

DATA TRANSMISSION IN THE INTERNET AND TAKING OVER THEIR PC, TABLET OR SMARTPHONE A WIND GENERATOR

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Abstract Harnessing this potential energy has a fundamental component, data collection about aerogenerator, for processing and optimization of production process of energy. In the system proposed by me, the costs are low and the benefits are manifold. The project can be expanded and improved, and can generate statistics on monthly or annual average wind speed in the area using an anemometer and an analogue input of the microcontroller. Data taken fot be saved and archived for a thorough study of the potential of wind in the area. Electricity charged can be totaled on different time intervals, such as weeks, months, or years.

Keywords *Optimization, Transport Data, Energy*

1. Introduction

It will consider a wind generator single phase power. Using a microcontroller ATMEGA 328 mounted on a plate ARDUINO [9], it will retrieve the following sizes: the speed of the generator; electrical voltage at the terminals of the generator power;; generator charge amperage through the circuit. Four sizes will be displayed on a LCD display-serial [10] at the same time will be sent to a computer for processing and display of graphic-type values of the specified quantities. All sizes will be sent to a web server to be accessed with a fixed or mobile device (smartphone, Tablet) using an INTERNET connection. System consisting of generator, microcontroller and display device is connected to a computer through a USB port, which will ensure at the same time and power supply microcontroller Board. There are also variant operation with individual power to a voltage source. For electrical power cut of electric generator, be sure to use a variable load. Discount rate of electrical quantities taken over by microcontroller, can be variable, and then in the system devised by me was set at one second. Type display system (LCD) was chosen for the way work independently

when the microcontroller Board is supplied separately and the system operates independently of a computer. Data transmission in the internet network in the way freelance work can be done with an ETHERNET card, but this case will not be presented in detail, leaving this aspect to be the subject of study for an expansion of the project's facilities.

2. Data Transmission in the Internet and Taking over Their PC, Tablet or Smartphone

For viewing remotely monitored system parameters, it will make a connection between the microcontroller and a computer card, ethernet card, or a dedicated. To summarize, the process of transmission, retrieval, processing and visualisation of the parameters, it will take account of the following aspects:

Variable-speed wind generator with transfer parameters what are subsequently monitored through electronic plate by the microcontroller. Deflection and connects to the PC via a USB cable, and for communication of data is allocated a port (usually COM7 but is not required). Data taken on the serial port of the computer, are

processed with the help of a program distributed free of charge, type OPEN SOURCE, PROCESSING¹.

PROCESSING program connects to a webserver, which will provide data for processing. For processing and viewing LIVE, we have chosen a free service and good reputation in the field of data processing in stream mode, COSM. Obviously, there are many variations that will lead to the same result, each with advantages and disadvantages. The method chosen by me takes advantage of data processing in LIVE mode, access via a browser, graphical manner, but in the case of mobile devices, the use of widgets which will facilitate the fullest access to data by means of a capacitive touch screen. Transmission of data to the lcd display device LCD².

I opted for the use of a device with two lines and 16 characters per line. This device is manufactured by SPARKFUN company. I chose this device serial and not parallel, because it uses a single data pin on the microcontroller, the listingul program used one can see that is pin 7. This is the major advantage of the device's LCD serial LCD device. A single data channel is possible due to the circuit using a PIC 16F88 UART protocol and a data transfer rate of 9600bps, set by default by the manufacturer. This can be changed depending on how to optimize the program, personally I used the device to the default value established by the manufacturer. In the listingul program, you can see which algorithm was used for transmitting the data towards the LCD. It has been thought in the following way: after taking and calculations sizes, each size was transmitted on the serial port on your computer. At the same time, it was done updating and for the LCD display. This can be seen in the following sequence:

```
Serial.print("P="); // send serial symbols
P=
Serial.print(putere); // send serial value
stored in the variable power
Serial.println("W "); // send serial
symbol W
/* here change the float int to display on
LCD
// the LCD does not support float
variables
/*
int intValue = (int)vin;
```

```
float diffValue = vin - (float)intValue;
int         anotherIntValue      =
(int)(diffValue*100)+0.01;
led.at(2,4," ");
if (intValue <10 )
{
led.at(2,5, intValue);
} else
{led.at(2,4, intValue);
}
led.at(2,6, ",");
led.at(2,7, anotherIntValue);
led.at(2,9, "V");
```

