Problem Statement 1: Video Content Analytics (VCA)

Introduction:

Video content analysis is the capability to automatically analyze video to detect and determine temporal and spatial events. These algorithms need to be implemented as a software component which can be easily integrated with software based MCU solutions which stream and record feeds from the video codec and cameras. There are many examples in the technology field like Video Motion Detection with regard to a fixed background scene and/or security examples like crowd management solutions, notably at The O2 Arena in London and The London Eye. However, this project requires development of VCA algorithms which can be integrated with an existing Tele-ICU solutions.

Tele-ICU

The ICU is a high-cost, high-demand, high-risk setting. Variance in care delivery is high, and Intensivists and experienced critical care nurses are in short supply. These factors have led hospitals to explore the use of remote ICUs. A Tele-ICU consists of a central command centre staffed with Intensivists and critical care nurses who can provide support to patients admitted in multiple distant ICUs. Intensivists at the command centre have access to patient data by means of real- time audio, video and electronic links. Patient data include medical records, laboratory and diagnostic reports, physiologic status and vital signs among others. The zoom and pan functionalities of the camera allow the Intensivist to monitor the patients' clinical status through indicators such as pupil size, skin colour and mental status.

The remote ICU provides benefits to help hospitals improve their standardization goals, adherence to evidence-based medicine practices, monitor the most critical patients more frequently, and improve overall ICU utilization and patient throughput.

The AV technology is an integral part of the Tele-ICU solution implementation across the country but its application in most use-cases is limited to only video rounds which is now easily possible with free available alternatives (WhatsApp video call, FaceTime) ; which means the cost vs benefit of the AV technology usage in an ICU setting is not clearly identified and these technologies need to provide clinical benefits which can rationalize the use of deploying costly cameras in the ICU setting.
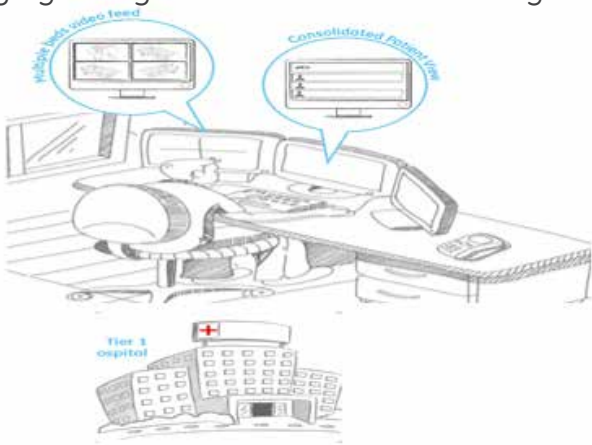
Example Use-Cases

The following use-cases are applicable for this solution implementation

- Emotional gesture detection; for patient distress alarms while in ICU bed for proactive attention from nurse or tele-nurse staff
- Patient safety protocol implementation e.g. Fall detection and prevention- this can be motion detection and if there is restless movement in the patient's bed it can trigger alarms.
- Unique patient identification by matching previous images stored to new frames received by cameras to ensure the right patient is selected while doing remote camera monitoring. Also application in NICU to identify the right neonates/infants in NICU or L&D setups