

Intruder Alert System for Aqua Culture with IoT Gateway

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Abstract—Security has a prominence role in every single system designed in a comprehensive scale. In this paper a security mechanism is presented that provides a solution in the field of Aqua culture. As it with physical things much more conviction is needed, especially in the sphere of Aqua culture. Security is one such major concern to address as sources show the share of aqua culture in economic growth of India is remarkable. Due to abnormal growth, lack of oxygen, deficiency of minerals and theft creating a haphazard in turn affects a lot of factors in aqua farms. To be precise theft of these leads to the tremendous loss of the business that leaves the aqua farmers into losses over night. This paper aims to detect a human presence or any living being around these aqua ponds/reservoirs and alert the control system and also sending the information in form of messages to the all nearby remote devices using Internet of Things by storing this data into the cloud in latter stages. The system adopts the IoT gateway as a processor, PIR sensors to detect the intruder and Ubidots open source cloud service to store and analyze the sensed data. At the end control room personnel may get alert notifications in the form Short Message Service, Mobile Call and other alert mechanisms as per the need of the hour.

Index Terms— Aqua farmers, Aqua culture, IoT gateway, PIR, Ubidots.

I. INTRODUCTION

According to FAO it is understood to identify the farming of aquatic organisms including fish, mollusks, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. The reported output from global aquaculture operations in 2014 supplied over one half of the fish and shellfish that is directly consumed by humans; however, there are issues about the reliability of the reported. Further, in current aquaculture practice, products from several pounds of wild fish are used to produce one pound of a piscivorous fish like salmon. Similar studies depicts the failure in expectation due to various factors like lack of oxygen and minerals, abnormal feeds, quality levels of water as shown in figure 1. Particular kinds of aqua culture include fish farming, shrimp farming, oyster farming marine culture, algae culture (such as seaweed farming), and cultivation of ornamental fish. Particular methods include Aquaponics and integrated multi tropic aqua culture both of which integrate fish farming and aquatic plant farming.

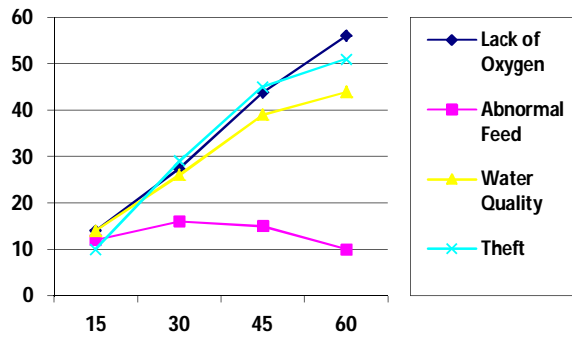


Figure 1. Sample loss due to various reasons in Aqua culture

Especially in countries like India, major contribution for aqua culture is from coastal corridor filled with profound fresh water lakes. The environment and climate as well is good for growing the prawns and shrimps. But the biggest frustrations we face in night harvest culture are theft. As shown above degree is increasing typical and is not anticipate. Security is the sweeping circumstance that can be deployed at all levels of system design in the entire ecosystem of development with automation [3]. Internet of Things is such noteworthy firm hand reinforce all stakeholders of world predominantly officiates connected things with their data sensing, storage, analytics and publishing. Constructive demands solicit aspects for M2M architecture; IoT layered architectures namely ETSI model, OSI seven layered model, ITU-T reference model, IETF specification model and connected things as well at levels of layered architectures. The concept of Internet of things (IOT) was introduced by the growth of the widely used global network known as the internet along with the deployment of ubiquitous computing and mobiles in smart objects which brings new opportunities for the creation of innovative solutions to various aspects of life. The concept of Internet of things (IOT) creates a network of objects that can communicate, interact and cooperate together to reach a common goal. IOT devices can enhance our daily lives, as each device stops acting as a single device and become part of an entire full connected system. This provides us with the resulting data to be analyzed for better decision making, tracking our businesses and monitoring our properties while we are far away from them. Internet of Things applications in the spotlight are Control intensity of vehicles with MQTT over constrained and unconstrained networks, Smart grid system with automated energy harvesting [2] etc as shown in figure 2.