How to organize the sequence above shows a problem: the fact that the library provided by the manufacturer of the LCD from this link does not support variables of type float. This has raised a problem and it required a solution that has also brought some extra program lines. After I asked for an answer to this company producing link we have adopted the following solution: I separate float value in two variables of type INT, i.e. two integers. I extract the integer value from float after the comma value was multiplied by 100 to obtain a whole number. Both were displayed on the LCD as two numbers of type INT and separated by a comma. A problem occurred to express the amount of electrical voltage of the generator because it was composed from either one or two digits before the comma. In this case, when it was composed of a digit, remained a free segment between digits and commas. Then you may have entered on condition that if the figure is less than 10 pointer to point to the location of five, and if it is greater than ten, to position himself to four. In this way, on the LCD screen will display the instantaneous values revolution, voltage and power cut generated by the generator. Măsurători experimentale și concluzii.

To verify the functionality of the system, we have made a number of determinations of electrical parameter values and the revolution. I used both the LCD device, but a great feature of the IDE development environment that provides the ability to Arduino data visualization on the serial port, was used for data visualization and lifting characteristics.

¹ <http://processing.org/>



Figure 1. Serial monitor.

Displaying data for electrical values and the revolution is done using COM 7 to a data transmission rate of 9600 bps. Updating from 0.5 seconds to make it through the gaps introduced into the program. LCD device, the upgrade is performed at one second, on the grounds of visibility and inertia. Accuracy is expressed measured values is two decimal places. Even though the process of intervening sizes tithes of the volt, and the smallest value that can be detected by analog Arduino entry is 0.04 V, this is satisfactory. The following figure presents the retrieved

data from the microcontroller's serial port, with each stage of the operation, as follows: Initially, deflection and plugs into the computer and begins to take over the values of quantities. These are: RPM = 0, i.e. the number of revolutions per minute is equal to zero and MINIMUM VOLTAGE. The two posts on the LCD and serial port, are produced by the following lines:

```

if (value <= 0) {
  Serial.println("MINIMUM
  VOLTAGE!!");
  led.at(2,4, " ZERO ");
  return;
}

