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# ARM Based Aqua Monitoring System Using Lot Environment

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**ABSTRACT**

In Aqua forming, the yields (prawn, fish etc.) depend on the water characteristics of the aquaculture pond. For maximizing fish or prawn yields, the parameters which are to be kept at certain optimal levels in water are dissolved oxygen, temperature, salinity, and pH levels. These parameters can vary a lot during the period of a day and can rapidly change dependingon the environmental conditions. The changes in the tank parameters majorly effect the yield. Hence it is necessary to monitor these parameters.We are establishing an automatic monitoring system for water tanks of aquaculture along with the IoT (internet of things) technology.

***Keywords:*** Aquaculture, ARM, Automatic Monitoring system, Internet of Things (IoT).

## 1. INTRODUCTION

The Water quality will directly affect the growth of aquaculture objects which damage the production and economic benefits. In the advancement of health culture concept and environment friendly aquaculture, it has greater demands on water quality management [1]. The introduction of monitoring suggested that monitoring was for compliance with regulatory standards for security and safeguarding environmental quality. This is true and forms the basis for monitoring, but other reasons are also crucial. The aquaculture industry has an important "possessor" interest in environmental quality.[3] As pointed out of the earlier water quality (in particular) is of essential importance in maintaining the health of the Aqua cultured resource. This is true whether the reason for optimization of fish growth to legal liability in case of litigation due to unaccepted environmental change which affects other resource users Environmental monitoring is therefore an important part of fish farm management. [5]

In Recent analysis of the water quality is required for a constant observing of the distinctive water quality parameters in the signicant construction [2]. It makes another standard in water quality sensing as the data is to be gathered in the end transmitted wirelessly over a certain period of time. Accurate measurement of water quality requires measurement of the parameters like pH, dissolved oxygen, water temperature, water level etc the pond production is limited by the availability of dissolved oxygen.[4] Dissolved oxygen is the most discriminating quality parameter, since prawns in the low dissolved oxygen are more exposed to diseases. Dissolved oxygen is required for the fish breath, waste decomposition and algal respiration.

## 2. RELATION WITH IOT

With the advancements of the Internet technologies and WSNs, a new trend is forming in the era of ubiquity[9][10] "IoT" is all about physical items talking to each other, where machine- to-machine (M2M) communications and person-to-computer communications will be extended to "things"[6].the architecture of IoT shown in below(fig.1).Since IoT is associated with a large number of wireless sensor devices, it generates a vast number of data. Sensor data acquisition interface equipment is one of the key parts in IoT

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applications. Data collection is the essential application of WSN and more importantly it is the foundation of other advanced applications in IoT environment [11]. IoT is a major drive to support service composition with various applications.

