

A Review of Internet of Things-based Water Quality Monitoring Systems in Aquaculture

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ABSTRACT Monitoring of aquaculture water quality parameters has become imperative in recent times in view of the colossal impact of disease outbreak to fish farming businesses. Traditional methods of monitoring aquaculture parameters such as chemical sampling Methods as well as experience Method have since given way to the era of Wireless Sensor network based monitoring systems. Which in more recent times is been improved upon with the paradigm of Internet of Things (IoT). This paper surveys different works on the use of IoT in monitoring aquaculture parameters. Works were reviewed based on power consumption, data security concerns, and cost. The works were also compared based on their sensor node architectures, the type of microcontrollers used and the wireless communication standards adopted. It was found at the end of the study that IoT offers good prospects for water quality monitoring in aquaculture. Some of the existing work had limitations of high power consumption. More recent architectures have solved the problem of power consumption to a significant degree. However opportunities exist for improvement in the areas of data security and cost of deployment.

Keywords: WSNs, IoT, Water Quality Monitoring, Aquaculture

1. Introduction

Fish farming is a sector that has been growing significantly in many countries around the world. Fish remains a vital source of protein with little or no side effects (FAO, 2000). Aquaculture is a modern method of fish farming which involves the cultivation of freshwater and saltwater aquatic species such as crustaceans, molluscs and aquatic plant under controlled conditions (Hempel, 1993). Factors like quick harvesting Cycle(between 3 to 6months), low technology requirement , and the possibility of using artificial plastic containers, concrete ponds to rear fish domestically makes fish farming attractive in most countries of the world (Idachaba *et al.*, 2017). Modern aquaculture practice requires water quality monitoring. Adequate and timely control of water quality has to be done to keep the concentrations of water environment parameters in the optimal range. Water quality refers to the measure of the suitability of water for a particular application based on its chemical, biological and physical characteristics. Certain set of parameters can be used to measure the quality of water available to fish in aquaculture, prime among these parameters are , dissolved oxygen, pH , unionized ammonia, carbon dioxide, nitrite