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Fetal-maternal Monitoring Device

Introduction

This case study showcases Mistral's expertise in providing product design services in the non-invasive medical electronics segment. Mistral was approached by a leading original device manufacturer (ODM) in the US specializing in design and development of products related to patient monitoring. Mistral's concept-to-deployment services helped in realizing the customer's idea for fetal-maternal monitoring device, and help bring it quickly-to-market.

" Medical device, supporting 32-channel of analog input data, for processing and displaying real-time fetal and maternal ECG data on tablet or PC "

The Customer

The customer is a technology leader providing highly-integrated signal acquisition and signal processing data management products for electrophysiological medical devices.

The Requirement

The requirement was to design a medical device for fetal-maternal monitoring and also to develop an application to display the processed data on a tablet or a PC.

Solution Provided

Mistral was involved in developing the hardware solution, integrating the signal processing algorithms into the framework, and the host GUI application.

The medical device developed for this application consisted of the following hardware modules:

- Analog Interface card supporting 32-channel of analog input data (human electrophysiological data collected through electrodes)

- DSP based Bio-Medical Board

- Programmable Control Module comprising of OMAPL138 and the CPLD for the analog card interface.

The device is designed to function in two variants; one with data processing being done by the DSP based Bio-Medical Board and another variant with data processing being done on the Control Module.

The device processes the raw analog input, converts it to digital data and applies ECG algorithms for extracting maternal and fetal data and metrics such as ECG, maternal and fetal heart rates and ST analysis. The device interfaces with the host PC via USB. The host GUI application receives the processed data from the device and presents it in a graphical format while providing patient alarms and electronic patient records.

The GUI application is designed to work in a normal Windows 7 host PC, as well as touch-based handheld versions of the OS. The generic framework provided by the application enables it to be seamlessly used on an Intel i7-based Windows 7 tablet computer.

The Challenges

- The application, especially the graphical representation, had to be designed to work smoothly in touch-based environments, including touch-based rewind functionalities

- Real-time data being received by the analog interface card had to be processed and displayed without any data loss. Microseconds of data lost would be interpreted by the algorithm as an error or dip in the patient's vital signs. In the process, even a healthy person could be reported as unhealthy.

Key Achievements

- Mistral was able to meet the challenging timelines set for the development of the product

- The host application was completed in just three months time

- This was Mistral's first application design on tablets.

Customer Benefits

- The Mistral team, who worked on the project, had vast experience on the OMAP platform. This saved valuable development and testing time to bring up a prototype, facilitating quick time-to-market value for the customer

- User documentation provided was of high quality, helping the customer in turn efficiently put together documents for commercial and FDA submittal use

- Flexibility of the Mistral team, while incorporating change requests and scope changes, helped the customer throughout the project cycle

- As complete solution providers in embedded design services, Mistral provided complete hardware, middleware and application solutions to the customer

- Mistral was referred by the customer to other customers for embedded design services.

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