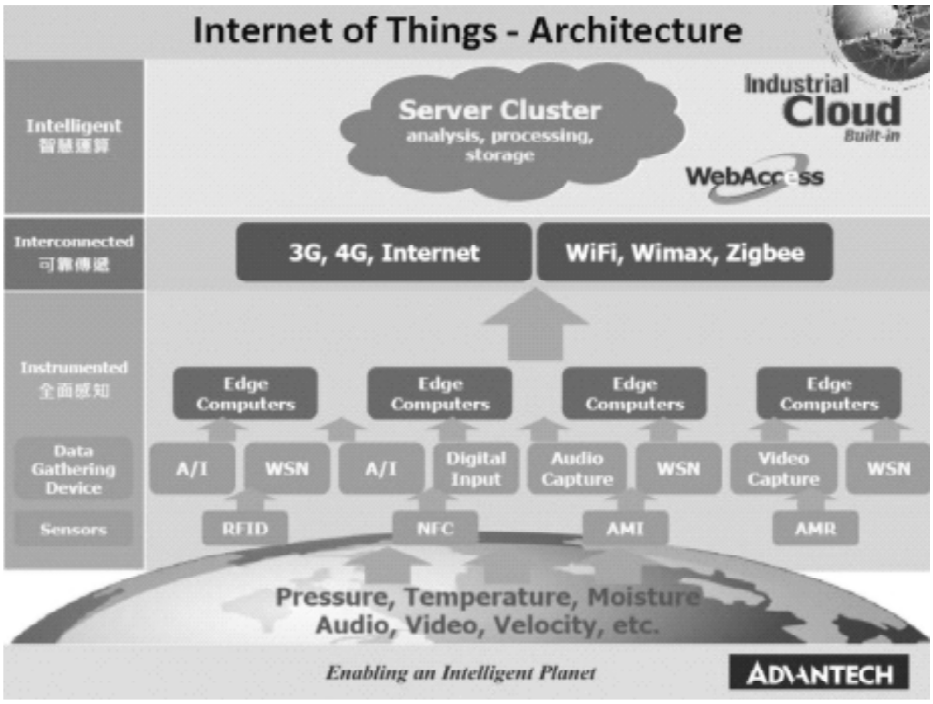



**Figure 1: Architecture of IoT**

Examples of such a workûow include a water environment monitoring system that adopts sensors to detect pollution and water quality. The Water environment monitoring is one of the IoTapplications[6], wherecomplexwaterqualityinformation, issued todetermine thewaterenvironmentalquality atthe same time. However, currently, there are few data collection devices that are dedicated to water quality monitoring on the market. Such devices can ensure high speed of data acquisition for multiple sensors and adapt to complex and various sensor types well. Thus, we design and implement a WSN data acquisition interface that can be used for water environmental monitoring.

## 3. DISCRIPTION OF PROPOED SYSTEM

The proposed system is the water quality monitoring system for the aquaculture. It contains sensors such as temperature, pH, Dissolved oxygen and water level that monitoring and sent to pc through zigbee communication.as shown in below (fig. 2).

**ARM 7:** ARM architecture has become the most pervasive 32bitarchitecture in the world; with wide range of ICs available from various IC manufacturers. ARM processors are embedded in products ranging from cell/mobile phones to automotive braking systems. A worldwide community of ARM partners and third-party vendors has developed among semiconductor and product design companies,including hardware engineers, system designers, and software developers. ARM7 is one of the widely used micro-controller family in embedded system application. This section is humble effort for explaining basic features of ARM-7 [8].

ARM is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture developed by British company ARM Holdings.A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical processors in

