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# Information Management and IoT Technology for Safety and Security of Smart Home and Farm Systems

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## ABSTRACT

Information management collects data from several online systems. They analyze the information. They issue reports about information for supporting decision-making management. Utilizing current modern innovations to try to control many obstacles such as high cost, high battery power and speed system, safety system, without building a full system to solve all these problems together, the authors created a new internet of things (IoT) system that provides attention to safety and security with low cost, low battery power, and high-speed system. As for the information management system, it aims at protecting remote privacy and managing the data collected from the system. This paper aims at developing an active system for managing most of the smart farm and home obstacles, such issues to deal with the security system for the farm's and house and animal hanger, raining, irrigation and watering system, food supplement system. Also, a network was established to connect all those systems. Connected database storage was used, infra-red (IR). The system is used for monitoring. They send all the collected information back to be maintained. Arduino will be used for programming this system to keep the cost in the required average.

## KEYWORDS

Farm System, Information Management, IoT, Safety and Security Systems, Smart Home

## INTRODUCTION

Information management aims at improving the decision-making process by providing up-to-date, accurate data about various organizational assets(teams, 2020). In this article, the researchers shed light on what is happening with Information management in smart 'home and Farm' based on IoT Technology. The Internet aims at passing information over a vast network for people to access, read, write and process it.

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Nowadays, humans are in a world of smart devices. They use a network called the Internet of Things (IoT) to connect these devices (Al-Qerem, Alauthman, Almomani, & Gupta, 2020; Alieyan, Almomani, Abdullah, Almutairi, & Alauthman, 2020; Celesti et al., 2020; Gupta & Narayan, 2019). Today, IoT has been developing much. For instance, about 50 billion items is connected to the Internet in 2020. IoT may be used in numerous locations. They can be used in speakers, smart home,smart building, intelligent gates and intelligent devices. Through the aid of other technologies (e.g. wireless sensor networks, cloud computing, and radiofrequency recognition), each device can be linked, interacted and communicated (Castiglione et al., 2015; Gupta & Quamara, 2018; Plageras, Psannis, Stergiou, Wang, & Gupta, 2018; Shahzadi, Tausif, Ferzund, Suryani, & Applications, 2016).

Every house (e.g. administrative, commercial and residential houses) consists mainly of various systems. Such systems carry out specific duties and works during the lifetime of the building or place (Shakeri et al., 2017). The greater the number of the subsystems and responsibilities they carry out, the harder they shall become to manage (Shakeri et al., 2017; Sun et al., 2013). Many services (e.g. ventilation, illumination, fire alarm, safety, video surveillance, etc..) are controlled remotely today. Despite that, the entire range of services is continuously monitored, administered and maintained. However, sometimes even the trained staff fail to carry out their duties effectively (Sun et al., 2013). Many of the conditions of such failure are attributed to global threats to building, earthquakes and other environmental catastrophes (Nascimento et al., 2014). Panic attacks may occur in such cases. Thus, the level of quality may decline (Lypak, Rzheuskyi, Kunanets, & Pasichnyk, 2018).

The motivation of our proposed system based on critical information such as, in 2018, there were about 3645 deaths in the USA during fires (administration, 2020). The rate of thefts is approximately 4.1 cases per 100,000 individuals in the latter year (Harrendorf, Heiskanen, & Malby, 2010). People try to make something to make the rate be less like make smart lock doors and make smart fire sprinkler. However, no one tries to make full system nor make the civil defence and police part more effective. Therefore, in our motivation, the world still no have supported a complete smart farm system capable of managing all agricultural and animal work requirements without human intervention. So that, we try to solve this problem by using IOT technology which supports machine that can't be in a panic and can do the safety measures correctly and fast to make sure we will make the dead rate be less**.** We will develop a system that is effective as much as possible, including low cost, low battery power, and respond to any event quickly. Supporting a full smart farm system capable of managing all agricultural and animal work requirements without human intervention and collecting the information issued from them remotely using a database linked to cloud computing

In the proposed system, the researchers will take the advantages of information management. They will use it in smart 'home and Farm' based on IoT technology. The safety and security system will provide the owner with the ability to monitor the house and the farm remotely.

The system in this study provides food and water for animals based on the recommended quantities. Such food includes all the needed nutrients. The system offers food and water to animals at a specific and appropriate timing in an elegant manner without having any human intervention. The raining alerting system deals with social duties. For instance, it closes the farm's house windows. It stops the irrigation process to keep the house clean while raining. It controls the irrigation on that day. That shall contribute to saving water.

The efforts in this paper aim to combine various aspects of the smart home and farm into one platform. Also, this platform presents 3 systems consist of 7subsystems connected to a database. A farm supposed to have a field, house, and hanger to store and maintain the farm tools and supplements. Thus, this paper shed light on the security and safety system of the house and hanger, the process of food supplement, the irrigation process and its relationship with the raining situation, and the watering system.

The main goal sought from our project is represented in building an active system to manage the house problems. The sub-objectives of our strategy include in maintaining the Security of the house while it's empty. They include decreasing the rate of fatalities in fires. They have: making life easier and more comfortable for busy people. In this system, the researchers try to make the farm a comfortable place as much as possible by using many methods. This system includes several subsystems, such as the security system of the house and security system for the hanger. Other subsystems include the ones that aim at making the daily works easy like irrigation system and central heating and condition system. So we built a new internet of things ( IoT) system that provides attention to safety, and Security with low cost, low battery power and high-speed system.

The rest of the paper is organized as follows: Section 2: It includes a review of the relevant works and literature, Section 3: It consists of the proposed methodology which sheds light on the system design. It sheds light on the performance of the proposed method, Section 4: It includes information about the system implementation and testing and results, section 5: It provides conclusion and recommendations for future work.

## LITERATURE REVIEW

Managing the systems of smart homes and farms have been increasing recently. The use of such systems saves money, effort, and time. The following sections present the literature related to the management of smart home and farms.

### System of Control and Security

Many articles shed light on the relationship between information technology and IoT technology. They also shed light on their role in intelligent living, capturing photos, alarms, foods (Bujari et al., 2018; Carpentieri et al., 2020; Durairaj & Asha, 2020; Zhao, Chen, Liu, Baker, & Zhang, 2020). It is estimated that the smart cities market is estimated to grow from $52 billion in 2015 to $147 billion by the end of the year 2020 (Bujari et al., 2018). The main perceived benefits of smartness are energy, money and time savings (Wilson, Hargreaves, & Hauxwell-Baldwin, 2017). According to Mital et al. (2018), when appliances simplify daily work, people shall accept new, intelligent devices in their homes. According to (Lee, Kwon, Lee, & Kim, 2017), the smart home contributes to improving social support.

Security based motion detection (Tewari & Gupta, 2020) (Hasan, Anik, & Islam, 2018) A motion detector/sensor is a system that has the ability to sense movement of objects (especially humans) in a certain range, it can pick up motion in different forms, such as radio waves, infrared rays, (e.g. triggering alarms) if any movement changes are recognized depending on user requirements.

