WiP Abstract: A Closed Loop Control Architecture to Maintain Patient Normothermia During Perioperative Periods

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***Abstract*—Use of anesthesia and the cold environment of an operating room inhibits thermoregulation in a patient body causing perioperative hypothermia. In the worst case, this situation may cause death. Maintaining normothermia is thus a key requirement during the perioperative period. In today's state-of-the-art, normothermia is maintained through a number of manual techniques, such as monitoring and controlling the temperature of the warming blankets, fluid warmers, and air conditioning system in the operating room. Since each patient illustrates different response to stimuli, a one-size-fits-all approach to maintaining normothermia is not the right approach. This paper presents ongoing work an autonomous, closed-loop control solution to maintain patient normothermia during perioperative periods.**

***Keywords*-Perioperative normothermia, Closed-loop, High confidence and Trustworthiness.**

I. Introduction

Hundreds of activities are required to optimize surgical outcomes as patients progress through the perioperative period. A perioperative period is the time duration that includes patient admission, pre-surgery, anesthesia, surgery, and post-surgery recovery. During the perioperative period, the core body temperature of the patient must be maintained at normal levels, which is 37° Celsius – referred to as *normothermia*. In normal conditions, a human body thermoregulates itself to maintain the setpoint. However, anesthesia and other factors, such as the cold environment in the operating room, inhibits the body's ability to thermoregulate itself leading to what is termed as "perioperative hypothermia." In the worst case, this can cause death.

Maintenance of normothermia is critical during the perioperative period [1], [2], as keeping patients warm has been linked to decreased complications and improved surgical outcomes. For a variety of reasons including manual techniques to keep patients warm, patients are often not warmed appropriately during the perioperative period. To overcome these problems, in this paper we present a closed loop system that maintains patient normothermia during the perioperative period.

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II. Patient Temperature Control System

Figure 1 depicts our ongoing work on a closed loop architecture for our cyber-physical system which tightly integrates the physical artifacts (patient body, warming blankets, HVAC system, wireless channel) with the cyber artifacts (the decision support system, control logic, communication middleware) that helps to propagate sensory and actuation information in real-time [3].

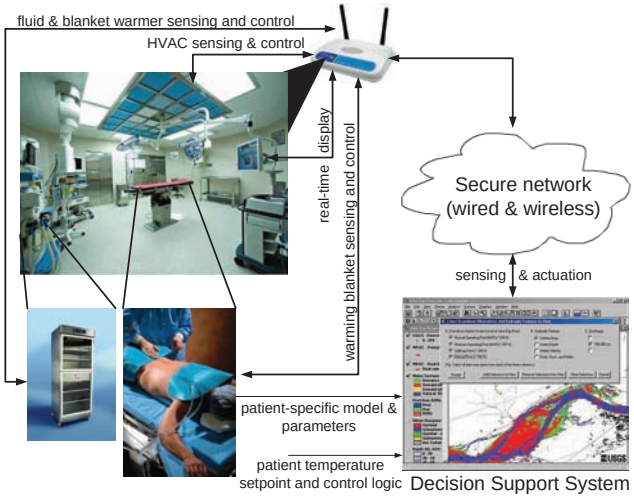

Figure 1. Proposed Architecture

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