graphic displays (touch-sensitive and ergonomic control). In light of this trend, Clairitec was asked to participate in the development of a graphical, touch-sensitive and custom-built Human-Machine Interface able to pilot a device specially designed for massage therapies and well-being using a palpating and special rolling technique.

The interface was intended to replace an obsolete control currently composed of a Lexan or Epoxy flexible keyboard with command buttons. Since it was an upgrade of an existing product, many constraints had to be taken into consideration. For example, the minimum display size had to be 7-inches, boasting a resolution higher than WVGA, with at least 300cd/m² of brightness. What's more, the interface had to be electromagnetically compatible within an industrial environment according to French norms NF-EN55022 or NF-EN61000-4-3. Last but not least, Clairitec was to deliver a semi-finished product ready for use in its final environment, the palpating and rolling massage equipment.

Full custom turnkey solution

As the main board of the application remained unchanged, the new touch-sensitive HMI had to be created around the existing one. Because the client already had internal expertise in software development, they first opted for a Linux solution, without any time control. Having issues in developing a graphical HMI which would be compatible with their visual guidelines and their main board (serial connection issue), the customer sought a back-up option that would guarantee a reduced developing time, a turnkey solution including hardware, software and graphic design together with a fully customized display. By choosing Clairitec HMI solution, the customer was able to develop their HMI in less than 4 weeks, straight from their main board thanks to a set of commands in C language – see figure 1.

To overcome the display barrier and offer a display device compatible with a 4-wire resistive touchscreen, we chose a 9-inch TFT WVGA screen with a brightness of 400cd/m² (touchscreen included). The SpiderGraph HMI board was a good option since it is equipped with an integrated graphic engine capable of managing 65535 colours through a 16-bit LCD TTL output – see figure 2. The card can directly manage the touchscreen and communicate through a RS232 or CAN serial connection. Once everything was plugged in, the developer only had to launch the command orders from the main board through a RS232 serial connection, to the SpiderGraph HMI
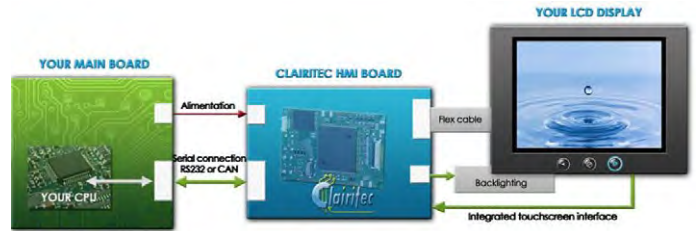

Fig. 1: Clairitec's HMI integration flow.

which converted the orders into images thanks its integrated graphic engine. With 32MB of memory capacity on-board, the graphic engine is able to save up to 400 images composing the HMI as well as around 20 character fonts.

The graphical aspect of the HMI project was carried out by an in-house designer at Clairitec. An ergonomics study of the equipment's functions enabled us to collectively define with the customer accurate technical requirements for the screen (images, buttons and fonts of the HMI). The visual style required by the client called for important design adjustments in order to be compatible with the display driven with the Clairitec HMI board. It took five days to adjust the bitmap format pictures, the bitmap format pictures to the nearest pixel for all of the HMI elements (background, images, fonts, widgets).

Fig. 2: The SpiderGraph HMI board with its modular connection module.

The whole project was then loaded in the GraphConverter software – see figure 3. This mandatory step enables to configure the HMI board and to precisely place the graphical elements according to the final needs of the customer. For instance, the start button of the device must be exactly placed 50 pixels away from the top right corner of the display so as to enhance working ergonomics. What's more, all the command buttons were placed on the same upper axis to ensure optimal reading comfort while using the head-up display mode.
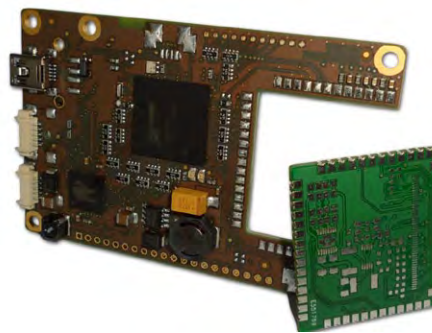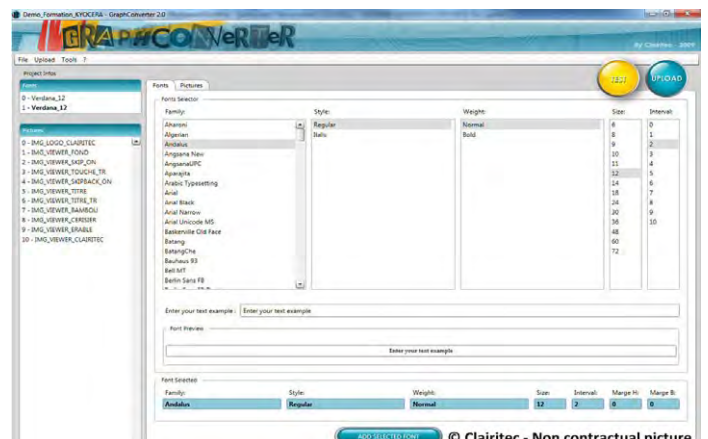

Fig. 3: The GraphConverter software use to configure the HMI board and the final user interface.

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