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Development of inexpensive multi-parameter sensors based network system for water environment monitoring

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ABSTRACT

In the conservation of water environments, it is necessary to monitor the physico-chemical parameters, such as color of water, spectroscopic data of water surface, CO_2 density, temperature and pressure around the shore. However, the designing of a flexible multi parameter sensing system using a computer is generally considered expensive. In addition, programming and circuitry of a multi-parameter sensing system is complex. A computer also requires electrical power. In this paper, we propose a new technique to modularize sensors. Applying this technique, a multi-parameter sensing system can be constructed with relative ease, and a controlling program of computer and an electrical circuit can be simplified. Using a small computer, a prototype measurement system was constructed and fundamental measurement was carried out. The power consumption and data acquisition process are also discussed.

Keywords: CO_2 sensor, small computer, spectrometer, water environment, water color.

1. Introduction

Monitoring of water environment parameters such as color of water, spectroscopic data of water surface and CO_2 density around the shore is critical for the conservation and sustainable utilization of water bodies such as estuaries, lagoons and lakes. Previously, we have proposed water environment monitoring methodologies using *in-situ* and satellite data in Sri Lankan lagoons and Japanese inland lakes (Dahanayaka et al., 2012, 2013). During those studies, we used commercially available instruments for water quality measurements, such as KRK CHL-30 handheld Chlorophyll meter for Chlorophyll -a monitoring and BSR112E spectrometer produced by B&W Tek Inc., USA, for water reflectance measurements etc. However, because the costs of these instruments were great for our limited budget and only one set of them was used in the studies, it was difficult for us to conduct ideal in-situ measurements for water quality monitoring. In order to understand water body productivity further, it is necessary to conduct simultaneous measurements over large sampling areas of the water body (Lovett et al., 2007; Vaughan et al., 2001). Therefore the development of a low-cost portable multiple-sensor system is necessary for the use in large scale, concurrent monitoring programs. As most of our present study sites are located in developing countries in the Asian region, such as Sri Lanka, Vietnam, Thailand, Philippines and Indonesia, the development of a low-cost multiple-sensor system for the continuous monitoring of water environments will be distinctly advantageous. Application of sensor technology is a solution for this issue and it provides biologists with the means of acquiring these synoptic data and also offers a cost-effective tool for complementing regular monitoring

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