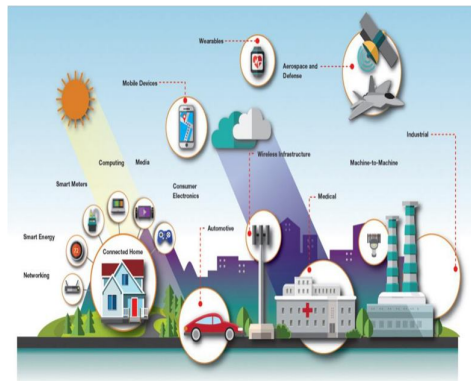


Figure 2: Connected Things and Internet of Things



Figure 3: Things connected in Eco System of Internet of Things

This includes the smart foot wear, smart watch; household accessories, ovens, smart vehicles and every non living thing/ accessory interacted with the cloud as shown in figure 3, and analyzing and evaluating thereafter.

II. RELATED WORK

In conventional methods the quantitative detection of intruder in terms of a theft is referred manually with the nomination authority. But the reaction and response may be delayed and unpredictable due to human loss and errors. At latter stages of analysis the decline in profit generation for upgrading the generalized errors are limited to traditional mechanisms only [7]. As these existed responses are undetermined in aqua harvests, leads to incidental massacre of aqua farmers. The specifics of inputting, feeding the samples are shown in the figure 4 and 5. This manual response relation along with detailed information in traditional scenarios is quarantined with integration and isolation of chambers/ ponds identified. At each and every pond the motive is to estimate the feeding quantity in proportion with the timely count of growing aquatic animals. The terminal factor that really bothers aqua farmers is the credit of lively beings in the pond/reservoir. The methodical arrangement of growing shrimps, prawns do not indulge the characteristic arrangement of theft control. The Systematic clarity cannot adjust as per the responses obtained in the form of replica even in the dark nights [2][4].



Figure 4: Snapshot of Fresh Water lakes



Figure 5: Prawn/shrimp baby samples in aqua pond



Figure 6: In house cultivation of prawns and shrimps

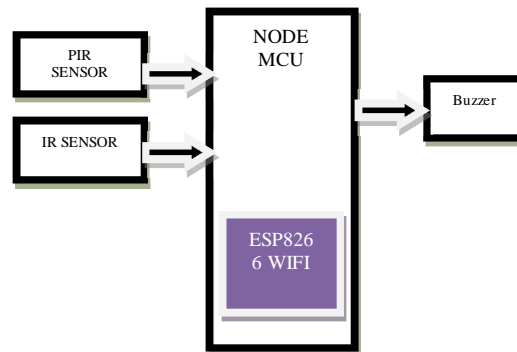


Figure 7: Block Diagram of Intruder Alert System

III. DESIGN AND IMPLEMENTATION

The expected scenario can be well established in reality with inclusion of hardware like sensing devices like object sensor, PIR sensor, and IR sensor. Once the sensing is initiated, ripples along with the regularized data with repeated sensing values is to be processed and stored at remote cloud services like Ubidots for data analytics and generating prudence to actuate the owners. The system design is as shown in figure 7 with a PIR sensor adopted and installed at the entrance of the gate processed and moulded with the support of IoT gateway processor like Raspberry Pi, Arduino, and Node MCU. For ease of connectivity and integration of external devices like GSM modules the assortment is better with Raspberry Pi. The working model is prototyped in such a way to detect the intruder for an intension of threat using PIR/ object sensor [5]. The node MCU processes the sensed data and activates the buzzer in response of identified entry at the installed

