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Control and Notification Automatic Water Pump with Arduino and SMS Gateway

R Ratnadewi¹, H Nurdyanto², A Najmurrokhman³, C Prabowo⁴, R Idmayanti⁴, H Eteruddin⁵, C A Sugianto⁶, N Kurniasih⁷, H K Siburian⁸, D Nababan⁹ and R Rahim^{10*}

¹Electrical Engineering, Universitas Kristen Maranatha, Bandung, Indonesia

²Department of Informatics, STMIK Dharma Wacana, Metro Lampung, Indonesia

³Department of Electrical Engineering, Universitas Jenderal Achmad Yani, Cimahi, Indonesia

⁴Department of Information Technology, Politeknik Negeri Padang, Padang, Indonesia

⁵Department of Electrical, Universitas Lancang Kuning, Pekanbaru, Indonesia

⁶Departement of Informatics, Politeknik TEDC Bandung, Bandung, Indonesia

⁷Library and Information Science Program, Universitas Padjadjaran, Bandung, Indonesia

⁸Department of Informatics, Sekolah Tinggi Manajemen Informatika dan Komputer, Medan, Indonesia

⁹Department of Information System, Universitas Pelita Harapan Medan, Medan, Indonesia

¹⁰School of Computer and Communication Engineering, Universiti Malaysia Perlis, Kubang Gajah, Malaysia

*usurobbi85@zoho.com

Abstract. This paper aims to facilitate the owner to control water pump machine from the vacuum, and the condition of the water is it full or not in house or apartment. The current control system still has many limitations in controlling the water pump machine at home or apartment. The water machine control system was designed with device that has a smart surveillance system that can be accessed with Android smartphone and all information from or to machine control system will command by using SMS, this device create a development of Arduino UNO microcontroller technology that allows the reading of the GSM Module and connected with SMS Gateway. Experiment results facilitate real-time water control and much easy for the owner to control water tank.

1. Introduction

Today the water machine is a necessity in everyday life for the community. As technology advances[1-5] in home appliances and communities[3,6-8] and most of the technology in smart home appliances are using fuzzy for decision[9], and water machines become a necessity for society especially in home users. Many types of water machines are built and various types of sizes and are used and offered to the public [10], [11].



Currently, the use of water machine is less efficient because the use of water machine especially when turning off the water machine that is full cannot be done automatically, of course, this problem made an additional cost of electricity and abundant water useless for the owner, and base on this problem a water machine control system are created with microcontroller Arduino UNO and smartphone as a controller[12-14].

Based on this problem, apart from the use of the controls using smartphones that have limited range due to using Bluetooth, the SMS Gateway [15-16] as a solution also has a remote access as the information will be sent automatically to the owner of the water machine that the water machine has been full and could be shut down by using SMS commands. This control system uses the engine stop technique to be connected and turned on together with Arduino UNO microcontroller. The Arduino UNO microcontroller is used to turn on and off the water machine automatically by a smartphone using SMS as a wireless communication to Arduino UNO controller. This paper aims to facilitate the owner to control water pump machine from the vacuum, and the condition of the water is it full or not in house or apartment.

2. Methods

System tools are designed and designed by the high point focused on modeling tools made based on the problems solved, and a little mistake will cause an error[6,8,17]. The design of automatic prototype Arduino-based water machine control prototype with an Android smartphone as follows. (See Figure 1).

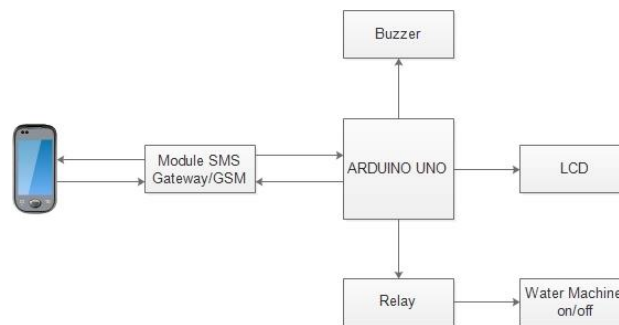


Figure 1. Model Designed Prototype Water Machine Control.