Digital revolution should enhance the traditional functioning of home objects. It aims at meeting the needs of various types of technology users. It aims at achieving that to raise efficiency and improve living experiences. The interfaces built should be easy to use. It should meet the user requirements (e.g. telling the user if the door is not closed) (Chen, Chang, & Applications, 2009; Strickland, 2011). Based on (Yang, Lee, Zo, & Systems, 2017), a decision on adopting the smart home may affect certain variables (e.g. Security, risk privacy and trust). Therefore, the intelligent home design should adapt to changes that occur to the people's lifestyles and needs (Balta-Ozkan, Davidson, Bicket, & Whitmarsh, 2013). Individuals use smart home technologies if the potential sacrifices are comparable to the concerned value or benefits (Kim, Park, Choi, & Excellence, 2017).

#### *Farming*

The researchers reviewed various approaches based on the sensors used, the part of the farm that has been served, etc... Shahzadi et al. (2016) developed that an expert program combined with IoT management for the cotton crop which sensors were installed through using Waspnote Agriculture Sensors Board. The program aims at tracking various parameters (e.g. temperature, humidity, etc..) to inform farmers via their phones. Bhavani and Begum (2017) employed IoT, Wireless service network )WSN( and cloud technology. They also implemented nodes, which are a series of different sensors, combined to form a single device for the measurement of various physical and environmental factors. The data is collected and stored in the cloud. Then, it is analyzed using MongoDB Cloud and R programming. Jha, Kumar, Joshi, and Pandey (2017) provide how IoT and sensors can be used to monitor agricultural fields in their paper. They aimed to equate the data obtained from the sensors to the data collected under optimal conditions.

### *Smart Farming Applications*

For water consumption to be controlled, FIWARE cloud components are combined with a PF program. In the reference of (Pawlowski, Sánchez-Molina, Guzmán, Rodríguez, & Dormido, 2017), tomatoes are observed in the greenhouse. The latter authors developed a method for evaluating the performance of several settings through using plant transpiration. The works of (Akkaş & Sokullu, 2017; Bajer & Krejcar, 2015) shed light on the use of low-cost and generic sensor nodes in greenhouses based on the Arduino platform and MICAz Motes, respectively. Greater use of SF techniques is a requirement in the implementation of low-cost and easy to replace sensor nodes. For many years, battery-powered devices like the ZigBee devices are essential in a farm (Akkaş & Sokullu, 2017). Several external systems are used to track wireless sensor data. This knowledge is used for statistical analysis. Below are a few IoT farming apps:1. SmartFarmNet: It provides a response to queries in real-time that are made from sensors via series-time data streams. (Saraf & Gawali, 2017) The proposed framework in this paper is based on IoT, which uses input data in real-time. The intelligent farm irrigation system uses an Android phone to track and control drips via the wireless sensor network remotely.

### *The Food Safety and IoT*

The ability to generate benefits from combining food safety practices with standard low-cost technology like IoT is essential. Although economies of scale may be possible in the future, there is a problem in finding viable and demonstrable short-term benefits, especially in the short run.

Using IoT technology in the food safety sector should not be an exciting diversion. The firms enforcing regulation recognized the real economic benefits of employing active sensors in the data acquisition process. Data collection isn't conducted only by humans. It significantly affects the costs and time ("How the Internet of Things is Shaking Up Food Safety," 2016).

IoT also allows for more excellent and more aggressive analysis of the energy use of machinery relating to food chain operation. The performance of the refrigeration systems, in particular, has a significant effect on food chain protection. What is significant is that the energy efficiency of this system has major economic significance. This system provides an indicator of the temperature fluctuations that directly affect food safety. IoT can play a critical role in controlling and solving the problems related to temperature variations and power consumption (Quamara, Gupta, & Yamaguchi, 2019; Roeder, 2016).

## Irrigation

The Wireless service network) WSN (is widely used today for solving many real-world problems. It is a network for sensors. Agriculture is an important field. Automatic irrigation is discussed in this section.

Gutierrez built an automated irrigation system with WSN and GPRS, Villa-Medina et al. This machine distributes the soil moisture and temperature sensor network in the root region of the plants. The sensor data is obtained and forwarded to the website by the gateway. This algorithm sets the temperature and soil water threshold value programmed for the regulation of the water quantity for irrigation through using a microcontroller-based gateway.

## Information Management in Smart Farms

A remote surveillance system was developed by Liao, Zhang, Fang, and Xu (2015). This system can be used for supervising farmland in real-time and making significant choices. The dataset is collected from a farm through using Zig Bee modules, which fusion data is transmitted via an ARM microcontroller with high-performance controllers and transfers the data to remote computers using GPRS modules for informed management decisions using the computer. This system aims at improving agricultural production and reducing costs efficiently.

The agricultural information technology (AIT) has been used (Yan-e, 2011) in all the aspects related to farming. It will become the most efficient mean for improving agricultural production. It will become the most efficient mean for using agricultural resources efficiently. Agriculture information management affects agricultural information and presentation. Throughout this experiment, the design method and architecture of intelligent agriculture information technology is designed in detail. That is done to introduce the concept of agricultural information management. It is done to analyze some characteristics of the characteristics of agricultural data. An illustration is given about the implementation of the farm production system.

However, most of the current systems still have problems in cost or speed of system, consumption battery power or focus on one objective so this review motivates one to think about a comprehensive solution that is related to smartness in modern home and farms. We present study shed light on the need for the smart home and farm. They proposed more ideas that support safety and Security, watering process, food supplement, irrigation, hangers, and resource management; Table 1 shows

**Table 1. A comparative smart ‘home and Farm’ systems based on IoT Technology systems**

| No | Activities | References | Advantages | Disadvantages |
|---|---|---|---|---|
| 1 | System of Control and Security | (Hasan et al., 2018) | Discussed how Motion detection based Security able to save smart home | It is not connected with the police office centre or civil defence, and this system consumption a vast amount of energy based on 24 monitoring system |
| 2 | Farming | (Jha et al., 2017) | Take the appropriate action and notify farmers in case there is a deviation from the determined values | IoT sensor node depends on Battery power at night which may cause unavailability |
| 3 | Smart farming applications | (Pawlowski et al., 2017) | developed a method for evaluating the performance of several settings through using plant transpiration | Other smart farm issues were not addressed, such as Soil moisture,..etc |
| 4 | The food safety and IoT | (“How the Internet of Things is Shaking Up Food Safety,” 2016) | firms enforcing regulation recognized the real economic benefits of employing active sensors in the data acquisition process | Data acquisition process significantly affects the costs and time |
| 5 | Irrigation | (Saraf & Gawali, 2017) | The proposed system based on IoT that uses. Smart farm irrigation system uses an android phone for remote monitoring and controlling of drips through the wireless sensor network | System design to do fix job related with irrigation only not connected with other farming requirements |
| 6 | Information management in smart farms | (Liao et al., 2015) | This system aims at improving agricultural production and reducing costs efficiently | Focused on the agricultural side only |
| 7 | Our proposed system | | Developing an active system for managing most of the smart home and farm obstacles (e.g. securing the farm’s house while it’s empty, the system design to connecting with the police office centre and civil defence, decreasing the rate of deaths in fires, and making life easier and more comfortable), it is included three systems consist of seven subsystems solved, it does not cost, and time, need low smartphone Battery power, food system to animal and farming system saving water, and many other advantages discussed in proposed sections. | The system needs to detect many parameters before began |

A comparative study summarizes the last systems build in smart 'home and Farm' based on IoT Technology systems.

