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# Integrating photocell sensors and associative memory machine learning model for blood leakage detection during dialysis therapy: Animal experiment

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Blood leakage and blood loss are serious life-threatening complications during dialysis therapy. These events have been attracted nephrology nurses and patients themselves. It will take a few minutes to lose over 40% of adult blood volume, resulting in mortality rates. In this study, we intend to propose the integrating an array of photocell sensors and an associative memory machine learning model to design a warning tool for blood leakage detection. Photocell sensors are arranged an array to detect blood leakage via the resistance changes with illumination in the visible spectrum of 500-700 nm. A photocell is a variable resistance semiconductor. It has some advantages, e.g., small size, low cost and low power consumption, etc. The resistance decreases with increasing light intensity. Therefore, when blood covers the photocell sensor, a photo-resistor has high resistance as several kilo-ohms (kΩ) or meg-ohms (MΩ). So we can use the dividing circuit and voltage follower (unity gain voltage buffer) to transfer voltage changes in an array sensor. Associative memory neural network is carried out to design a virtual alarm unit in an embedded system. The proposed warning tool can also indicate the risk level in a remote monitor device via WiFi wireless network (IEEE 802.11 Standard, wireless local area network) and cloud computing in an indoor environment (20-30 m). The received signal strength indicators are about ≥70-80 dBm from the transmission distance, <30 m. Finally, the animal experimental results (pig blood) will show the feasibility. In addition, the proposed algorithm is also easily implemented in an embedded system.

## Biography

Ping-Tzan Huang has received BE degree (Technological Academy) from the Kao-Yuan University, Kaohsiung City, Taiwan in 2008, BS degree in the Department of Electrical Engineering from the National Taiwan University of Science and Technology, Taipei City, Taiwan in 2010 and MS degree in Electronics Engineering from National Tsing Hua University, Hsinchu City in 2012. Currently, he is pursuing his PhD degree in the Department of Electrical Engineering, National Tsing Hua University, Hsinchu City, Taiwan, where has been since 2012. His research interests include biomedical signal processing, spares matrix technique, image processing and computer applications.

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