Based on figure 1, Arduino UNO[12,18] will process signals and incoming messages and then sent to LCD devices. LCD will display data received from Arduino UNO; the next relay will receive commands from those processed by Arduino UNO and connect the on/off cables on a controlled water machine using a smartphone.

Experiments performed require some supporting components as shown in Figure 2 below:

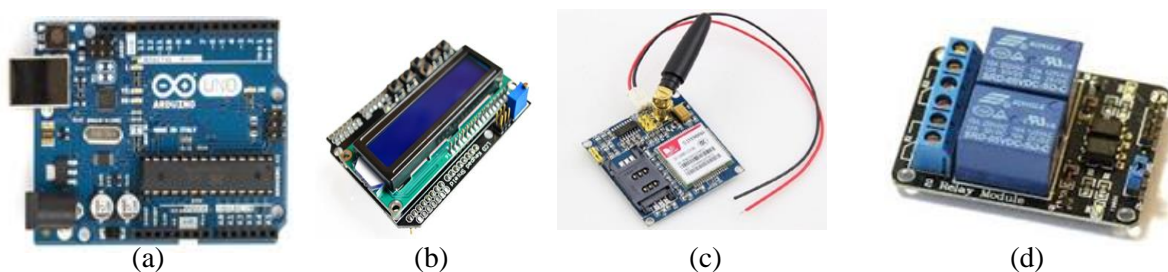


Figure 2. Arduino UNO (a), LCD Display (b), GSM Module (c), Relay (d).

Figure 2 is a component used to create a prototype automatic water pump machine controlled using a Smartphone and SMS for controlling water pump, and each component will be connected one by one and then placed on a water tank to check the water conditions.

3. Result and Discussion

Arduino UNO on this prototype is the central part of the overall control system of input and output connected to various other devices, below is the result of prototype and experiment perform. (See Figure 3).