## PROPOSED METHODOLOGY

In this section, we will discuss in details how our proposed will combine seven subsystems in IoT technology to build full smart 'home and farm' systems. Figure 1 presents the smart home and farm system activity diagram and the way the systems operates. It is illustrated further. The researchers displayed the design of the proposed systems and database.

Figure 1 presents each subsystem in the proposed main system. It presents the main objectives of each stage. The researchers of the presented study utilized information management systems with IoT technology. Such utilization aims to construct a novel privacy-preserving remote data integrity checking scheme. That is done to build a smart home and farm system. The proposed system consists of 7 subsystems. Those subsystems are illustrated in the argument below. The researcher designed a *safety and security system*. The latter subsystem aims to make the house and the farm more secure and safe. It presents on the screen the things that the user should do. Such things include: "*enter the password*", telling one who uses the system, telling one what he needs to do. They include: communicating with the police in case someone tried to enter the house without having true signals. There are more details illustrated in the sections below. Shown in details as follow.

### Safety and Security System

This system can be accessed by providing the owner with a tag and password. In addition, the Civil Defense can be accessed through a tag. Figure 2 shows the safety and security system flowchart. The researchers draw shed light on this flowchart in order to make sure that the information is clarified. The full description of this flowchart is discussed in the argument following Figure 2, pseudocode written in experimental design testing section.

Figure 2 presents the display *safety and security system flowchart*. It presents the way we managed the information between the system phases.

**Figure 1. The Smart Home and Farm System Activity Diagram**

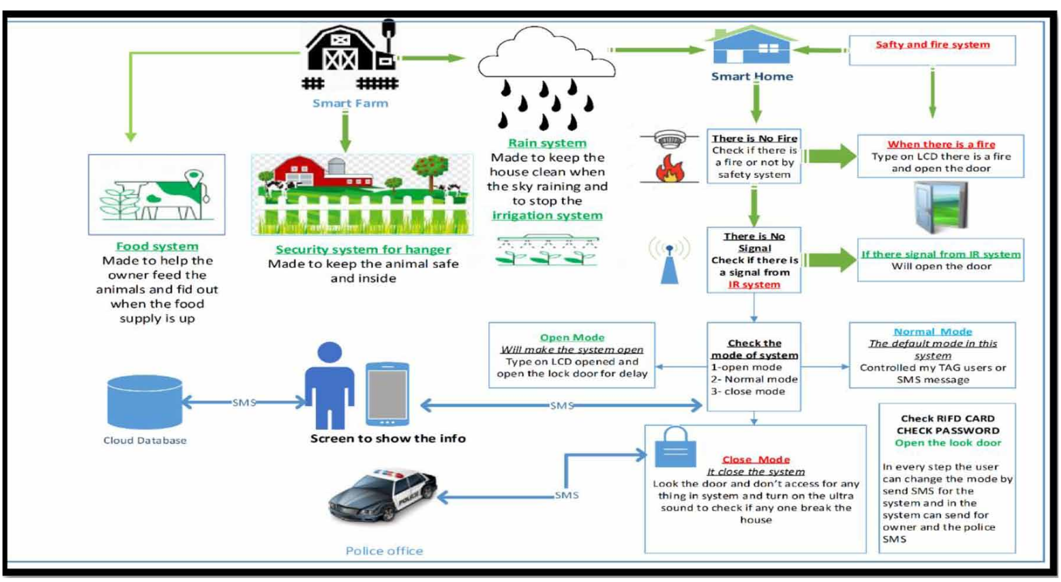
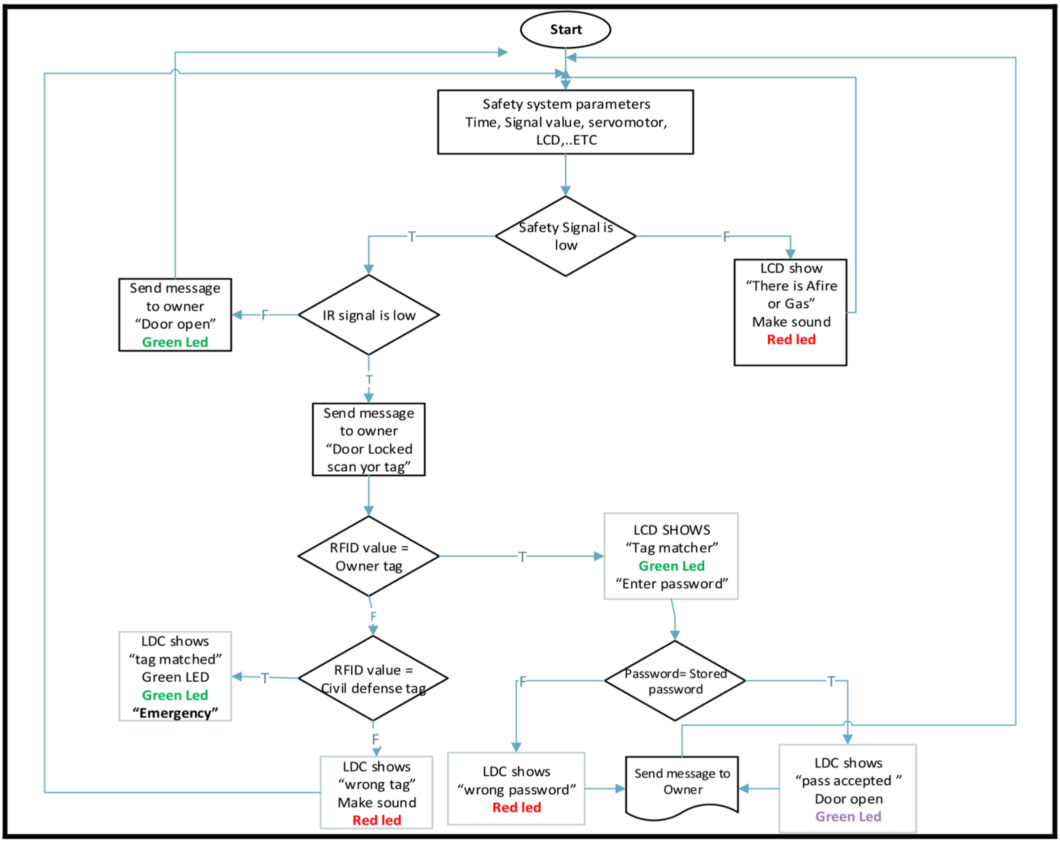


Figure 2. Safety and security system flowchart




## How Does the Safety and Security System Operate?

This system has three modes.