system [6]. As shown in circuit diagram of figure 8, ESP 8266 acts as MCU that is connected to digital pins via OUT signal of PIR sensor. If an intrusion is recognized the buzzer is activated that refers a LED ON/OFF. The lay out figure 9 shows equal shared fresh water ponds with internal boundaries between each other. Security measures to control the unauthorized entry are installed at all the estimated corners with line of sight detection in range sensors. The control system is oversee with underpin of Ubidots- Internet of Things data analytics and visualization platform. This is an intensive, interactive and real time data visualization app builder. Prototype embedded with the processor, sensors and connecting wires are shown in figure 10. The hardware for alert mechanism also annex wifi/GSM module integrates with cloud service that enables the channel registration in cloud service.

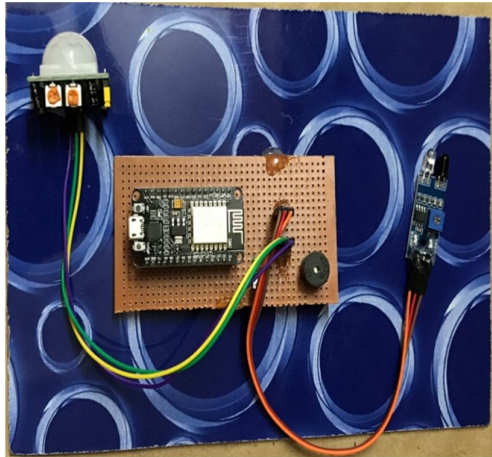


Figure 8: Circuit Diagram of Intruder Alert System

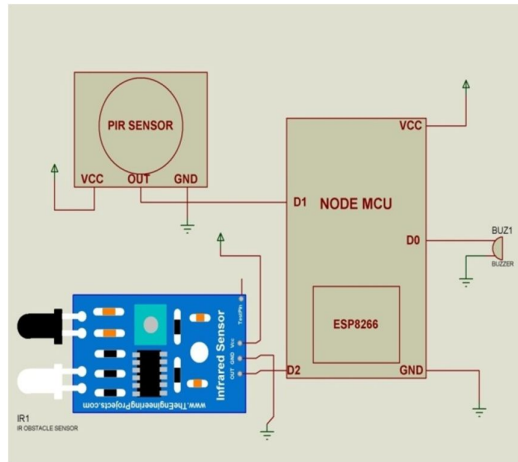


Figure 9: Layout of Intruder Alert System

The id is saved with its unique id precipitated for an application. This may varies occasionally with typical assistance.

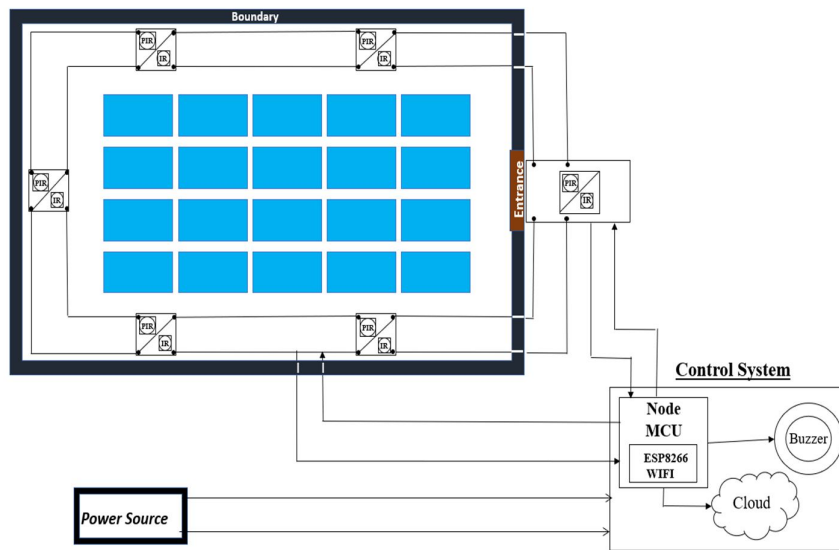


Figure 10: Hardware of Intruder Alert System

IV RESULTS AND FINDINGS

This section of the paper envisages the results established in the veracity of services rendered from cloud service – ubidots. It can be a simple SMS, call alert, email and telegram notification. The attentiveness could

also be extended to sundry social networking applications and websites. This could be anticipated only with the redecorate of cloud security, channel, and notification rehabilitations.

