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STRUCTURE AND CAPABILITIES OF SMART HOME SYSTEM USING CLOUD

Abstract. This work proposes an exceptional structure of low cost smart home system, based on IOS app linked to the cloud service, which is used for monitoring and controlling. It meets various kinds of requirements of technical and economic perspective and fulfills them all. In addition to that, tools like temperature and humidity sensor, motion sensor, distance sensor, gas sensor, sound sensor etc. will increase effectiveness of the data analysis and changes indication. Moreover, this home automation system could be used not only in industrial and governmental needs, but could also be useful in private sector. In addition to that, gathering and storing data in cloud services guaranty safety and remote access.

In this article are shown results of development of SHS (Smart Home System), integrated with the cloud environment and interacting with NodeMCU, which can be used by students, engineers and other users for studying and applying SHS and sensors.

Key words: Smart home, Home automation, Cloud services, IOS, Internet of Things(IOT), Data gathering, Data processing, Home monitoring, Remote control.

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Аңдатпа. Бұл жұмыс мониторинг және бақылау үшін пайдаланылатын бұлттық қызметпен байланысқан, IOS қолданбаға негізделген, құны төмен ақылды үй жүйесінің айрықша құрылымын ұсынады. Ол техникалық және экономикалық сұраныстарға жауап береді және олардың барлық талаптарың орындайды. Сонымен қатар, температура мен ылғалдылық сенсор, қозғалыс датчигі, қашықтық сенсоры, газ сенсор, дыбыс сенсоры сияқты құралдар деректер талдауын және өзгерістер бақылауын арттыруға мүмкіндік береді. Сонымен қатар, бұл үй автоматтандыру жүйесі, өнеркәсіптік және үкіметтік қажеттіліктеріне ғана емес, сонымен қатар жекеменшік секторда пайдалы болуы мүмкін. Сонымен қатар, бұлтты қызметтерде деректердің жинап, сақтауына кепілдік қауіпсіздігі және қашықтықтан қатынауына мүмкіндік береді.

Бұл мақалада студенттер, инженерлер мен тағы басқа пайдаланушылардың үйренгеніне пайдаланылуы мүмкін, бұлтты

сервистермен интеграцияланған және NodeMCU біріктірілген SHS жобасының нәтижелері көрсетілінген.

Кілтті сөздер: Ақылды үй, Үй автоматтандыру, Бұлтты қызметтер, IOS, Заттардың Ғаламторы, Деректер жинау, Деректерді өңдеу, Үй мониторингі, Қашықтан басқару.

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Аннотация. В данной работе предложена структура экономически эффективной системы умного дома, основанной на платформе IOS, связанная с облачным сервисом, который используется для мониторинга и управления. Она отвечает различным требованиям технической и экономической перспективы. Кроме того, такие инструменты, как датчик температуры и влажности, датчик движения, датчик расстояния, датчик газа, звуковой датчик - повысят эффективность анализа данных и индикации изменений. Кроме того, эта система домашней автоматизации может использоваться не только в промышленных и государственных целях, но также может быть полезной в частном секторе. В дополнение к этому сбор и хранение данных в облачных сервисах гарантируют безопасность и удаленный доступ.

Автором представлены результаты разработки SHS, который интегрирован с облачной средой и взаимодействует с NodeMCU, который может служить практическим примером для студентов, инженеров и других пользователей, изучающих и применяющих SHS и датчики.

Ключевые слова: Умный дом, Автоматизация дома, Облачные сервисы, IOS, Интернет вещей, Сбор данных, Обработка данных, Мониторинг дома, Удаленное управление.

Smart Home System based on high technologies, with an exquisite style and unique comfort for everyone. On the one hand, the "smart house" provides an intelligent management system that allows us to automatically perform our daily routine activities. On the other hand, the system is used for tracking and monitoring the safety of house - protect against thieves, as well as gas and water leakage, and any dangerous situations. The smart home system allows you to control light and curtains, heating, air conditioning and ventilation systems, security systems, audio and video equipment, other electronic devices using portable or built-in touch panels or remotely from anywhere you want.

A smart home, is unique control system that allows you to control and monitor not only all electrical appliances, but it also has special sensors that can receive different kinds of data: temperature, humidity, pressure, illumination, movement and presence of a person, as well as leakage of water and gas.

Even though the idea sounds very technical and futuristic, a true Smart home is intuitive and simple to use so that everyone in the family enjoys living

there. Home automation can simplify our living in the same way automatic washing machine simplifies washing the clothes. In the future, Smart homes are likely to become as common as washing machines. Currently, every fifth new house in the eighth has some kind of structured installation and mass production of smart homes has started in Western Europe. With a majority of mankind living in the region, it is also Asia that calls loud in demand for energy efficient and comfortable solutions in the massive construction works that take place over there.