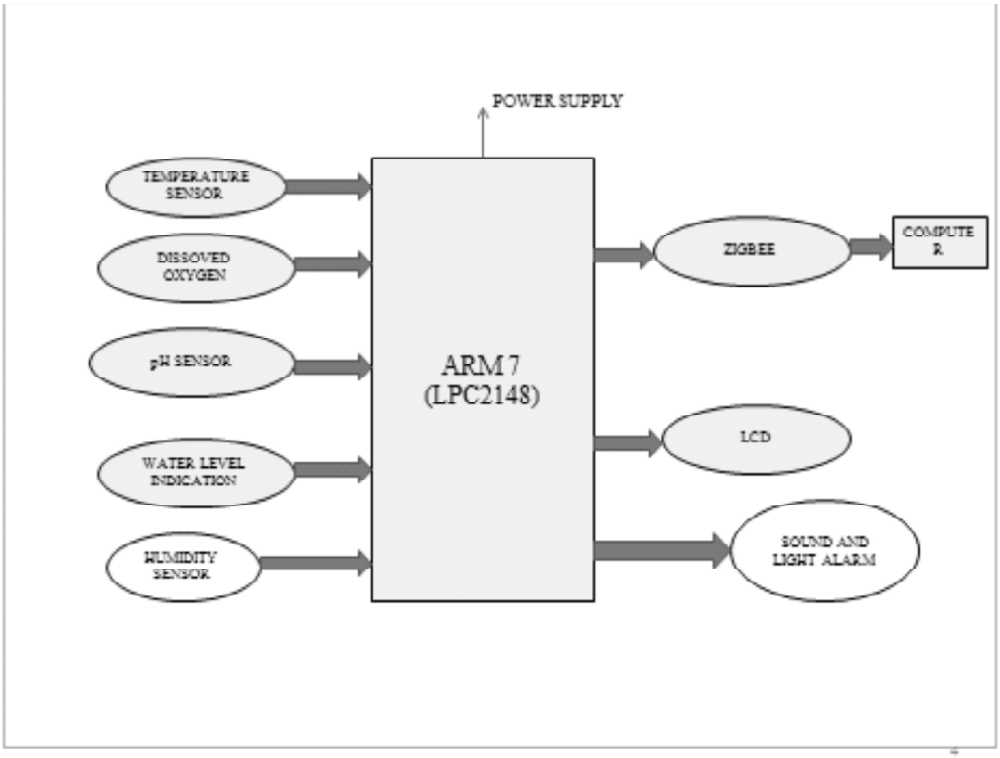



**Figure 2: Hardware diagram of the system**

average computers. This approach reduces costs, heat and power use. These are desirable traits for light, portable, battery-powered devices—including smartphones, laptops, tablet and notepad computers), and other embedded systems [7]. A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost, providing higher processing power and improved energy efficiency for servers and supercomputers.

Features are: 32-bit RISC-processor core (32-bit instructions);37 pieces of 32-bit integer registers (16 available);Pipelined(ARM7:3 stages); High Code density; Mostly Single-cycle execution;8 / 16 / 32 -bit data types; Speed 1Mhz to 1.25Ghz; simple structure, reasonably good speed and power consumption ratio.

SENSORS MADULE

1. *GPP011 PH meter* to measure the value of PH which is akind of immersion probe, type of GPE02P, has the precise of ±0.01pH, the range of output voltage is 0~5V, has a power of 2.5w.
2. *RY952 Oxygen sensor* is used to measure the oxygen. It hasa precise of 0.01mg/L, range of measurement is 0~20mg/L, the range of output voltage in air is 15~20mV, response time is less than 20s.
3. *LM35 Temperature sensor* is used to measure temperature.The input voltage is +5V. The high resistor current resource is changing with a speed of 1ìA/ [7].

**POWER SUPPLY**

In every project we need different voltages for different circuits. So we need to construct different power supply circuits of different voltages employing different voltage transformers, rectifier circuits, filter circuits and regulator circuits. This type of construction requires many components (transformers, capacitors, regulators etc..,) Shown in below (fig. 3). So the size of power supply module becomes costly.

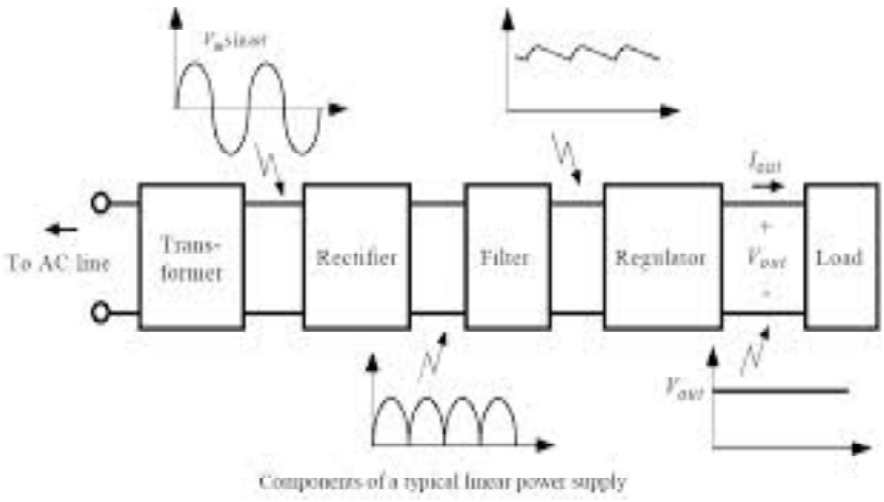



**Figure 3: Components of Regulated Power Supply**

### 3.1. Software Design

Execution flow of the system firmware is shown in the fig. 4. In this the threshold value for sensors is fixed. If the sensor level exceeds the threshold value automatically the alarm is ON.