### *Open Mode*

The *Open* mode will be activated in two conditions.

*The first condition* is represented in having the owner sending an SMS for the system containing "*open*".

*The second condition* is represented in having the safety system sending a signal for this system. This signal means that there is a fire in the house. This model of the system will be like it is halted. Anyone can go inside the house without a tag or password. In this case, the system will go back to normal mode after some time (one can choose any duration he/she wants).

### *PC*

Assuming that this mode is activated, if the system received a message from the owner, the LCD will show "*opened*". Then the green led will be on for a while (about 5 seconds in the test). In this case, the locked door will be opened.

If the safety system sends a signal, the LCD will show "There is a fire or gas infiltration". The system will turn the red led on, and the buzzer will make a tone for a while (about 5 seconds in test). In this case, the locked door will be opened. In this case, the users can operate their information management systems remotely, in a high-speed system with low battery power because it depends on an SMS message.

### Close Mode

The ***Close*** mode will be activated when the owner sends a message for the system containing "***close***". In this mode, the system will reject any tag or open the door. It will turn on the ultrasound to notes in case anyone tries to break into the house. If someone breaks into the house, the system will send a message for the owner containing "someone is breaking into the house". In this case, the system will send another message to the police. The latter message states: "someone is breaking into my house" and data about the house location.

Note: The mode will get back to the normal mode through receiving a message.
PC: when this mode is activated, the LCD will show "closed". In this case, the system will send a signal to the database to store the time and event.

### Normal Mode

This mode is the default mode in this system.

When this mode is activated, the following statement is shown on the LCD "*Door lock*" and "*scan your tag*". After scanning the tag, 3 cases may occur. Such cases are:

1. *The first case:* The tag matches the Civil Defenses tag.

In this case, the door shall be locked. It shall show the following statement: "Tag Matched". Then, it will show the following word: "Emergency" and reset after a while (we make the duration 5 seconds).

2. *The second case*: The tag matches the owner tag.

In this case, the LCD will show the following statement: "Tag Matched". Then, it will show the following statement: "Enter password". It will store the numbers or characters and type '*' on the screen to inform the user that he has entered the password. That will lead us in another two cases.

*The first case:* when the password matched, it will type on the screen "pass Accepted" and "Door opened" after that; it will send a message to the owner containing "Door opened. If it wasn't you, type 'close' to halt the system". After that, it will open the door after some delay to check if there is are spend to the message from the owner.

*The second case:* when the password doesn't make a match, the system will show the following statement "Wrong password". It will make a tone from the buzzer. It will activate the red led on. After that, it will send a message to the owner stating the following "Someone Tried with the wrong password. Type close to halt the system." After about 1 second, the system will go back to normal

3. The last case when the tag doesn't match the storage tags.

In this case, it will show the following statements: "The wrong Tag Shown" and "Access Denied". In this case, the buzzer will make a high tone and the red led on. In this case, the system will send a message for the owner containing "Someone Tried with a wrong tag" and "Type 'close' to halt the system". After about 1.5 seconds, the red led will be closed, and the buzzer will not make any tone.

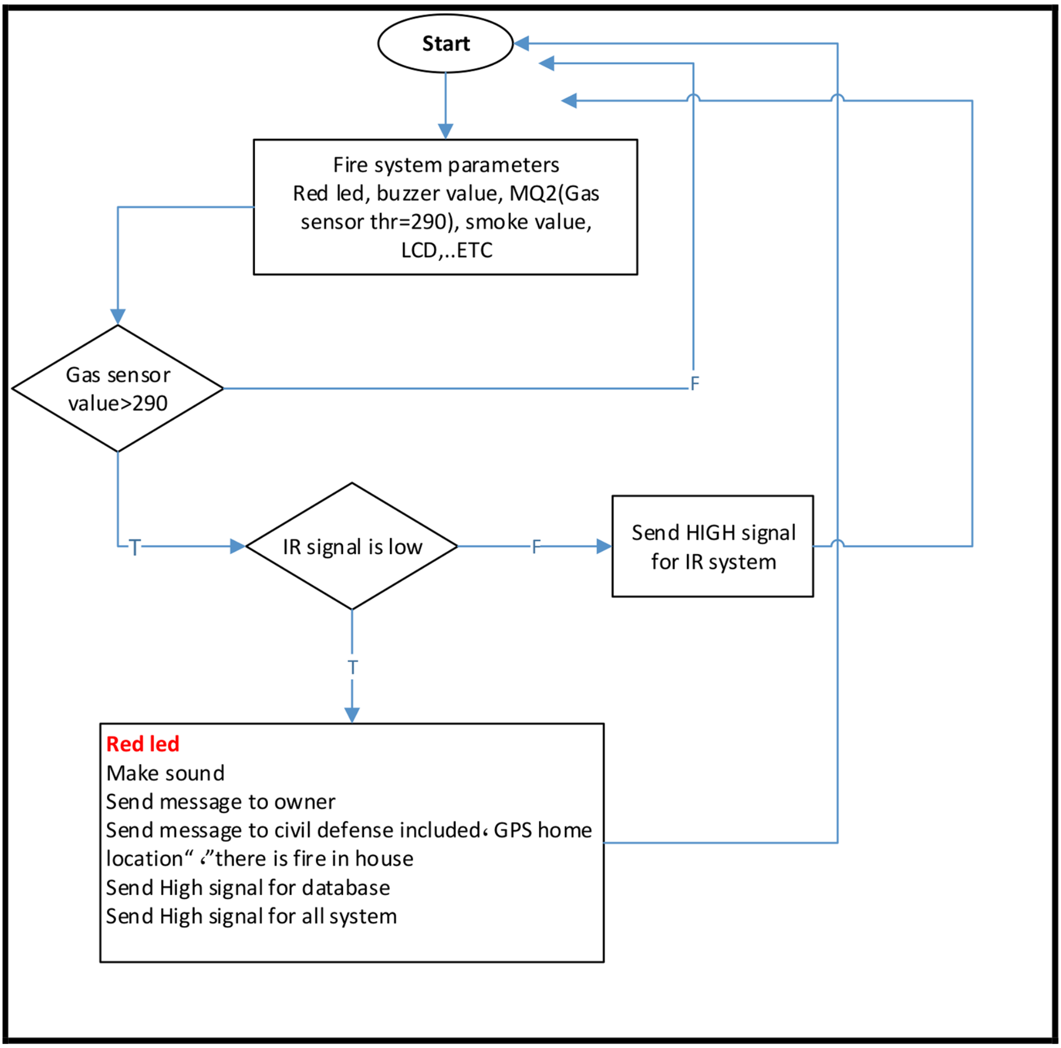
## House Fire System

This system aims to take preventive measures. It seeks to measure the rate of gas in the area. That is done in order to identify whether the rate is normal or not. Then, the system will take preventive measures. Such measures are listed below:

1. Sending a signal for all system to give priority for preventive measures;
2. Sending a signal for the IR system to open the windows and close all lights;
3. Sending a signal for the security system to open the door;
4. Sending a message for the civil defence and the owner;
5. Sending a signal for the database;
6. Opening sprinkler.

