Wireless Sensor Networks for Swift Bird Farms Monitoring

A.K. Othman, K.M. Lee, H. Zen, W.A.Wan Zainal, M.F. M. Sabri
Department of Electronic Engineering, Universiti Malaysia Sarawak,
Kota Samarahan, Sarawak, Malaysia

***Abstract*—This paper provides an in-depth study of Wireless Sensor Network (WSN) application to monitor and control the swift habitat. A set of system is designed and developed which includes the node's hardware, GUI software, sensor network, and interconnectivity for remote data access and management. System architecture is proposed to address the requirements for habitat monitoring. The application driven designed, provides and identifies important areas of work in data sampling, communications and networking. In this monitoring system, a sensor node (MTS400), IRIS and Micaz radio transceivers, and a USB interfaced gateway base station of Crossbow (Xbow) Technology WSN are employed. The Graphical User Interface (GUI) is written using a Laboratory Virtual Instrumentation Engineering Workbench (LabVIEW) along with Xbow Technology drivers provided by National Instrument. This monitoring system is capable of collecting data and presents it in both tables and waveform charts for further analysis. This system is also able to send notification messages by e-mail, whenever changes on the swift habitat at remote sites (swift farms) occur, via the Internet connectivity. Other functions that have been implemented in this system are the database system for record and management purposes; remote access through the internet using LogMeIn software. Finally, this research draws a conclusion that a wireless sensor network for monitoring swift habitat can be effectively used to monitor and manage swift farming industry in Sarawak.**

I. Introduction

The swift farming industry has the potential to grow into a multi-billion dollar industry due to the industry's relatively profitable risk-return profile as well as a continuously growing demand for edible birds' nests by wealthy countries. There is also a discernable world-wide trend pursued by international home grown pharmaceutical and herbal products companies in using edible birds' nests as base materials for producing natural and organic health supplement products. Malaysia is currently the 3rd largest producer (7%) of edible birds' nest in the world behind Thailand (20%) and Indonesia (60%) with estimated annual weight value of approximately 160 tons for the world consumption in 2006. The total consumption value of edible birds' nest throughout the world in 2006 is estimated in the vicinity of USD1.5 to USD4 billion. The main markets are Hong Kong (50%), China (8%), Taiwan (4%), Macau (3%), Japan, and South Korea. Their demand will continue to grow at double-digit rates for the next 2 decades and this delicacy is catching quickly in the United States [1].

Breeding the swift is not an easy task. The birds itself are very sensitive to human being and require special care to produce a high quality nest and productivity. About more than 1500 swift farms in Sarawak, Borneo has been setup but none of the farms has real time monitoring. These farms are mostly equipped with electrical equipments including humidifier, audio system and timers, thermometer and humidity tester. The temperature and humidity of the farms are monitored manually only once in every four to six weeks due to the remote access and sensitivity of swift habitat. Sudden extreme change of temperature and humidity could cause the swifts to migrate to other places. Farmers used audio system with special sound alternately to attract female and male swift and this is done manually at a farm. Manual monitoring and controlling of equipments in the farms will frighten the swifts away. All the above problems could negatively affect the production of birds' nests and hence result in a great lost to the investors of the swift farms.

The application of wireless sensor network for swift farms monitoring claims to be enormous potential benefits for scientific communities and society as a whole. This application will enable long-term data collection, monitoring and managing remotely. Interconnectivity with the physical environment at a swift farm will allow each sensor to provide localized measurements and detailed information that is hard to obtain through traditional method.

This paper develops specific monitoring applications for swift habitats. It presents a collection of requirements, constraint and guidelines that serves as a basis for general sensor architecture for many such applications. This includes identifying the current problems and pro-

9781-4244-3941-6/09/$25.00 ©2009 IEEE