OPTICAL BASED SENSING EMULATION WITH ELECTRONICS INTERFACING FOR AQUACULTURE POND MODEL

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ABSTRACT

This project presents the design of an Aquaculture pond model equipped with an emulated optical fiber sensing system. Aquaculture, in large scale production often requires high labor intensity, real-time monitoring, remote sensing capabilities, and control. The objectives of this project are to design an LED emulator circuit and an optical receiver circuit. The system uses an optical fiber as a propagation medium between LED emulator and optical receiver. The optical receiver circuit is designed for interfacing with a microcontroller (Arduino) controlling an aeration system. On the LED emulator part, results show that by varying the sense resistance, the intensity of the LED is varied. The optical fiber was also observed to be able to successfully propagate light from the LED emulator to optical receiver. Readings taken from the optical receiver circuit indicate that, by outputting different levels of light intensity from optical fiber onto a photodetector interfaced to the optical receiver circuit, different voltage levels are produced. The system as a whole was seen to be able to control an aeration system allowing control in an Aquaculture pond model.

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1.1 Background and Motivation

This project is part of a project entitled Continuous Monitoring of Aquaculture pond equipped with Optical based Sensing System.

Aquaculture is the cultivation of Aquatic organisms such as Fish, shrimps etc. Unlike fishing, aquaculture refers to cultivation of these aquatic organisms under controlled conditions.

Today, aquaculture is said to supply an estimated 43% of all fish that is consumed globally. The Government under the department of Fisheries Malaysia has provided aquaculture industrial zone for high impact project (HIP) as much as 28099 hectares to be developed (sources from www.dof.gov.my). Of these 28099 hectares, 6435 hectares involves farming in ponds. An Aquaculture Industrial Zone (AIZ) was set up as part of the permanent food production zones by the state government as a measure to ensure that sufficient land is allocated for aquaculture development (source http://www.fao.org).

The industry has also seen a rapid increase in production. Over a period of ten years (2000-2010) the industry has experienced an increase in production from 150,000 tonnes in the year 2000 to about 580,000 tonnes in the year 2010.

The contribution of aquaculture sector to Malaysia's GDP shows a positive improvement within the years. Aquaculture sector has contributed 0.283 in production value as percent of GDP in 2003[1]. With respect to socio-economic development, aquaculture contributes towards improving food supply, employment and income.