

Aquaculture Intrusion Detection System based on IoT Mesh network

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Abstract— *Aquaculture industry has been suffering significant losses from intruders and fishing boats. To eradicate such intrusions, we suggest a solution for intrusion detection based on Bluetooth mesh communication. Bluetooth Smart mesh modules incorporated with human motion detect sensors such as PIR on buoys could form an active net for detection of humans and objects. Automatically, Solar power can generate sufficient power for each modules. One mesh module which has 3G communication as a mother module will communicate with monitoring system. This paper illustrates a proposed solution for aquaculture intrusion detection that claims novel efficiency by employing Bluetooth Smart mesh networks and an IoT platform.*

Keywords— *Aquaculture, IoT, Bluetooth Smart, Mesh, Theft*

I. INTRODUCTION

In often times, fishermen were threaten the livelihoods of them as well as suffering a great anxiety by the theft of near shore ocean culture such as abalone, sea cucumber. The theft results in great loss profit and gives lethargy to fisherman. The theft of aquaculture is sure to eradicated.

The solution had to be capable of detecting unauthorized boats and person. Since surveillance was to be carried out over both land and sea, variable environmental factors such as precipitation and wind velocity were needed to be addressed as well. The intrusion detection system has reduced the need for operator attention to a monitor, enabling security staff to attend to other functions. In addition, installation was easy and the service has been excellent[1].

Bluetooth Smart & Smart Mesh

Bluetooth Smart, known as Bluetooth Low Energy (BLE), is an interesting short-range radio technology that could be used for connecting tiny devices into the Internet of Things (IoT). Multi-hop mesh networking technology can enable Bluetooth Smart to apply in even wider range of use cases. BLE mesh provides peer-to-peer and robust multi-hop connectivity for a large number of local BLE devices. This way, IoT application data can be exchanged between any local BLE device and the Internet through the mesh network and a gateway[2,3].

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II. AQUACULTURE THIEVES INTRUSION DETECTION SYSTEM

The system provides ubiquitous service network by activated Active Sensing & Service Area (ASSA) zoning using a Bluetooth mesh which is the latest Internet of Things (IoT).

