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Solve Complex Devices or Clarify a User Interface with Virtual Tools.

Virtual instruments or virtual tools are computer simulations of physical devices. They can be simple as a "volume slider" or "button press" on a computer screen, smartphone, or tablet.

We've all seen flow charts and wireframes: page schematics used to display information, functions and priorities. Unlike their static brethren, virtual instruments are the computer generated, live and sometimes animated versions that react to input like the physical machines they pretend to be.

With virtual tools a developer can easily change button function and placement, timing of events as a result of input, experiment with variables like battery life, power requirements, and computer processing needs. The software can be used to explore risk analysis and failure modes, and a user can use the instrument as a "state machine" – to present and see a snapshot of the device it mimics at a chosen point in time.

Virtual instruments are most useful for:

- Developing and testing complex devices that would be too costly to modify after they are constructed.

AND

- Devices that have an intricate or potentially confusing user interface.

The Plex-ID universal pathogen detector is an example of a complex device that could not have been completed without first "building" a functional virtual instrument. There were too many variables, restrictions, and requirements to optimize the system without first trying virtual solutions.

Our team programmed functionality for the pathogen detector in "C", and later composed the graphics for operational representation in Visual Basic. After the virtual instrument was completed, our engineers could change any variable, including major hardware modifications, and observe (via computer interface) how that change would affect the system's throughput rate.

We were able to control the mechanics of the procedure to mesh with the client's fixed chemistry and desalting process regimen to satisfy their output targets. According to our electronics program manager, Kevin Oberkramer, we could not have completed the project without using a virtual tool.

Another application for virtual instruments is for simplifying intricate or potentially confusing user interfaces. Indeed, we can compose and build prototypes to run on computers or touch screens that simulate real life actions. One software program we currently use is Proto i.o. We can build a deceptively real web-based version that runs on an Internet browser, and looks and behaves like an app on a smartphone, tablet, or computer.

In the concepting phase and before the development money for coding is spent, our industrial designers and clients can interact with "virtual" user interfaces which include animations, gestures, and familiar touch actions such as pinch, swipe, and button press. In this manner we can minimize changes and development costs by experimenting with user testing earlier in the project, instead of at the end.

Whenever customers can save money and development time, they are willing to listen. Virtual instruments developed for comprehensive system configurations are not inexpensive, but for a complex project like the Plex-ID, the effort may be required if the client expects the team to achieve rigorous hardware, budget, and functionality targets.

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