P2-2-22-D 全身麻酔中の新鮮ガス流量と吸着剤に対するCO2負荷の関係：麻酔器の動作モデルを用いた定量的検討
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Relation of the fresh gas flow rate and the carbon dioxide load on the absorber during general anesthesia
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In general anesthesia (GA) using the semi-closed ventilation, carbon dioxide (CO2) needs to be removed from the expired gas by absorber. The primary factor that determines the amount of CO2 recirculation is the fresh gas (FG) flow rate. The purpose of this study is to design a semi-closed ventilation model and quantitatively analyze the effect of the FG flow rate on the CO2 absorption during GA. Methods: The ventilation process is modeled as follows. During the inspiration, FG is blended with recycled gas from the bellows and sent to patients. The gas from the bellows passes the absorber, and CO2 is eliminated before mixing with the FG. During the expiration, the expired gas and FG is stored in the bellows. Once the bellows is filled, the spillover gas is scavenged into the draining system. The simulation program was developed, and the amount of CO2 absorption was calculated as per varied ventilation settings. Results: The simulation demonstrated that the CO2 load on the absorber increases in a non-linear manner as the FG flow rate decreases. This simulation model can be used to measure the cost-effectiveness and environmental impacts of different ventilation settings during GA.

P2-2-23-D 採血支援システムにおける腕姿勢に対応した針制御に関する研究
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A Study of Needle Control Adapted to the Arm Posture for Blood Collection Support System
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The purpose of this study is development a blood collection assistant system for accident prevention. In the previous studies, a vein detection system by using absorbance of the hemoglobin, a needle puncture system by using the peak detection of puncture force and blood detection by electrode were developed and integrated. In this study, needle posture control following arm posture was performed with posture markers placed on a NIR-illuminator for vein detection. The arm angle was calculated from the relationship of distance between camera and each marker in the captured image. Experiments were performed to evaluate the accuracy of needle posture control for angle, position and direction according to the arm. As the results, maximum error of control was 6°, 2.8mm and 2.2° in the angle, position and direction, respectively. It seemed that the accuracy of position control was enough for needle puncture to vein of 4mm diameter with 21G needle of 0.8mm diameter. However, improvements of link mechanism and control algorithm were required to reduce the error of angle and direction control.

P2-3-1-E ワンショットデジタルホログラフィによる生体組織の精密三次元計測
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High precision 3D measurement of living blood cells by one-shot digital holography
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We developed a 3D measurement system using digital holography. Our system can reconstruct a 3D shape from a single fringe image by using frequency analysis. Proposed system enables the measurement of 3D shapes of living cells (e.g. red blood cells) which are moving in liquid samples. This paper describes the measurement results of living cells. An experimental result shows that our measurement system can measure the 3D shapes and the movement of living cells in nanometer order. Proposed 3D measurement system based on digital holography is low in price and high in measurement accuracy. This system is expected to become a standard research and inspection tool for medical uses, water quality inspections and many more.