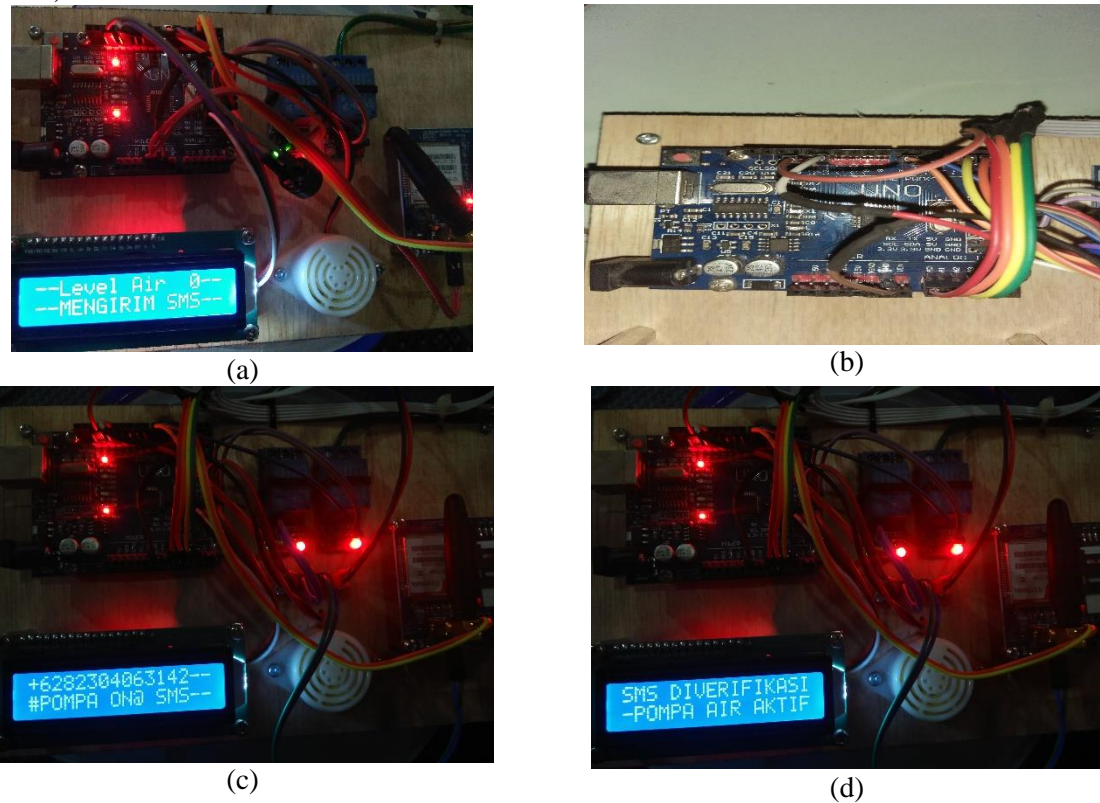


Figure 3. Experiment Prototype and Control Water Pump.

The experiment results of GSM SIM900A module is performed by sending a short message to the owner of the water pump that the water tank is empty. Owner will turn the water pump back on by sending the message #POMPA ON@, or when the water tank is full, it will automatically shut down the machine and send an SMS to the owner that the water tank is full, below is the snippet code for controlling device using SMS Gateway.

```
if(sms.available())
{ //Serial.println("Message received from:");
  sms.remoteNumber(senderNumber, 20);
  lcd.setCursor(0,0); lcd.print(senderNumber);
  i=0;
  while (c = sms.read()) {
    isi_SMS[i]=c;
    if(isi_SMS[i]=='@') goto lompat;
    i++;
    if(i>120) {sms.flush(); goto selesai;}
  }
  lompat:
  lcd.setCursor(0,1); lcd.print(isi_SMS);
  sms.flush();
  delay(100);
  pump_on=0;
```

```

for(j=0;j<i;j++)
{ if(pompa_on[j]!=isi_SMS[j]) pump_on=1; }
i=0;
lcd.clear();
lcd.setCursor(0,0); lcd.print("PERINTAH-->");
if(pump_on==0) {
    digitalWrite(solenoid,LOW);
    digitalWrite(pompa,LOW);
    lcd.setCursor(0,0); lcd.print("SMS DIVERIFIKASI");
    lcd.setCursor(0,1); lcd.print("-POMPA AIR AKTIF-");
    delay(3000);
}
else{lcd.setCursor(0,1); lcd.print("Format SMS SALAH");
    kirim_sms_salah(); delay(3000); }
selesai:
for(j=0;j<12;j++) { isi_SMS[j]=' '; }
sms.flush();
delay(100);
sms.flush(); // Delete message from modem memory
}
}
}

```

This prototype is tested using some water conditions that exist in the water tank with a size of 500 liters, table 1 are some results detection of water tank conditions received through the smartphone. See Table 1).

Table 1. SMS Notification in Smartphone Application.

No	Condition Water	Water Level	Notification and Status Water Pump
1	500 Litre	Full	Off
2	300 Litre	Full	Off
3	250 Litre	Full	Off
4	200 Litre	Half Full	Off
5	100 Litre	Half Full	Off
6	80 Litre	Empty	On
7	60 Litre	Empty	On
8	50 Litre	Empty	On
9	30 Litre	Empty	On
10	10 Litre	Empty	On

Table 1 is the result of the test perform on the water tank, from some experiment that obtained good results can be controlled with a considerable distance due to connect through a GSM network that is wider than WiFi module or ethernet shield, and for the security of communication is filter from SMS number so not just any SMS message can be process.

4. Conclusions

An experiment of water pump control prototype got a good result, and SMS gateway as connection between smartphone application with the device in sending and receiving notification is good enough, one of the weakness prototypes designed it isn't implemented fuzzy method as the process of water volume check in the water tank so it must meet certain new volume conditions to send a notification.

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