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ICOM'08

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Asan G. A. Muthalif
Amir A. Shafie
Momoh J.E. Salami



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An Overview of Pulse Oximetry System for Noninvasive Monitoring

Muslim A. Abu-Umar, Liban A. Kassim and Othman O. Khalifa

Department of Electrical Engineering
International Islamic University Malaysia,
Jalan Gombak, 53100 Kuala Lumpur, Malaysia

ABSTRACT

Pulse Oximeter is a medical electronic instrument that measures the oxygen saturation (SaO₂) of arterial blood and pulse rate by non-invasive techniques. It is a medical device that measures the oxygen saturation of the blood as well as the heart rate to allow for a rapid detection of hypoxemic events that could potentially be fatal. Since oxygen is the most important element for human to continue living, an effective low-cost device is needed to monitor oxygen levels in the human blood. Lack of sufficient oxygen in patients blood tend to cause Hypoxemia which an abnormally low concentration of oxygen in the blood. It can cause irreversible brain damages and eventually anesthetic deaths. This paper primarily focuses on the theory behind pulse oximetry. Beginning with the Beer-Lambert's Law, which relates the intensity of light before and after an absorbing medium. An overview of techniques commonly used for design of pulse Oximeter is presented. The principle of Pulse Oximetry was introduced.

Keywords-Pulse Oximeter, SaO₂, Hypoxemia, Heart rate, Motion-artifacts

1. INTRODUCTION

Living creatures have many physiological needs. Apparently, oxygen is the most important element for humans to continue living. This fact proves interesting especially if we know that about 20 % of what humans breathe is oxygen [1]. Oxygen is carried by hemoglobin in the blood and it is distributed to the body throughout the tissues. If someone lacks sufficient oxygen then they tend to have Hypoxia, which can be deadly at times [2]. In order for man to keep track of oxygen levels in his blood, a little, yet very practical, electronic device was introduced to serve this need. The device is the pulse oximeter. Pulse Oximeter is "a medical electronic instrument that measures the oxygen saturation (SaO₂) of arterial blood and pulse rate by non-invasive techniques" [2]. It is a medical device that measures the oxygen saturation of the blood as well as the heart rate to allow for a rapid detection of hypoxemic events that could potentially be fatal [3].

Pulse Oximeter is just an example of a modern device that would provide telemedicine to patients. Telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve patients' health status [3]. The pulse oximeter is generally acknowledged to be one of the most important advances in the history of clinical monitoring. [4]

Virtually, every patient whether in the hospital, sub-acute care center or at home, would benefit from pulse oximetry, in the form of continuous monitoring or intermittent diagnostic testing. This proves very true when we know that a 10 seconds absence of oxygen supply to the brain will result in the person losing consciousness, a little longer could result in death. Pulse oximeters have a wide range of applications that provide a good level of healthcare services [5].