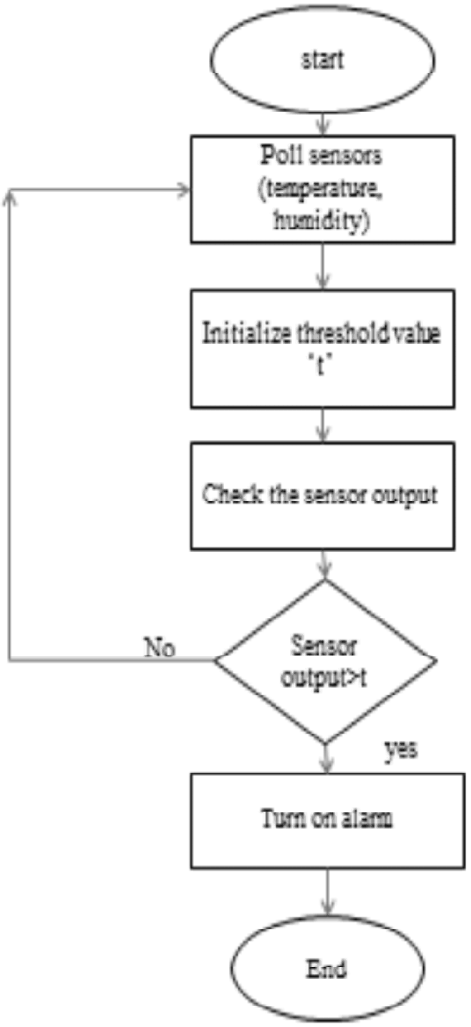



**Figure 4: Flow chart of Aquaculture monitoring system**

### 4.2. Hardware Design

The sensors like temperature, dissolved oxygen,humidity,pH,water level indication is connected to the ARM processor and the values send to the pc(Iot) through zigbee technology. If any sensor value exceeds the threshold value the alarm is sound and the values are shown in computer or the values will displayed in IoT Environment. Prototype implementation of aqua monitoring system is shown in below (fig. 5).

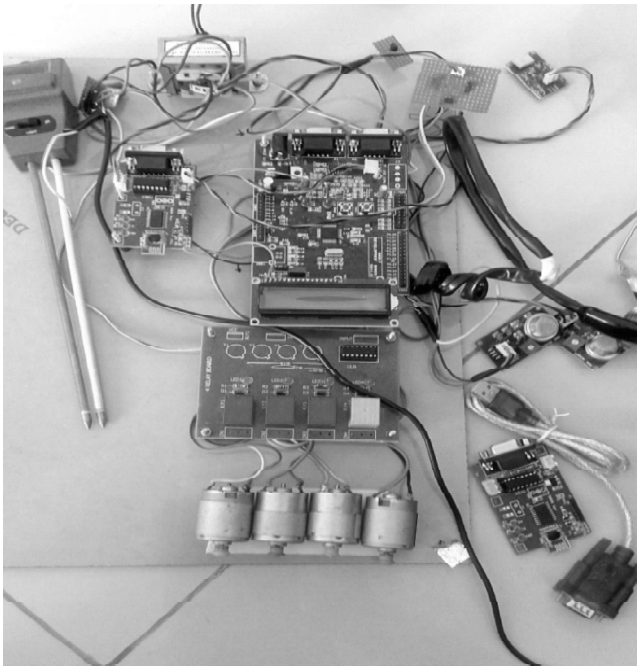


**Figure 5: Prototype of aqua monitoring system**

## 5. RESULTS AND DISCUSSIONS

Sensors values monitoring has been done in proteus ISIS 8.1 software. This software does not support for a sensors, thus equipment electrical output is provided by using variable resister. Shown in below fig. 6.