```

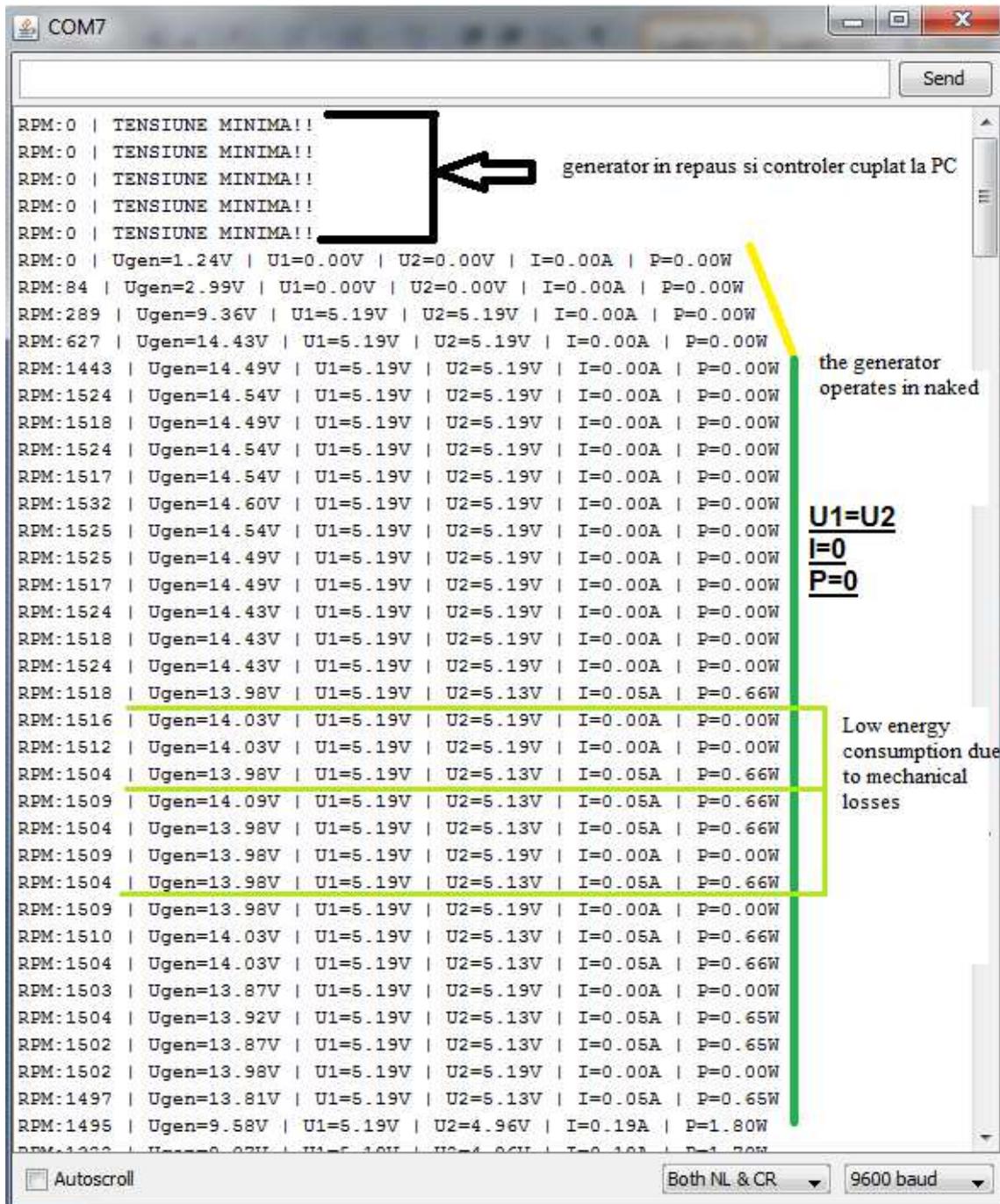


Figure 2. Displaying data for electrical values

In listing above, you can distinguish the transitional period during which the generator starts from rest and reach rated speed, around 1500 RPM. The next area is constituted by the idling of the generator, and there's no load applied (LED or MCC). In this area, the rated speed is 1500RPM, the voltage at the terminals of the generator $U_{gen} = 14,4$ V and $P = 0$ W. In the next area can be distinguished operation under load. Here the speed will decrease and air generator strength will increase. The data

collected on the serial port, are processed using an Excel spreadsheet. The variation in time elapse, represented by the 154 samples collected by the microcontroller, is illustrated in the following figure.

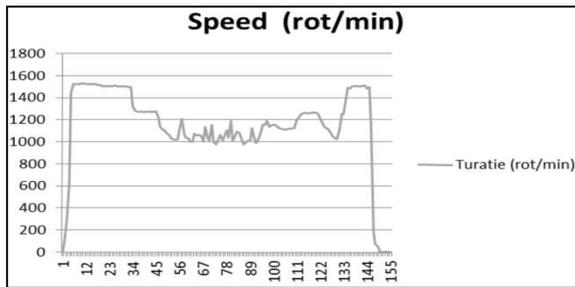


Figure 4. samples collected by the microcontroller

In the graph you can see that the regime is, the speed of the generator decreases up to 1000 rotations per minute and depends on the load applied to the electrical circuit. Over time, the operation shown in the example above, covers all operating regimes, therefore it can be said that can characterize the generator in any way complete, functioning in a greater time will be a repeat of the parameters from the picture.

The generator voltage at terminals, is shown in the following figure.

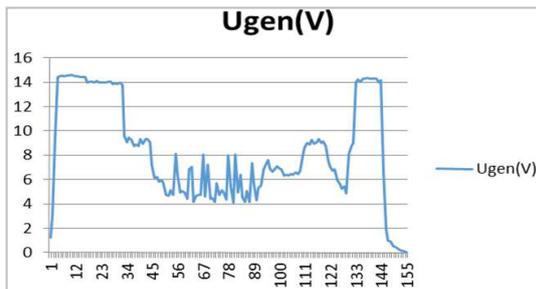


Figure 5. generator voltage at terminals.