In works [1] - [42] present structures of SHS. Let's consider some of them:

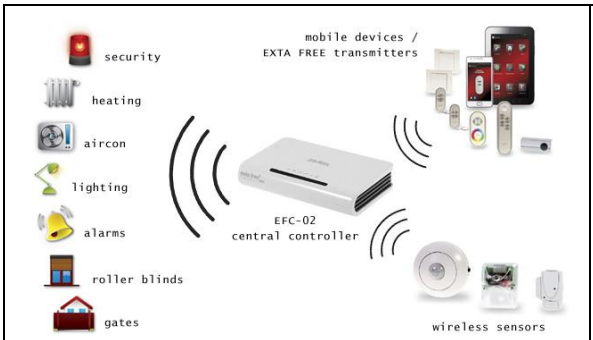


Figure1.

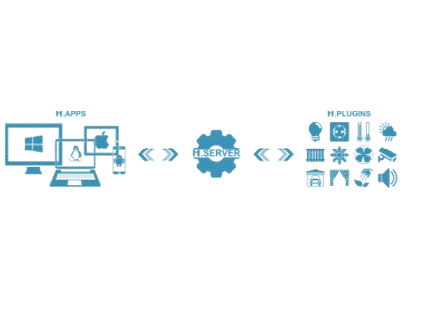


Figure 2.

In Figure 3 the concept of SHS based on Arduino YUN is demonstrated. In Figure 4 is shown UI of IOS based on IOS.

Advantages of SHS:

- Save Money and Environment. Smart home feature tools like temperature and humidity sensor, light switches. Having the ability to monitor data graphs will help user to manipulate heating system and light will help you save money on electricity bills and gas. Also allows user to track energy usage and expenditures.
- Remote access. After converting home into smart home, user will be able to control and access home remotely, no matter where he is.
- Customization. There are plenty of home automation devices on the market and user certainly don't need to buy all of them at once. It is related to user needs and can be customized and programmed specifically.
- Security. Smart home system will skyrocket efficiency of home security, by connecting motion detectors, door and window locks and other devices. Also the ability to witness activity in your home from anywhere is one of the most significant advantages.
- Easy to use Application, which is based on mobile platform has optimized User-Interface and very simple to use.

As a result of the analysis of works [1] - [20] and determining the main advantages of the SHS, now can consider development part.

Development of structure of SHS based on NodeMCU

As a result of the analysis of works [15] - [20], modern SHS and their applications representing their functional capabilities and advantages were identified. During the development of the SHS, great attention was paid to the order and sequence of the work performed on the basis of the analyzed results of the developed systems. The general structure of the Smart Home System is shown in the Figure 5.

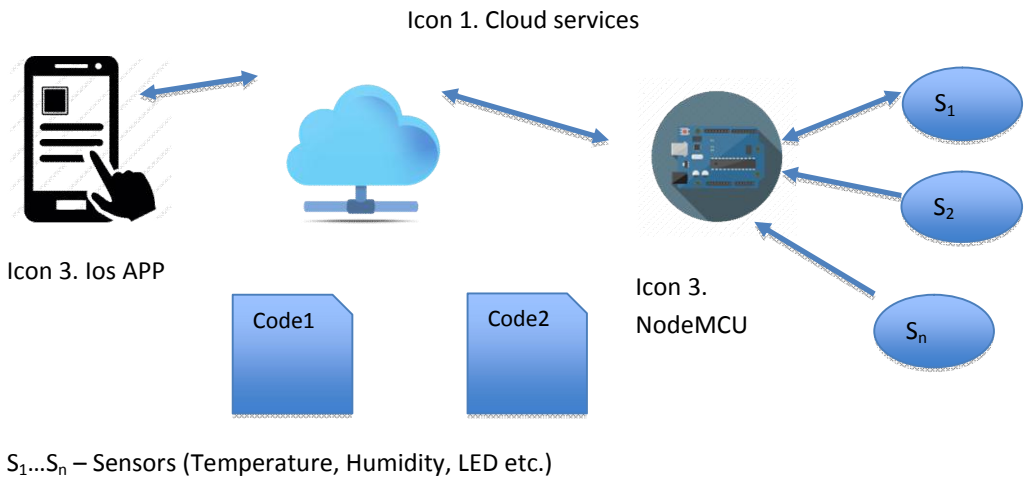


Figure 5 - The general structure of the Smart Home System.

2 part of code (Code2) of SHS represented in Table 1.

Table 1. Parsing changes in Cloud service and applying results to NodeMCU

```
 Serial.println("send start");
 Serial.println(millis());
   HTTPClient http;
   http.begin("http://api.thingspeak.com/channels/240592/feeds.json?results=1");
//Specify request destination
   int httpCode = http.GET();                                        //Send the request

   if (httpCode > 0) { //Check the returning code

     String payload = http.getString();   //Get the request response payload
     Serial.println(payload);             //Print the response payload
     int f1 = payload.lastIndexOf("field1")+9;
     f1 = payload.substring(f1, f1+1).toInt();
     Serial.println(f1);
     digitalWrite(D0, f1);
```

```
}
Serial.println("send end");
 Serial.println(millis());
   http.end();   //Close connection
//end
 long  timeout = millis();
  while (client.available() == 0) {
    if (millis() - timeout > 5000) {
      Serial.println(">>> Client Timeout !");
      client.stop();
      return;
    }
  }

  // Read all the lines of the reply from server and print them to Serial
  while(client.available()){
    String line = client.readStringUntil('\r');
    Serial.print(line);
  }

  Serial.println();
  Serial.println("closing connection");
}
```

By virtue of using ThingSpeak [6] user is able to analyze and process gathered data and represent it as shown in Figure 6-8

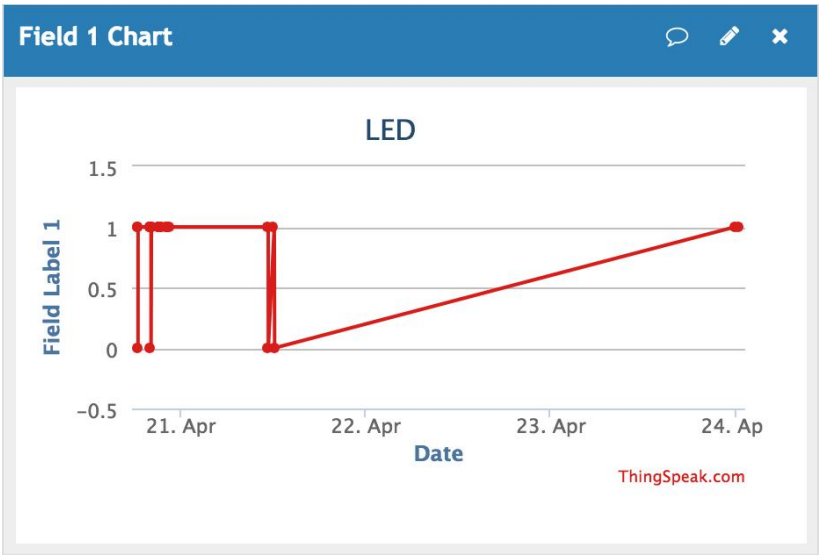


Figure 6 – represents whether light on/off.

Figure 7- represents whether door is open/closed .

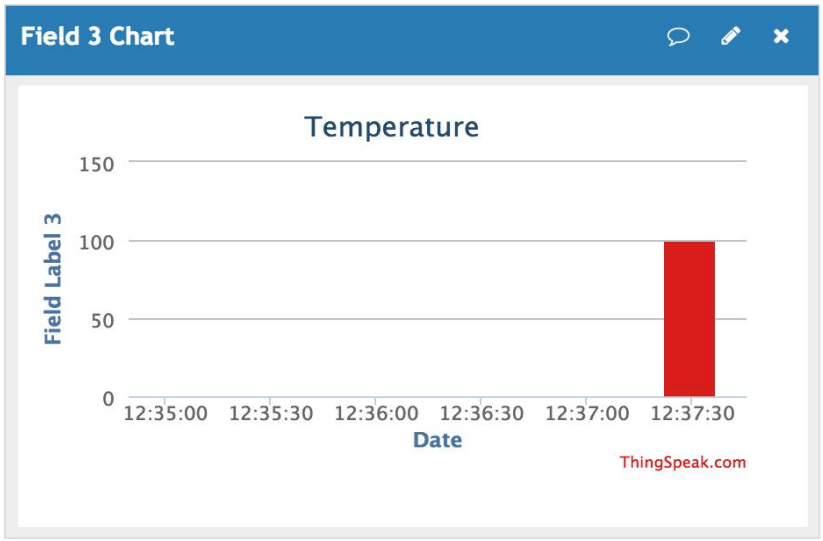
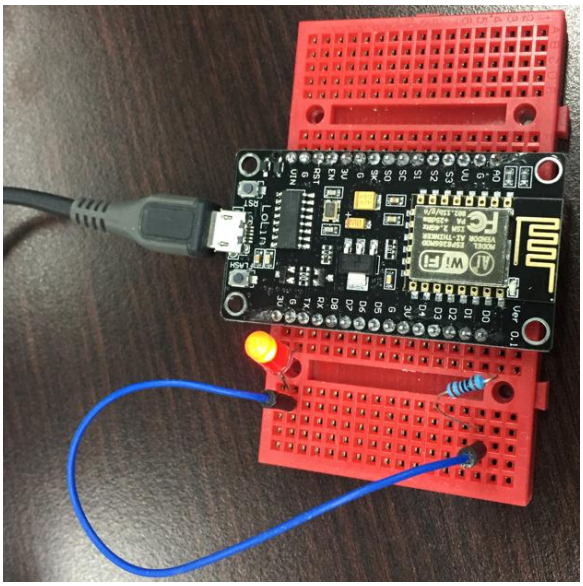


Figure 8 – represents temperature changes.



Pic 5. NodeMCU Turning LED on.

Conclusion

In this work, is presented and analyzed structure, capabilities of Smart Home System, as well as impact on the modern world. The first part of the work is focused on the structure and advantages. Secondly,, it can be witnessed that the price for similar products on the market is really high – average is about several hundreds of dollars. Here is shown relatively low cost Smart Home System based on NodeMCU for about 20-30$. In addition to that, is represented improved code of SHS where significantly decreased response time of NodeMCU to cloud service. Also, optimized computing of average temperature and other sensors, in order to take data more precisely.

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