Figure 3 shows the house fire system flowchart, while pseudocode is written in an experimental design testing section.

**Figure 3. House Fire system flowchart**



However, IR system: This System aims to make the control easier (e.g. turning on the lights and windows, and managing the data collected from IR system,IR technology usEd in all sub system.

## Hangar Security System

It aims to protect the barn from several risks that one may face. That is done by taking several procedures and complying with rules in the barn to reduce these risks.

Benefits: The System provides the necessary protection for the barn from entering unauthorized people or stealing.

How does the system operate?

We developed an information management system that relies on controlling all hangar facility as flow: There are several presses at the door of the barn. If a person presses a group of presses in a certain pattern, the lighting that is present at the door shall be changed from red to green. Such change indicates that the door was opened, and the protection device was stopped. Otherwise, the protection device remains activated. The protection device consists of several devices that aim to measure the distance. The first device is used for making sure that the animals are present in the barn. The second devices are used to make sure that there is no person inside the barn. If the device found that there is no animal inside the barn or that a person has entered the barn, it shall start the alarm and turn on the red light. The red light indicates that the barn is in danger. In this case, a warning message shall be sent to the owner of the barn about the situation inside the barn—pseudocode written in experimental design testing section.

## Water and Rain System

A system that measures the rate of water in a tank, to check the water storage for house storage and irrigation storage, so we will have included two subsystems are Rain system This System made to close house windows and stop Irrigation system if was there rain as shown in Figure 4, and Irrigation system: It supplies the soil with water at specified intervals and in a smart way without human intervention.

For life and for economics, water is a vital resource. Today, the management of water scarcity is one of the most important challenges. So we focus, to build a full management system based on IoT technology for improving the water utilization.

### *Water and Rain System Benefits*

It intelligently measures the rate of water in the tank without human intervention and sends a warning message to the person that the water is about to run out. How the system works: it measures the rate of water in the tank using a distance measurement piece and compares the reading to the normal rate determined by the human being. If the water reaches less than the normal limit, it sends a warning message to the homeowner that the water is about to run out and if the percentage of water in the reservoir for irrigation reaches less from the natural limit, it also sends a signal to the irrigation system not to irrigate due to the low water level. Figure 4 shows the Water system flowchart, pseudocode written in experimental design testing section.

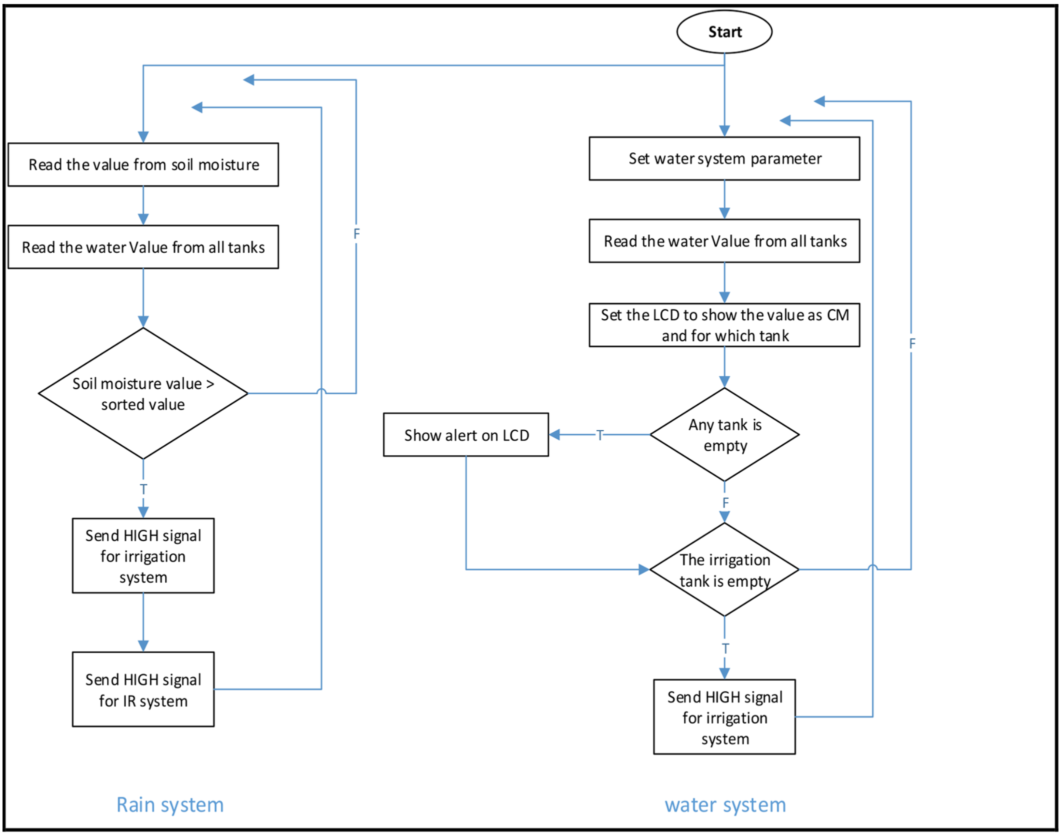
## Irrigation System

It is the process of supplying the soil with water by installing devices such as sprinklers.

### *Irrigation System Benefits*

It supplies the soil with water at specified intervals and in a smart way without human intervention, and this system helps to regulate irrigation and makes it easier for people. How the system works: Initially, this system receives a signal from the water system that checks if there is water in the tank or not and the rain system that inspects it is raining or not, if it does not rain and if there is water in the tank, irrigation is done according to certain times that are determined by the owner as shown in Figure 5.

Figure 4. Water and rain system flowchart




### Food System

The food system aims to help the owner in feeding the animals. It aims to find out when the food supply is up. We provide Figure 6. Food system flowchart below and a Pseudocode written in experimental design testing section. Such a description is provided to show the way the system operates.

### Database System

Cloud Database aim to store the data collected from all systems as separately. It aims to show reports. To display this report, type the user need to take the SD card and put it in SD reader when the user opens the SD card will see his information.