The waveform of the voltage at the terminals of the generator is similar to the waveform of the variation in the time of the revolution. As a matter of idle operation reaches the value of 14.8 V, and, under operation with maximum load, voltage drops to 4V. The current through the circuit, is represented in the following figure.

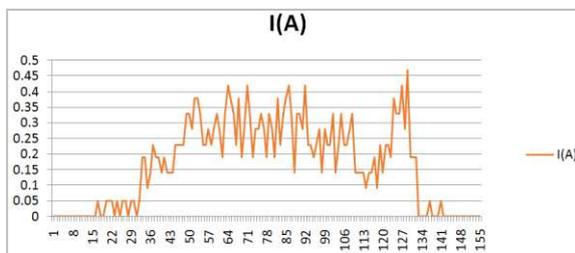


Figure 6. current through the circuit

The current maximum is about 0.48 and is reached when the consumer is DC motor and he applies a full load. If there was a

juxtaposition of the voltage at the terminals of the generator and the current through the circuit, the time course of these would be characterized by two inverses. Electric power charge air generator, illustrated in the following figure.

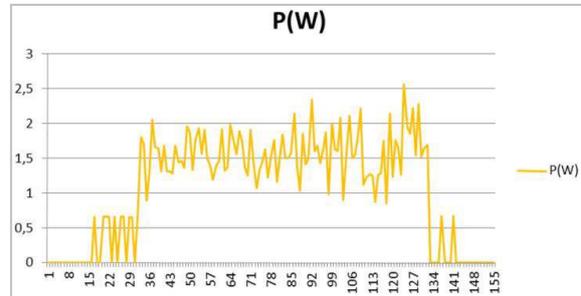


Figure 7. Electric power charge air generator

In the graph you can see that the maximum value is obtained from the sample 130. The bottom line is this: At 128 sample power generator, has charged the maximum quantities and the values retrieved are the following:

RPM = 1138 revolutions/minute;
 Ugen=6.82V; I=0.38A; P=2.56W

In the process of measuring the following factors which have limited the accuracy of data collected: the resolution of analogue inputs which expresses the value of 1024 bits. How the maximum input voltage is 5V, it follows that those 1024 bits can be expressed through a specified minimum voltage that can be notified of 004V = 0, 4mV. Analyzing the sample 128, the electric potential difference between the terminals of the resistor is 0, 45V. The following are the maximum error for the determination of blood:

$$E = \frac{0,45 \pm 0,004}{0,45} = \pm 0,991\% \quad (3)$$

You can correct this error by changing the electric resistance value of resistors comprising voltage dividers. Personally I opted for values presented to protect the analog inputs of the microcontroller. The sampling rate is the next factor which introduces an error in the measurement process. Taking into account the way of variation of parameters, this error is relatively small and can be neglected. In conclusion, it can be said that the monitoring system of the wind generator has a series of advantages and drawbacks. The system is monitored in real time, take multiple

parameters. At the same time, it can bring a number of improvements with respect to the calculation of energy delivered for a period of time, displaying of statistics in terms of the average running speed for a given period. The possibility of data transmission distance is a factor that brings a major benefit to isolated places and isolated consumers. The power consumption of the system is given by the amount of energy absorbed by the microcontroller and LCD device plate being of very little value, this constituted yet another advantage of the system. Presentation of the acquisition system based on deflection and ATMEGA 328, can be seen here [13]. Checking the operation of the data acquisition system with microcontroller is presented here.

4. Conclusions

DC engine has a broad applicability in electrical actuator systems, and electrical traction systems. Students in upper secondary education, beginning with Class XI, or school of Arts and Trades, must acquire the basics about electric drives systems with DC motors. Thus, learners need to identify operating regimes of the M. C. C., wiring diagrams and command, as well as circuit elements that appear in these schemes. The appropriation of electrical quantities and processes that underlie the actuator electrical systems, enables students to choose elements of the circuit, and ultimately the optimal solution for a SAE.