A. FINDING 1

Unauthorized entry identified in the form of a voice call that informs the intrusion with information of date and time with an immediate effect shown in figure 11. Here the spike to culminate is the quick response and control action.

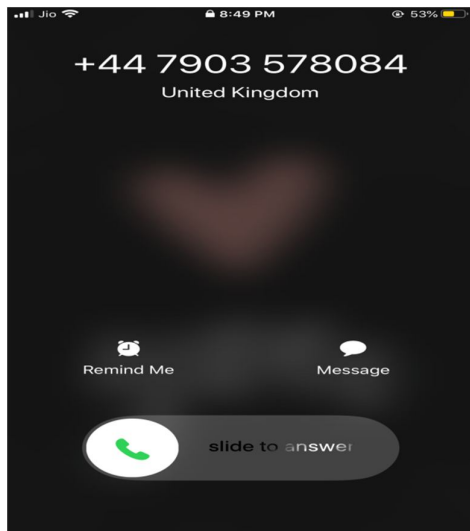


Figure 11: Voice call alert notification

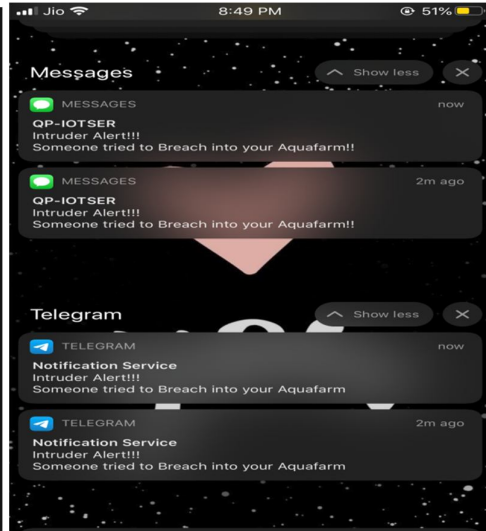


Figure 12: Telegram notification

B. FINDING 2

The latter finding estimates the Telegram notification in figure 12. This feature could be adopted for better innovativeness let escorts the social awareness and digital moderation.

C. FINDING 3

The subsection gives the investigative intuitiveness of the Email alert (figure 13) in case the regular updates with the respective vision of designed installation. Better the control response from the reliable sources better is the trace history and backup mechanisms.