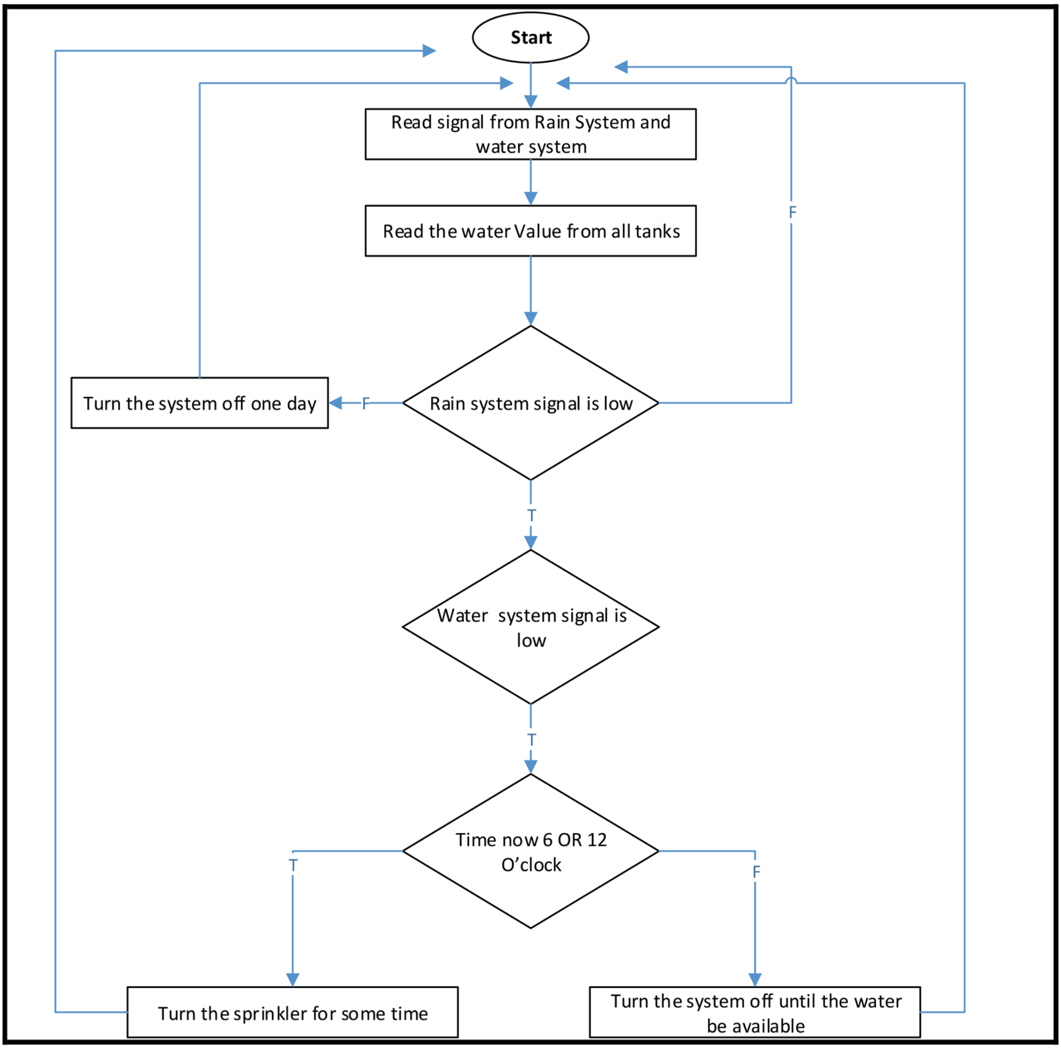
The cloud database in the proposed system is very important. It can manage the information collected from any location. One can track the user's full system from any place and at any time, with high speed.

## EXPERIMENTAL DESIGN TESTING AND VALIDATION

Arduino is used for programming this project-to keep the cost within the determined limit.

In the proposed methodology section, the researchers explained the way the systems operate. They provide information about the tool and sensors used in the proposed smart home and farm system. Information about that is shown through Table 2 which shows in the Appendix.

**Figure 5. Irrigation system flowchart**



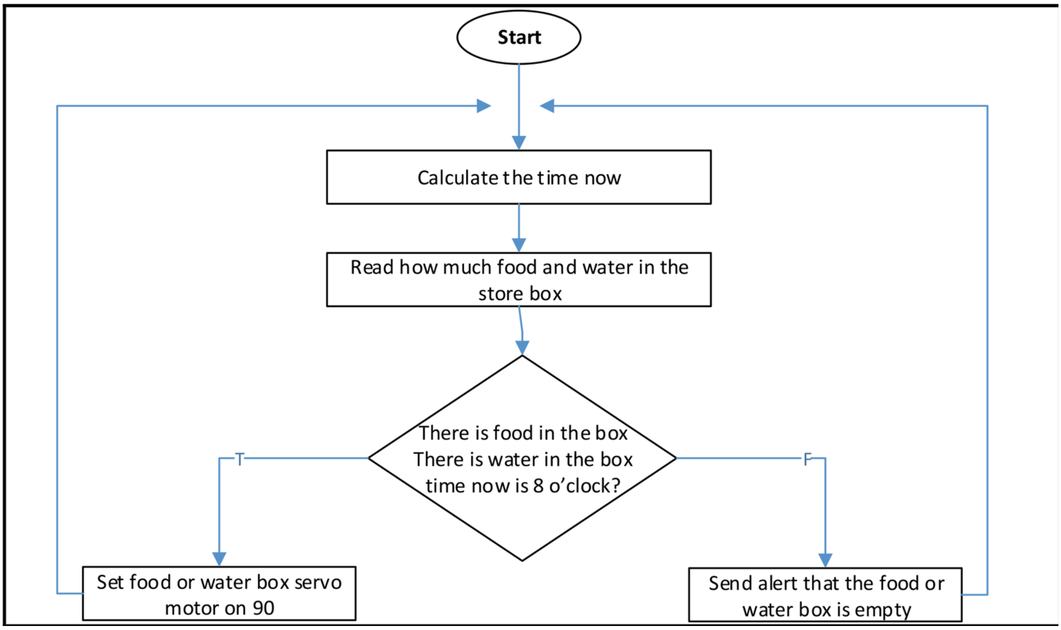

However, we developed a safety and security system with house fire system. The latter subsystem aims to take safety measures automatically and communicate with the civil defence. We developed the security system for the hanger. The latter subsystem aims to keep the animals safe and inside the farm part. We developed the water system. The latter subsystem aims to check the water storage for 1.house storage, 2.irrigation storage. It consists of two more subsystems which are:

1. **Rain system:** It aims to keep the house clean when the sky raining. It aims to stop the irrigation on the raising day. It initiates its operations 24 hours after the rain stops.
2. **Irrigation system:** It aims to make the irrigation process easier.

However, our system works at high speed because it depends on SMS message to control full order.