Appendix

Program used for programming the PIC Microcontroller, ATMEGA 328 (final version)

```
#include <SoftwareSerial.h>
#include <SparkFunSerLCD.h>
SparkFunSerLCD led(7,2,16);
int ledPin = 13;
volatile byte rpmcount;
unsigned int rpm;
unsigned long timeold;
// declarații pentru partea de măsurare
tensiune
float vout = 0.0;
float vin = 0.0;
float vout2 = 0.0;
float vin2 = 0.0;
float vout3 = 0.0;
float vin3 = 0.0;
```

```
float curent = 0.0;
float putere = 0.0;
int analogInput = 0;
int analogInputa = 1;
int analogInputb = 2;
float R1 = 48500.0; // !! rezistenta R1 !!
float R2 = 4600.0; // !! rezistenta R2 !!
int value = 0;
int valoare = 0;
int valoareb = 0;
void rpm_fun()
{
    rpmcount++;
}
void setup()
{
    pinMode(analogInput, INPUT); //aici
preiau prima tensiune
    Serial.begin(9600);
    led.setup();
    delay(1000);
    led.at(1,1,"RPM:");
    led.at(1,10,"P:");
    led.at(2,1,"Ug:");
    attachInterrupt(0, rpm_fun, FALLING);
    pinMode(ledPin, OUTPUT);
    digitalWrite(ledPin, HIGH);
    rpmcount = 0;
    rpm = 0;
    timeold = 0;
}
void loop()
{
    turatie();
    delay(1000);
    tensiuni();
}
void turatie()
{
    //delay(1000);
    detachInterrupt(2);
    rpm = 8.57*1000/(millis() -
timeold)*rpmcount;
    timeold = millis();
    rpmcount = 0;
    Serial.print ("RPM:");
    Serial.print(rpm);
    Serial.print (" | ");
    led.at(1,5," ");
    led.at(1,5,rpm);
    attachInterrupt(2, rpm_fun, FALLING);
}
void tensiuni(){
// read the value on analog input
value = analogRead(analogInput);
valoare = analogRead(analogInputa);
valoareb = analogRead(analogInputb);
if (value >= 1023) {
```

```

Serial.println("TENSIUNE
MAXIMA!!");
return;
}
else if (value <= 0) {
Serial.println("TENSIUNE
MINIMA!!");
led.at(2,4, " ZERO ");
return;
}
vout = (value * 5.0) / 1024.0;
vout2 = (valoare * 5.0) / 1024.0;
vout3 = (valoarb * 5.0) / 1024.0;
vin = vout / (R2/(R1+R2));
vin2 = vout2 / (R2/(R1+R2));
vin3 = vout3 / (R2/(R1+R2));
curent = (vin2 - vin3)/1.2;
putere = vin*curent;
Serial.print("Ugen=");
Serial.print(vin);
Serial.print("V | ");
Serial.print("U1=");
Serial.print(vin2);
Serial.print("V | ");
Serial.print("U2=");
Serial.print(vin3);
Serial.print("V | ");
Serial.print("I=");
Serial.print(curent);
Serial.print("A | ");
Serial.print("P=");
Serial.print(putere);
Serial.println("W ");
/*aici modific float în int pentru a afișa
pe LCD
//biblioteca LCD-ului nu suporta variabile
float
/*
int intValue = (int)vin;
float diffValue = vin - (float)intValue;
int anotherIntValue =
(int)(diffValue*100)+0.01;
led.at(2,4," ");
if (intValue <10 )
{
led.at(2,5, intValue);
} else
{led.at(2,4, intValue);
}
led.at(2,6, ",");
led.at(2,7, anotherIntValue);
led.at(2,9, "V");
//LCD pentru Putere
int intValuep = (int)putere;
float diffValuep = putere -
(float)intValuep;

```

```

int anotherIntValuep =
(int)(diffValuep*100)+0.01;
led.at(1,12," ");
led.at(1,12, intValuep);
led.at(1,13, ",");
led.at(1,14, anotherIntValuep);
led.at(1,16, "W");
}

```

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