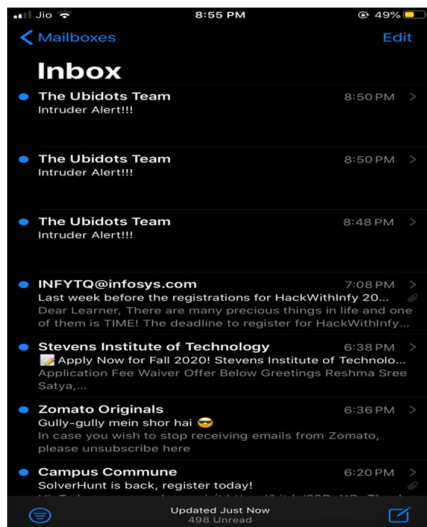


Fig 13: Email alert notification

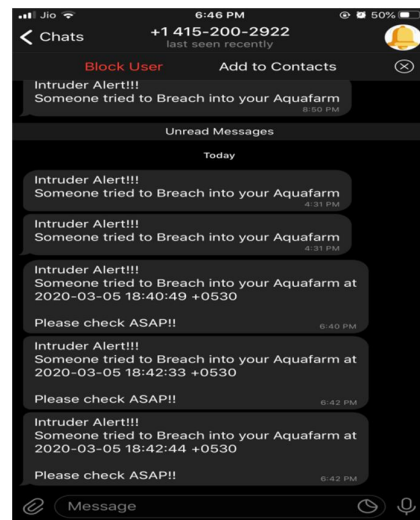


Fig 14: Intruder alert notification with detailed information

D. FINDING 4

Amongst all the discussed and detailed investigations, SMS alert is more reliable and ease of informative control action to adopt quick response filled with in depth control actions in form of date and time of entry.

TABLE I: EPITOME OF RESULTS AND COMPARISON

Alert(s) Generated	Traditional System	Automated system	Security Provision	Respondent action
Voice Calls	×	√	Low/ Moderate	Accurate
SMS	×	√	High	Accurate
Email(s)	×	√	High	Accurate
Telegram	×	√	High	Accurate
Any other/ Social Nwteorking	×	May be implemented	High	Accurate

V. CONCLUSION

Aqua farmers are prime recognized stake holders for employment generation and revenue as well. In special areas of coastal districts south India, consummate investment is into aqua farming in cultivation of shrimps and prawns. Disruptive variants in decrease of samples thrown into water lakes/ ponds are identified for which the count of samples grown in timely manner is to be estimated. This will increase the losses referred with unknown quantity with regular full feeding into reservoirs/ponds. This paper addresses the count to consider for by recognizing the threat/ intrusion near the aqua farms. Later notifying in form of an SMS/ Voice call/ Telegram alert/ Email. A subtle conclusion is given with a well framed automated service for the identified problem in aqua culture.

VI. FUTURE SCOPE

In future the exact replication of sample count is related for interim food feeding that improves the other parameters. The exacerbation for the analysis of feed forward distribution for the data collected on various sensors, recall incarnation, deciding contributions with respective grades, resulting experiences, expected sediments of under water samples growth can be presented. Using the results obtained, profound knowledge on cases of learning tools, data analytics and analysis can be estimated.

REFERENCES

- [1] Doros Soto, "Developing an Environmental Monitoring System to Strengthen Fisheries and Aquaculture Resilience and Improve Early Warning in the Lower Mekong Basin," Food and Agricultural Organization United Nations, FAO/NACA workshop, 2017.
- [2] E. Anna Devi, "Developing an Environmental Monitoring System to Strengthen Fisheries and Aquaculture Resilience and Improve Early Warning in the Lower Mekong Basin" IJIARE, Issue 4, Volume 4, pg 11-15, 2107.
- [3] Sachin, "Automatic Anti Theft Alarm and Alert System Using Arduino & GSM Module " 2016.
- [4] Sanket Parode, "Smart Surveillance System using Raspberry Pi and Face Recognition", IJARCCCE, Volume 6, Issue 4, 621-624, 2017.
- [5] Muhammad R Ahmed, "Malicious attack detection in underwater wireless sensor network", <https://ieeexplore.ieee.org/xpl/conhome/7422344/proceeding>, 2015.
- [6] Yi-Bing-Li, "FishTalk: An IoT-Based Mini Aquarium System", IEEE transactions, volume 7, 2019.
- [7] K. Krishna Kishore, "Automatic Feeding system for Aquaculture", <https://ieeexplore.ieee.org/xpl/conhome/8063614/proceeding>, 2017.
- [8] Kevin Odhiambo Obiero, "Predicting uptake of aquaculture technologies among smallholder fish farmers in Kenya" , Springer series, 2019.
- [9] "Abundant Food, Job Security, and Export Income with Restorative Aqua Culture", Reshaping Development Pathways in LDCs, 2019.
- [10] Martin Fore, Kevin Frank, "Precision fish farming: A new framework to improve production in aquaculture", Biosystems Engineering, Elsevier series, volume 123, 2018.