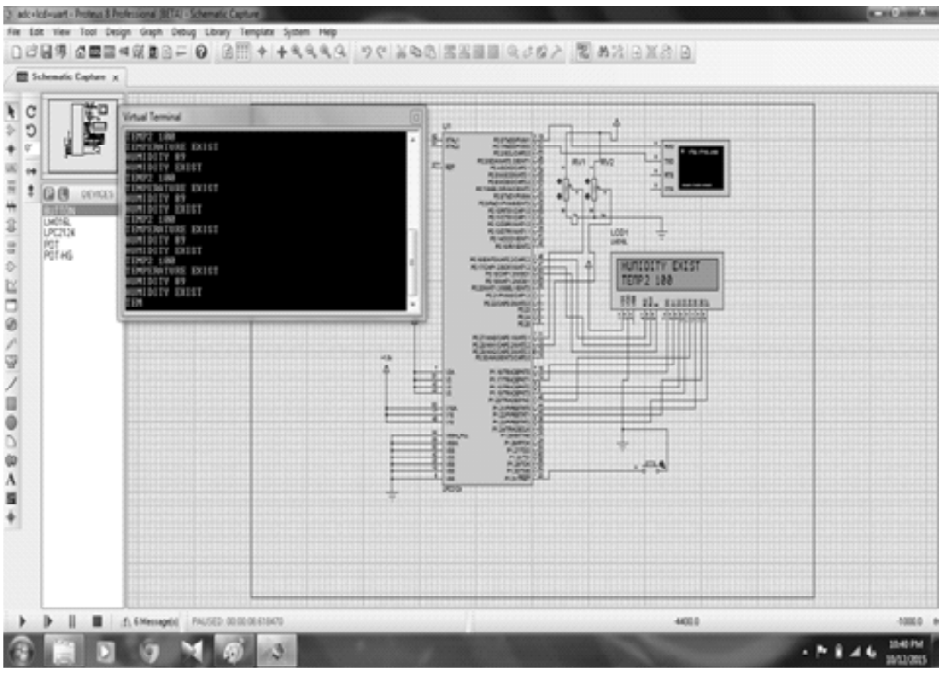


**Figure 6: Proteus simulation**

Storing data in the database of aquaculture environmental information sent from each sensor nodes in real time and also monitoring data shown in below (fig. 7). So that the user can have access to aquaculture environmental information. Information can be opened as datasheet with which user can understand the condition of aquaculture environment and take suitable action for any feasible problems in appropriate time.Sensor value consists of one table for all sensors where the date, time and sensor values are stored in IoT Environment shown in below (fig. 8).

