DESIGN AND IMPLEMENTATION OF A VOICE-BASED CONTROLLER FOR THE SOLAR 8000 MONITOR

Presenting Author: Christopher W Connor, MD, PhD, Brigham and Women's Hospital

Background/Introduction: Recently, in response to the STA Engineering Challenge for 2020, we demonstrated and published that a standard Solar 8000 anesthesia monitor (General Electric, Madison, WI) could be controlled by touchless gestures by electronically modifying an external controller [1]. In the course of this work, we found that there was considerable enthusiasm among surveyed clinicians for also implementing a method for obtaining voice control of this near-ubiquitous anesthesia device.

Methods: A Solar 8000 controller was purchased on the secondary market and re-wired to a Raspberry Pi (Raspberry Pi Foundation, Cambridge, UK) and a custom daughter board containing an MT8808 8x8 Analog Switch Array (Microsemi, Ottawa, Canada). The controller was modified so that all possible keypresses or dial movements on the controller could be generated electronically through programmatic manipulation of the switch array gates. An external microphone/speaker was attached, as shown in Figure 1. Detection of wake-words was accomplished using Snowboy (https://snowboy.kitt.ai) locally on the device, and received speech was parsed into intentions using Google Voice (https://voice.google.com) in the cloud. Intentions were effected by creating the relevant sequence of simulated keypresses or dial movements on the controller through the intermediary hardware interface.

Results: A range of spoken word commands, such as to cycle the blood pressure or to silence an alarm or to zero an arterial line, were successfully detected, parsed, and effected through the modified controller interface. Response times were satisfactory for plausible clinical application even when relying upon cloud-based remote services for speech interpretation.

Conclusion: Voice-based operation of the GE Solar 8000 monitor is technically viable by modification and retrofitting of an existing controller, and a combination of local and cloud-based software. Surveyed anesthesiologists appear to be enthusiastic about the potential for novel, hands-free user interaction.

References:

1. Owens GE, Connor CW, "Controlling Anesthesia Hardware with Simple Hand Gestures: Thumbs Up or Thumbs Down?". Anesthesia & Analgesia 2020, online ahead of print. PMID: 32701544

Figure: