ELECTRIC CURRENT MONITORING SYSTEM USING A MICROCONTROLLER AND IOT MODULE

Alif Fakhri Nurrohmat
Dicky Muhamad Sopian
Kristoforus Iubileagung Hanang Pradipta
Putra Hari Suci
Wildan Luthfiana
Ari P Wahyu

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Alif Fakhri Nurrohmat, *Informatics Engineering Widyatama University Jl. Cikutra No.204A, Sukapada, Kec. Cibeunying Kidul, Kota Bandung, Jawa Barat 40125*
Email: alif.fakhri@widyatama.ac.id

Dicky Muhamad Sopian, *Informatics Engineering Widyatama University Jl. Cikutra No.204A, Sukapada, Kec. Cibeunying Kidul, Kota Bandung, Jawa Barat 40125*
Email: sopian.2015@widyatama.ac.id

Kristoforus Iubileagung Hanang Pradipta, *Informatics Engineering Widyatama University Jl. Cikutra No.204A, Sukapada, Kec. Cibeunying Kidul, Kota Bandung, Jawa Barat 40125*
Email: pradipta.hanang@widyatama.ac.id

Putra Hari Suci, *Informatics Engineering Widyatama University Jl. Cikutra No.204A, Sukapada, Kec. Cibeunying Kidul, Kota Bandung, Jawa Barat 40125*
Email: putra.hari@widyatama.ac.id

Wildan Luthfiana, *Informatics Engineering Widyatama University Jl. Cikutra No.204A, Sukapada, Kec. Cibeunying Kidul, Kota Bandung, Jawa Barat 40125*
Email: wildan.luthfiana@widyatama.ac.id

Ari P Wahyu, *Informatics Engineering Widyatama University Jl. Cikutra No.204A, Sukapada, Kec. Cibeunying Kidul, Kota Bandung, Jawa Barat 40125*
Email: ari.purno@widyatama.ac.id

Abstract

Electricity is clearly needed by all people from various walks of life. The electrical system is developing rapidly today, starting with a centralized system, the distribution process and ending with consumers as users of electrical resources. As electricity consumers, we don't know how much electricity we use every day, especially when it comes to the electronic devices we use every day. In addition, in recent years there have been frequent internal accidents caused by power outage or short circuit and excess electrical capacitance, which can cause all electricity to be cut off. These

problems can actually be solved by power quality (capacity) monitoring systems and power distribution management. This system is a system that helps consumers to monitor the power consumption of household electrical appliances. The purpose of this research is to create a power monitoring system for several electronic devices used at home and the output power consumed can be viewed through the Thingspeak website. This system consists of a microcontroller that uses an ACS712 flow sensor to detect power, uses an ESP8266 module to transmit data to Thingspeak Web, an Arduino module to collect data and run the system, and an LCD to view power consumption results. .

Keyword: IOT, ACS712, Monitoring system

Introduction

The power grid includes the generation, transmission and distribution of electrical energy. The electricity distribution system delivers electricity through feeders and transformers from distribution stations to end users such as homes, office buildings and factories. Similar to network quality monitoring, an integrated system is also needed in case studies in electricity distribution [1]. The generator is connected to the transmission system and then to the substation, at the substation there are consumers such as factories, offices, shopping centers and apartments. Electricity is a property of matter created by the presence of an electric charge [2]. Electricity can also be interpreted as follows:

- Electricity is the state of certain subatomic particles, such as electrons and protons, which cause attractive and repulsive forces between them.
- Electricity is a source of energy that is channeled through cables. Electric current is created because electric charge flows from the positive channel to the negative channel [3-7].

Electricity creates the 4 fundamental forces of nature and is a constant in matter that can be measured. In this case, the term "amount of electricity" is also used with the terms "electric charge" as well as "amount of charge". There are 2 types of electric charge, namely positive and negative [8]). Through experimentation, like charges repel each other and opposite charges attract each other. The magnitude of the attractive and repulsive forces is determined by Coulomb's law and several electrical effects are discussed in electrical and electromagnetic phenomena [9, 10].

Literature Review

Thing Speak is an Internet service that provides services for using the "Internet of Things". Thingspeak is a service that includes open source applications and APIs for storing and retrieving data from various devices using HTTP (Hypertext Transfer Protocol) over the Internet or over a LAN (Local Area Network). ThingSpeak can be used to create sensor logging applications, location tracking applications and any social network connected to the internet with status updates [11].

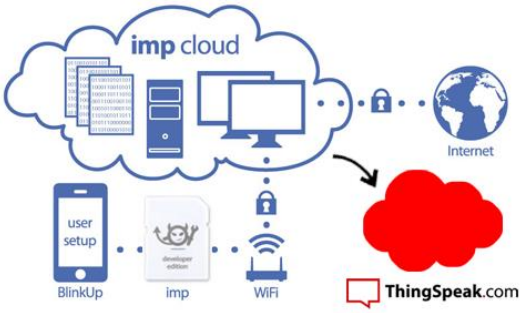

Figure 1. Process thingseak configuration

The Internet of Things (IoT) is a network that connects various objects with identifiers and IP addresses so that they can communicate with each other and exchange information about themselves and their perceived environment. Objects in IoT can use or generate services and work together to achieve a common goal. With this capability, IoT has shifted the definition of the Internet as computing anywhere, anytime, to anything, anyone, and any service [12-17]. One of the problems that are still a weakness in the application of IoT is security and privacy. Attacks on IoT security can include attacks on RFID tags, communication networks, or data protection to prevent and overcome this security mechanisms and protocols are needed [18, 19].

Electric power is the amount of electric charge caused by the movement of electrons flowing through a point in a circuit in unit time. The existence of a conducting medium between two points that have a potential difference. The greater the electric potential difference between two points, the more power will flow. Connect the ACS712 power sensor to Arduino with Arduino 5V voltage connected to the ACS712 power sensor Vcc pin via the red wire, then Arduino Ground is connected to the ACS712 power sensor GND pin using the blue wire and the Analog Reader (A0) from Arduino is connected to the output signal pin of the power sensor. . ACS712. Figure 1.shows that the computer monitoring system is connected to Arduino, then Arduino is connected to the electrical power sensor, namely ACS712, and then ACS712 is connected to a voltmeter to find out how much power is being released system performance in this case the power delivered to the DC micro motor via ACS712 [20].

In a room filled with devices that use a power source, monitoring tools are essential. Some devices that use a power source without a monitoring device are certainly very difficult to monitor. Some electrical devices already have a control unit to simplify operation. However, this becomes difficult when you want to monitor more than one electrical device because there are not many power monitoring tools out there designed to monitor the electrical performance of household appliances. The more electrical devices that are managed, the more monitoring tools are needed. In the case of household appliances, automatic control from the control center is still used to detect excess power or excess power so that the electricity supply in the house stops. This method is certainly very risky for residential construction, it can cause a short circuit due to the absence of electrical energy management or electrical energy monitoring tools. Therefore, the authors developed a system that can monitor the quality of the performance of electrical equipment at home in one control device, so that users or residents of the house can predict the excess electricity consumed. The controller uses a laptop at home as well as Arduino and ACS712 for monitoring tools [19, 21].

Methodology

System design aims to create a system that can detect the electrical performance of the device or large enclosure. A monitoring and power distribution tool that is made using several hardware components including the Arduino UNO ACS712 microcontroller as a detector of flowing energy. Monitoring power quality and power distribution settings able to residents see power usage so as not to overload the power supply so that electricity will be cut off and cause power outages and the most feared is an electric short circuit.

In designing this system, software is needed to send the program and enter it into the microcontroller. The software is Arduino IDE. Arduino IDE (Integrated Development Environment) is software will used programming C languages for Arduino devices or other Arduino-compatible development board devices such as DFRobot or Freeduino and Seeduino. Arduino IDE is based on the JAVA programming language. Arduino IDE is also equipped with a C/C++ library, commonly called Wiring, which makes it easy to operate input and output. Arduino IDE is developed from processing software which is specifically converted into Arduino IDE for programming with Arduino.

Figure 2. Code for monitoring system

in the picture above is an electrical monitoring system using the C language, in the picture we have to activate which pins will be opened and will be implemented in the system, the sensor will be connected to the existing PIN on the arduino which will convert electrical data from analog to digital datain the picture above is an electrical monitoring system using the C language, in the picture we have to activate which pins will be opened and will be implemented in the system, the sensor will be connected to the existing PIN on the arduino which will convert electrical data from analog to digital datain the picture above is an electrical monitoring system using the C language, in the picture we have to activate which pins will be opened and will be implemented in the system, the sensor will be connected to the existing PIN on the arduino which will convert electrical data from analog to digital data.

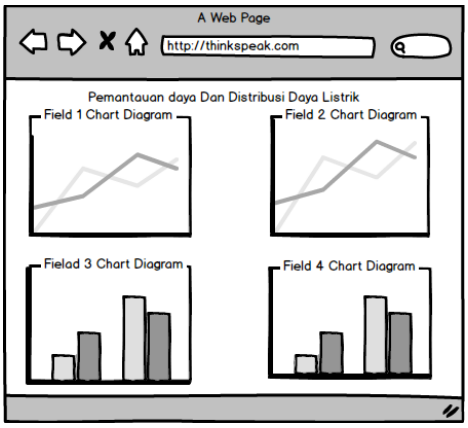

Figure 3. Design user interface

In Figure 3 is a visual design process on a website application, in that section it can be implemented in the form of a website, the data is sent wirelessly by the system then the data will be connected to the Arduino component, the advantages of using wireless can be opened on any platform component and connected to the network. internet, the monitoring system is real-time and easy to use

Results and Discussions

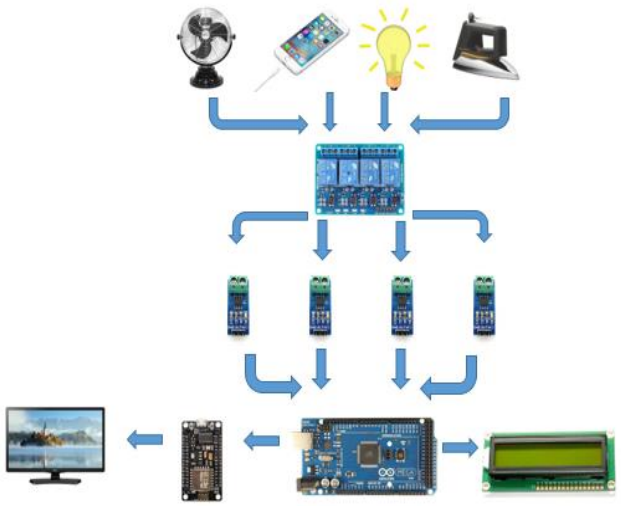

Figure 4. Design implementaion Arduino interface

Arduino circuit with Acs712 is used to connect or transmit power data used by electronic devices, This circuit was developed after the Arduino microcontroller program, where the function of the Arduino is to read and transfer data to a laptop and to connect to the LCD and Thinkspeak web. the test method can be used to control all electrical equipment, the first component of acs 712 will be used as a medium that will convert the analog signal taken from the component into a digital signal which becomes a digital value. As a safety, relay components will be used which will later be used to secure if there is an excessive current surge so that the main component doesn't burn.

The monitoring system will be sent back directly using the esp8266 module. The component will display a visual description of the use of electric current in the form of a website so that it is easy to observe and learn. The graphic display is realtime and will change according to the condition of the tool and the current surge on the microprocessor. In website mode, we can choose the type of visual display, either in the form of graphs or charts. The number of sensors themselves can be added according to the needs of the excess use of Arduino components and the esp8266 allows the use and control of components to be carried out with a wide range and without cables.

Conclusion

In the experiment above, it can be concluded that the acs721 component can be used to calculate spikes in the amount of electric current usage, these components can be connected to Arduino components and convert electrical signals into analog data. esp8266 components can be displayed visually in graphic form and can be easily read by the system. In further research, it can still be limited to the number of Arduino PINs and unable used for measuring the use of electric current components at the industrial level stage.

For further development, the use of microcontrollers can use rasbery Pi and arduino nano with more PINs and can be combined with devices and wifi networks using IP codes and passwords as additional data security systems, in this monitoring system the weakness is in connectivity because the sensor reading system is online. so that a unstable network connection will cause the data reading system to be not updated, the reading system for using electricity resources is still limited to thingspeak and has limited features for further development, it is expected to use servers and website monitoring data that can be developed independently so that the menus and modules used can be adjusted according to need.

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