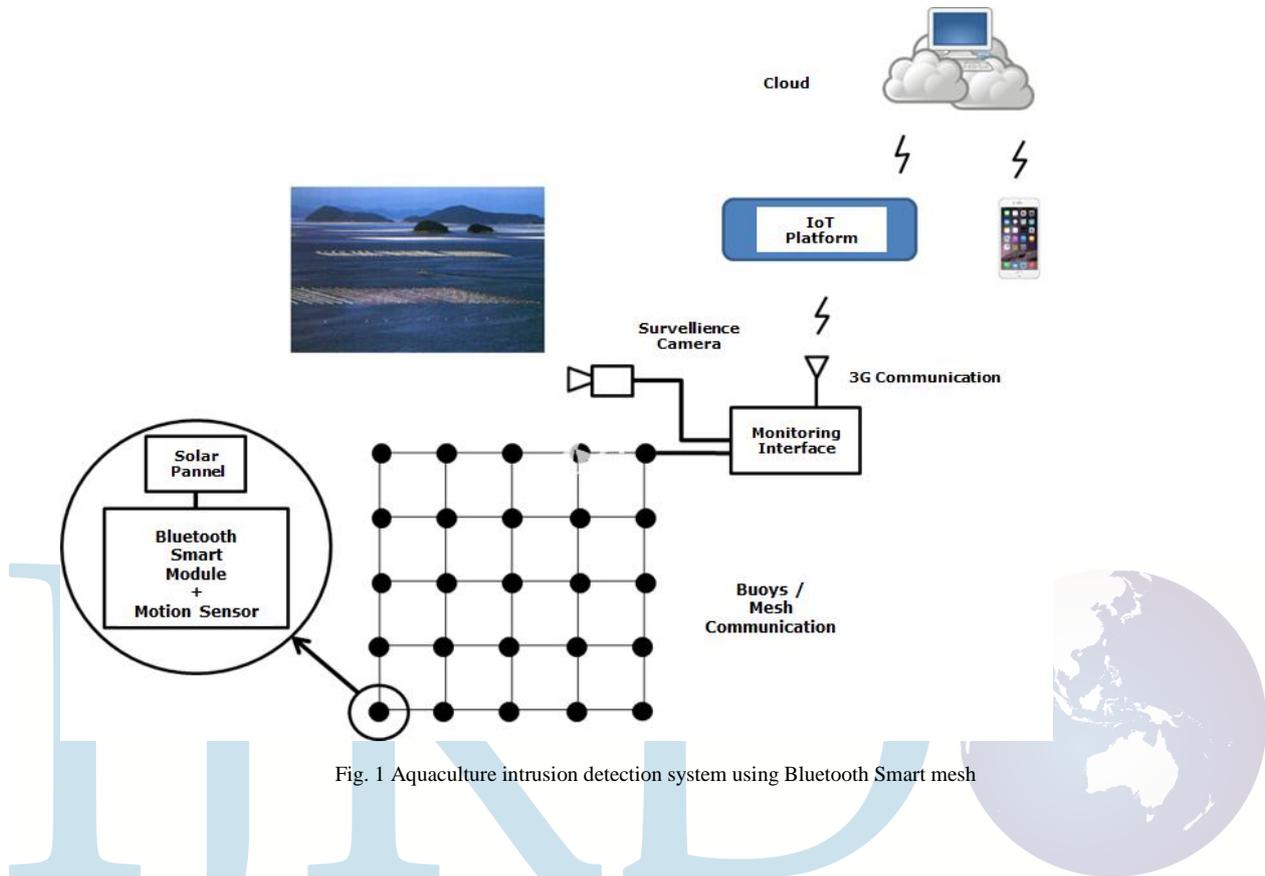


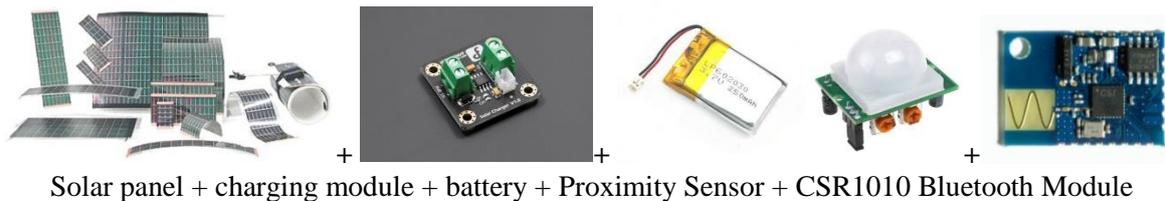
Fig. 1 Aquaculture intrusion detection system using Bluetooth Smart mesh

A. Development of Bluetooth based intrusion detection and mesh communication module

Bluetooth smart mesh is the latest IoT technology to establish a broadcast to consistently control the number of nodes within their communication range (about 50 meters). We develop and manage the aquaculture intrusion detection system by using this IoT technology. When mounting the mesh module on each buoy, it is connected to each other through the mesh communication. So aquaculture is able to handle the entire network as a single.

B. Development of 3G communication module and IoT platform

Our system consists of PIR sensor, BLE mesh communication module, 3G communication module as mother module, IoT platform, and monitoring system with smartphone application as shown in Fig. 2. As a mother module, a module mounting a 3G communication part in one of several modules can be communicated with the terrestrial. This 3G communication module is equipped with a camera to send the necessary commands in the video or photo shoot in order to monitor from land. It is ensured the mobility and independence by supplying electric power using the solar power generators.



Solar panel + charging module + battery + Proximity Sensor + CSR1010 Bluetooth Module

Fig. 2 component of intrusion detection system

C. IoT platform and smartphone application

3G module is the passage to interface with the smart phone and archive for the final act in which the information is stored. IoT platform analyzes information and extracts useful pattern by aggregation multiple aquaculture information. Smartphone application (app.) for aquaculture operator has the function of alarm, sensor condition monitoring, camera connection to aquaculture.

D. Conventional intrusion system vs. our IoT Based intrusion system

The disadvantage of conventional intrusion system is complex, high-cost structure, and the inconvenience of use. Existing aquaculture intrusion system which has video oriented service using CCTV has a limit to the thief intrusion detection. But, IoT based intrusion system has solutions for facilities of difficult access locations, 24-hour surveillance needs, and difficult communication and power supply. And mesh networks formed by a large number of simple modules can be economically extended. It is easy to use and extend smartphone applications by cloud and it can be further applied to leave open the possibility of big data technology offers solutions that target the entire

IV. CONCLUSIONS

The results obtained with the work described in this paper allow to conclude that it is possible to reduce substantially the number of false positive events as well as to create new intrusion detection mechanisms from potential attacks.

Overall, we consider the solution proposed to be:

- More reliable, by allowing a better surveillance systems with PIR sensor and solar power supply.
- More accessible, by allowing an Bluetooth mesh communication and 3G communication
- More efficient, by the use of IoT platform, cloud service, and smartphone application.

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