We developed the IR system: This subsystem aims to make the control process easier (e.g. turning on the lights and opening the windows, and etc..). We developed the food system; the latter subsystem aims to help the owner in feeding the animals and find out when the food supply is up.

**Figure 6. Food system flowchart**




We developed the database system. The latter subsystem aims to store information collected from all systems as separately. It aims to show the owner the information to keep him informed. However, the information management system aims to connect all the subsystems with each other. That is done for keeping the home and the farm more secure, comfortable and able to manage it from a long distance. The researchers discussed below each subsystem. That is done to identify the way each subsystem operates.

However, Figure 2 shows the safety and security system flowchart while pseudocode below will be showing the full description steps of this chart to make sure that the information is clear.

The IoT-enabled smart home and farm provide cost-effective IoT services. Commercial space has significant requirements in terms of comfort, accessibility, protection, security management. We exerted effort to make sure that the system provides cost-effective and stable services.

Figure 3 shows the fire system flowchart, while pseudocode will be showing the full description steps of this chart below.

Pseudocode of the House Fire System:

```
set pin for red led, buzzer, pin for all systems, database as output
set pin for IR system and MQ2(gas sensor) as input
set integer variable name sensorthres =290

read from MQ2 and store the value in integer variable name smoke_
value (there is MQ2 for the house and another one for hangar)
if the smoke_value more than sensorthres then
       if the read from IR system pin is LOW then
          let the red led turn on and the buzzer made a sound for
          some time
          let SIM900 send a message for owner and civil defence
```

```
          set the database pin to send the HIGH signal for some time
          set the all system pin to send the HIGH signal for some time

PC:
1. the message that will send for the owner will be "there is the
fire in your house" when the MQ2 in the house has red more than
sensorthres and will send "there is the fire in your hangar" when
the MQ2 from the hangar have higher read

2. the message that will send to civil defence will include:
        1."there is the fire in the house."
        2.the location of the house as known for human and on
          google map and the place set manually
```

An organization maintaining a fire alarm faces several false alarms reported on a regular basis. These false alarms reduce the level of productivity. They delay the response times. Fixed alarms or delays are not being monitored in the fire alarm management business. There is also no way to give feedback to the fire alarm sensor for changing the alarm parameters temporarily in case of a false alarm. The proposed system allows Security and efficiency and reduces maintenance costs.

Below we will descript the pseudocode of the Hangar security system to show how it does it design to work.

IoT resources aim to strengthen food tracking, product traceability and hangar animal movements, and the management of the food chain components. The stages of the food chain supply process shall be affected positively by the use of IoT technology for capturing and controlling the chain's power and balance.

Figure 3 shows the fire system flowchart while pseudocode will be showing the full description steps of this chart.

Below we will descript Figure 4 by the pseudocode of the Water and rain System to show how it does it design to work.

Pseudocode of the Water system:

```
set pin for an irrigation system as output
read the water value from all tanks tank by ultrasonic
set LCD to show the value as CM and for which tank using names for
all tank
if the irrigation tank is empty then
send the high signal for the irrigation system
if any tank is empty then
show alert on LCD
Pseudocode of the rain system
set pin for the Irrigation system and IR system as output
read the value from soil moisture
if the soil moisture value more than stored then
send hogh signal for irrigation and IR systems
```

Below we will descript Figure 5 by the pseudocode of the Irrigation system to show how it does it design to work.

Pseudocode of the Irrigation system

```
set pin for sprinkler as output (we use led because of size we
can't use sprinkler in our project)
set pin for Rain system and water system as input

if the Rain system is low then
if water system signal is low then
      turn on the sprinkler on when the time reached the 6 o'clock
      or 12 o'clock by use RTC to know the time
else
turn the system off until the water be available
else
turn the system off for one day
```

Smart irrigation systems based on IoT contributed to using the water resources in the precise landscape of farming optimally. This paper presents an open-source smart device focused on the technology to prevent irrigation requirements in a field by sensing the soil's parameters such as the moisture of soil and the temperature of the soil.

Figure 6 shows the food system flowchart while pseudocode will be showing the full description steps of this chart.

The linkage between electricity, water and food in domestic environments; the environmental sustainability of our system are very important subjects, and we handled food-system knowledge to make our full system contribution.

### The Proposed Project is Tested Throughout Two Stages

The first stage is the test functionality based on simulation. It aims to identify whether the projects actually work as it is intended. It aims to check the validation of all the functions and materials after. Then, we test the system as one unit. For instance, in the safety system, they tested the RFID. To be specific, they tested whether the read value matches what we want or not through use difference tags. They tested whether the MQ2 gas sensor read the integer value and used a small fire to change the value. The time of implementation was in few second in high speed with low energy using an SMS message.

In the second stage, we managed and tested the systems as one unit. They checked the validation of all the subsystems operates jointly. For instance, they checked with the database works when another system sends a high signal for it connected with police office and civil defence centre in simulation mode. As a result, we have very good result depend on communication with all parts of the system, which can be used to build full safety and security system and full agriculture system, able to have full smart farm and house and can be implemented in future real life and we proved that our system best than many current systems discussed in Table 1.

## CONCLUSION AND FUTURE WORK

Data management is a mean for gathering and optimizing the total data related to key information; different devices transmit vast quantities and variations of information from various applications. The management of IoT data aims to ensure that the systems, regulations, processes and procedures that can accommodate the entire data life cycle need are created and implemented. Smart devices aim to control items in order to automate jobs. They aim to save time. They can capture, distribute and understand information. However, a tool is needed to collect data, reach a conclusion, and identify the trends and patterns.

The researchers utilized information management systems with IoT technology. They aimed to develop smart home and motivational farm system. This system aimed to make life easier for busy people, old people and children. It will make the house safer by using several subsystems. Such subsystems include the safety system and security system, etc. The safety system measures the rate of gas. Then, it opens the windows automatically when reaching a specific rate. It will protect families from serious disasters. If there is a fire, the safety system sends a signal to the house owner and the Civil Defense. In high speed and low-cost communication using an SMS message.

Our proposed system is developing an active system for managing most of the smart farm and home obstacles, such issues to deal with the security system for the farm's and house and animal hanger, raining, irrigation and watering system, food supplement *system,* The security system contacts the house owner only if someone is trying to break into the house. In this case, the system will contact the police too. The Water system aims to check the water storage for:1. House storage, 2. irrigation storage . The Water system consists of two more subsystems, which are: a)- Rain system: It aims to keep the house clean when the sky raining. It aims to stop the irrigation on the raising day. It initiates its operations 24 hours after the rain stops. b)-Irrigation system: It aims to make the irrigation process easier, IR. The system aims to make the control process easier (e.g. turning on the lights and opening the windows). The Food system aims to help the owner in feeding the animals and find out when the food supply is up. The Database system aims to store information collected from all the subsystems as separately. It aims to keep the owner informed. Arduino was used for programming this project. It was used to keep the cost within the determined limit. The use of the proposed system shall contribute to reducing the rate of deaths in fire accidents and thefts if implemented in the real world. There are other systems that can be used in this project. All the subsystems in this study could work harmonically jointly or separately. The proposed system can be developed and updated; we proved that our system best than many current systems discussed in Table 1 logically. The problem that we had in the test that we need to set many things manually in the first stage only, like The tank size in a water system, the value of tags, House location, House password, and what the user wants to record in the database, etc. so we will try to improve the system in the future.