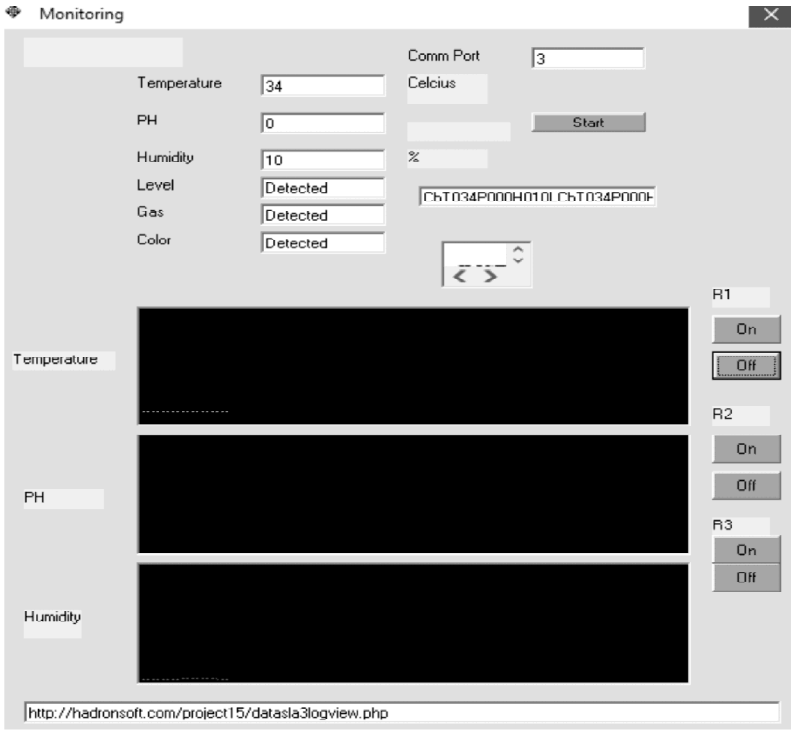
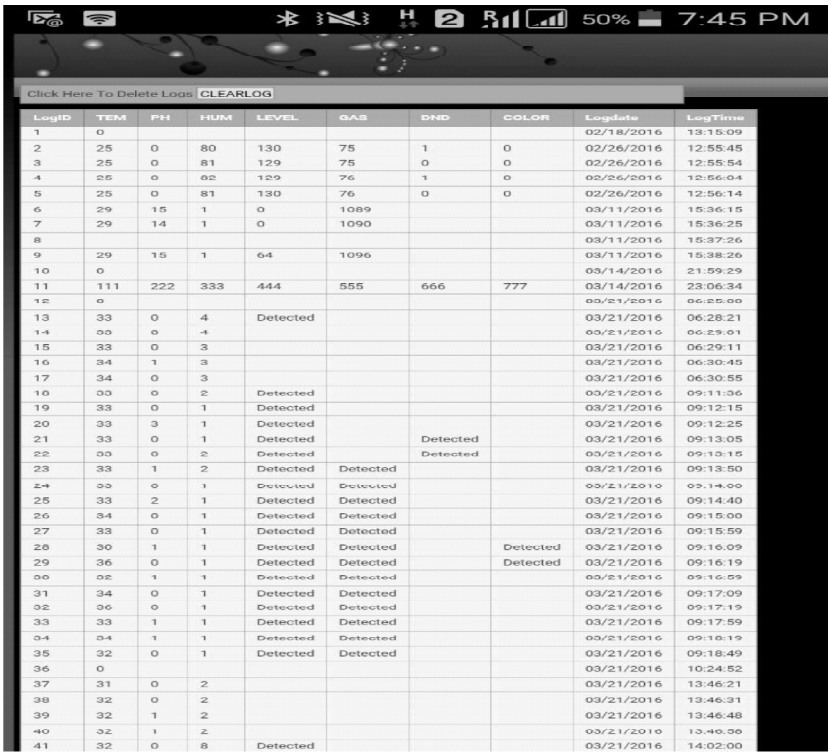



