

ICE STORM: A PROTOTYPE VIRTUAL INTEGRATED CLINICAL ENVIRONMENT

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It is challenging to plan clinical environments of the future without first developing a means to try “what if” scenarios with innovative clinical workflow and system integration. To address this need, the MD PnP research group collaborated with Lockheed Martin Corporation and DocBox, Inc. in developing ICE STORM, a prototype virtual reality environment for simulating workflows in an advanced and fully integrated clinical environment. This system, implemented in the MD PnP Lab, used five computer-driven plasma displays, the largest (85”) showing a first-person view of an ICU, and the others showing clinical context: alarm settings, event log, close-up of vital signs monitor, and floor map. Lockheed built the hardware and software infrastructure and implemented the ICU, device design, and workflows to the requirements developed by DocBox and MD PnP.

Workflows in the ICE STORM environment demonstrated the potential patient safety benefits of integrating data from all devices in the ICU and providing advanced bedside clinical decision support. One scenario showed that EKG electrical interference triggered an arrhythmia alarm. The alarm was suppressed by using data from the within-normal-limits arterial BP and SpO2 pleth. Another scenario detected a vasodilator drug-infusion error, and an invasive BP measurement error which could otherwise mask the drug infusion error.

The technology we explored is promising, and further development, if closely coupled with clinical expertise, will lead to a simulation tool that may be useful in domains as diverse as prototyping medical devices and electronic device interfaces, training clinicians, and adverse event analysis.