A Novel Visualisation System for ICU Nursing Effort Per-Patient

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Introduction: Patient and nurse interaction in the Intensive Care Unit (ICU) influences patient recovery, care and outcome [1-3]. In particular, it is imperative to build up a nurse-to-patient ratio system for ICU. However, most of evaluation systems are patient oriented, focusing on assessing the patient condition. The assumption made in these evaluation systems is that the sicker the patient, the higher nursing care provision is required. These systems are broad and may not easily differentiate patients needing more or less care. There is no standard method to consistently quantify patient and bedside nurse interaction. This paper presents a new Nurse Motion Tracking System (NMTS), which is developed to track and evaluate nursing motion at the patient bedside, aimed to quantify the time nurses spend on nursing activities.

Methods: NMTS consists of a motion sensing input device, Microsoft Kinect for Windows. The Kinect is fixed on the ceiling with embedded the camera and infrared sensor facing downwards. The system is set up in an experimental environment to simulate the patient bedside area. The total distance from the ceiling to the floor is 2.7 m, which corresponds to the actual height of the intended test ground in the Christchurch hospital Intensive Care Unit (ICU). The total tracking area for the NMTS is 2.1 m × 1.5 m (Length × Width). The image of each test candidate captured using the NMTS is known as a 'blob'. Every blob will be identified by enclosing its contour with a square, as well as a centre point.

Results and Discussion: A system to monitor nursing activities near the ICU bedside is developed and tested in a simulated experimental environment. NMTS is able to track the different candidate heights, adapt to different motion path and identify multiple people simultaneously. NMTS uses two metrics, distance and dwell time, to evaluate nurse-patient interaction. The robustness of the system proves it can be used in clinical usage. The new system will be used to calculate how nurse spend their time in ICU, help ICU to find a more

appropriate nurse-to-patient ratio, prevent nurse burnout and decrease the mortality of patients.

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