**Figure 7: Data of aqua monitoring system**




| LogID | TEM | PH | HUM | LEVEL | GAS | DND | COLOR | Logdate | LogTime |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | | | | | | | 02/18/2016 | 13:15:09 |
| 2 | 25 | 0 | 80 | 130 | 75 | 1 | 0 | 02/26/2016 | 12:55:45 |
| 3 | 25 | 0 | 81 | 129 | 75 | 0 | 0 | 02/26/2016 | 12:55:54 |
| 4 | 25 | 0 | 82 | 129 | 76 | 1 | 0 | 02/26/2016 | 12:56:04 |
| 5 | 25 | 0 | 81 | 130 | 76 | 0 | 0 | 02/26/2016 | 12:56:14 |
| 6 | 29 | 15 | 1 | 0 | 1089 | | | 03/11/2016 | 15:36:15 |
| 7 | 29 | 14 | 1 | 0 | 1090 | | | 03/11/2016 | 15:36:25 |
| 8 | | | | | | | | 03/11/2016 | 15:37:26 |
| 9 | 29 | 15 | 1 | 64 | 1096 | | | 03/11/2016 | 15:38:26 |
| 10 | 0 | | | | | | | 03/14/2016 | 21:59:29 |
| 11 | 111 | 222 | 333 | 444 | 555 | 666 | 777 | 03/14/2016 | 23:06:34 |
| 12 | 0 | | | | | | | 03/21/2016 | 06:25:00 |
| 13 | 33 | 0 | 4 | Detected | | | | 03/21/2016 | 06:28:21 |
| 14 | 33 | 0 | 4 | | | | | 03/21/2016 | 06:29:01 |
| 15 | 33 | 0 | 3 | | | | | 03/21/2016 | 06:29:11 |
| 16 | 34 | 1 | 3 | | | | | 03/21/2016 | 06:30:45 |
| 17 | 34 | 0 | 3 | | | | | 03/21/2016 | 06:30:55 |
| 18 | 33 | 0 | 2 | Detected | | | | 03/21/2016 | 09:11:36 |
| 19 | 33 | 0 | 1 | Detected | | | | 03/21/2016 | 09:12:15 |
| 20 | 33 | 3 | 1 | Detected | | | | 03/21/2016 | 09:12:25 |
| 21 | 33 | 0 | 1 | Detected | | Detected | | 03/21/2016 | 09:13:05 |
| 22 | 33 | 0 | 2 | Detected | | Detected | | 03/21/2016 | 09:13:15 |
| 23 | 33 | 1 | 2 | Detected | Detected | | | 03/21/2016 | 09:13:50 |
| 24 | 33 | 0 | 1 | Detected | Detected | | | 03/21/2016 | 09:14:00 |
| 25 | 33 | 2 | 1 | Detected | Detected | | | 03/21/2016 | 09:14:40 |
| 26 | 34 | 0 | 1 | Detected | Detected | | | 03/21/2016 | 09:15:00 |
| 27 | 33 | 0 | 1 | Detected | Detected | | | 03/21/2016 | 09:15:59 |
| 28 | 30 | 1 | 1 | Detected | Detected | | Detected | 03/21/2016 | 09:16:09 |
| 29 | 36 | 0 | 1 | Detected | Detected | | Detected | 03/21/2016 | 09:16:19 |
| 30 | 32 | 1 | 1 | Detected | Detected | | | 03/21/2016 | 09:16:59 |
| 31 | 34 | 0 | 1 | Detected | Detected | | | 03/21/2016 | 09:17:09 |
| 32 | 36 | 0 | 1 | Detected | Detected | | | 03/21/2016 | 09:17:19 |
| 33 | 33 | 1 | 1 | Detected | Detected | | | 03/21/2016 | 09:17:59 |
| 34 | 34 | 1 | 1 | Detected | Detected | | | 03/21/2016 | 09:18:19 |
| 35 | 32 | 0 | 1 | Detected | Detected | | | 03/21/2016 | 09:18:49 |
| 36 | 0 | | | | | | | 03/21/2016 | 10:24:52 |
| 37 | 31 | 0 | 2 | | | | | 03/21/2016 | 13:46:21 |
| 38 | 32 | 0 | 2 | | | | | 03/21/2016 | 13:46:31 |
| 39 | 32 | 1 | 2 | | | | | 03/21/2016 | 13:46:48 |
| 40 | 32 | 1 | 2 | | | | | 03/21/2016 | 13:46:58 |
| 41 | 32 | 0 | 8 | Detected | | | | 03/21/2016 | 14:02:00 |

**Figure 8: IoT Results**

## 6. CONCLUSION

ARM based Aqua monitoring system by using IoT environment was designed and implemented. The collected data provides an accurate analysis of successful operation of the system. In future developers it can also possible for the automatic control all the parameters.

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