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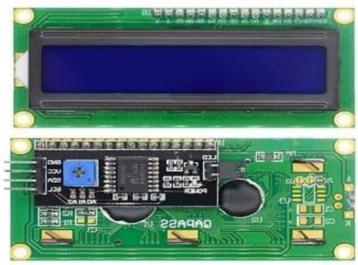
## APPENDIX

**Table 2. Description for the tools used in the proposed smart home and Farm system**

| | |
|---|---|
| *MFRC522 RFID reader:*<br>RFID refers to the detection of radiofrequency. When transmitting data over short distances, RFID uses electromagnetic fields. RFID is helpful in recognizing persons, making purchases, etc. | <br>*Figure 7. RFID reader* |
| ***LCD:***<br>An LCD (liquid crystal display) is the easiest and cheapest form to show data. Which are used in daily equipment such as retailers, calculators, parking meters, printers, etc. and then they are suitable for text or tiny icons. The following image has a front and rear view of LCD. | <br>*Figure 8. LCD* |
| ***Servo motor:***<br>This package enables an RC (hobby) servo motor to be operated on an Arduino board. Servos have built-in gears and shaft that could be operated accurately. The shaft can be placed at various angles, normally between 0 and 180 degrees, using regular servos. Ongoing servos spinning the shaft allows different speeds to also be selected. | <br>*Figure 9. Servo motor* |
| ***SIM900:***<br>This is a roadmap to the Arduino SIM900 GSM GPRS shield. Read about sending, receiving and making phone calls and receiving Arduino calls. | <br>*Figure 10. SIM900* |
| ***Keypad:***<br>These keypads very popular among the Arduino tinkerers. They are very low-priced, and you can use them with any microcontroller (MCU). | <br>*Figure 11. Keypad* |

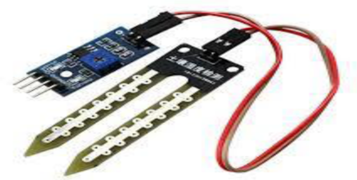
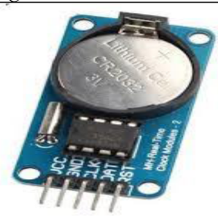
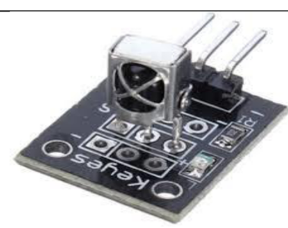
*continued on following page*

**Table 2. Continued**

| | |
|---|---|
| ***Green led:***<br>The Blink software is the first one to create or start your Arduino journey once users start the Arduino adventure. They must turn on and off the LED inside this system at that time. | <br>*Figure 12. Green led* |
| ***Buzzer:***<br>Usually, a piezo buzzer is used as a ring or beep to warn users. It forms of push-button is common does provide a type of warning, household gadgets or embedded systems device | <br>*Figure 13. Buzzer* |
| ***Red led:***<br>The Blink software was the one to create or start the Arduino journey once users start the Arduino adventure. User will blink a Lead on and off at any point in this tutorial. | <br>*Figure 14. Red led* |
| ***Ultrasonic:***<br>In order to calculate the distance of an object, the HC-SR04 ultrasonic sensor uses sonar. Including high precision and reliable reads, it provides excellent non-contact range detection in ease of use kit. The transmitter and receiver modules are supplied with ultrasonic. | <br>*Figure 15. Ultrasonic* |
| ***6 to 12V Power (normal battery)*** | <br>*Figure 16. Battery 12v* |

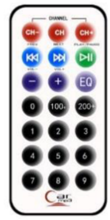
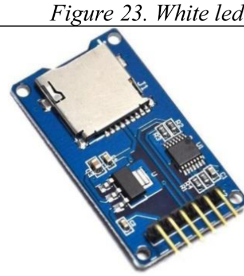
*continued on following page*

**Table 2. Continued**

| | |
|---|---|
| ***Gas sensor:*** For detecting gas leakage, the Grove-Gas Sensor (MQ2) module is valuable. It is ideal for H2, LPG, CH4, CO, tobacco, smoke or propane detection. Due to its higher sensitivity and quick response time, the measurement can be done at the earliest opportunity |  *Figure 17. MQ2 gas sensor* |
| **Soil Moisture Sensor:** Typically the ground humidity sensor or hygrometer is used to measure soil moisture. It is, therefore, ideal for creating an automated watering system or tracking the plants' soil moisture. |  *Figure 18. Soil moisture sensor* |
| ***RTC module:*** The module will also hold the time even if the Arduino is not activated. So time doesn't reset each time you start and deactivate the module. |  *Figure 19. RTC module* |
| Bush button: Once the buzzer is open, the pin is attached to 5 volts, and we read a Pause. Once the button is open, the pin is un-pressed. When the button is closed (pressed), it attaches its two legs to the pin so that it displays a Small. (A pin is always wired to 5 volts; however, the pin is "closer" to the ground by the resistor between them.) |  *Figure 20. Push-button* |
| **IR module and remote:** An infrared device composed of a transmitter infrared and a receiver could identify an object. In more depth, an infrared signal of a specific rate consistent with an infrared recipient that is to detect it is transmitted by an IR transmitter commonly identified as IR LED. In various application styles, there are specific types of IR sensors. For instance, IR technology is being used to identify objects clearly in close proximity sensors, compare sensors to seek a path or count objects in sensors. |  *Figure 21. IR module* |

*continued on following page*

**Table 2. Continued**

| | |
|---|---|
| | <br>*Figure 22. Remote* |
| **White led:**<br>The Blink software is the first one to create or start the Arduino experience once it begins an Arduino adventure. Users must turn on and off the LED inside this system at a certain time. | <br>*Figure 23. White led* |
| **SD module:**<br>The Arduino will create and transfer data with the SD library by creating a file in an SD card. | <br>*Figure 24. SD module* |
| **For smart central heating and conditioning systems:**<br>**We need**<br>**DS18B20:**<br>This paper described the fundamental theory and the features of the DS18B20 1-Wire digital thermometer and explained the nature and precise measurement technique of the FPGA and DS18B20 temperature sensors for their hardware and software. The real temperature is measured, and its results are correct relative to the specific thermal range. This device offers simple interface features, high precision, improved anti-interference and safe, secure work, etc. | <br>*Figure 25. DS18B20* |

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