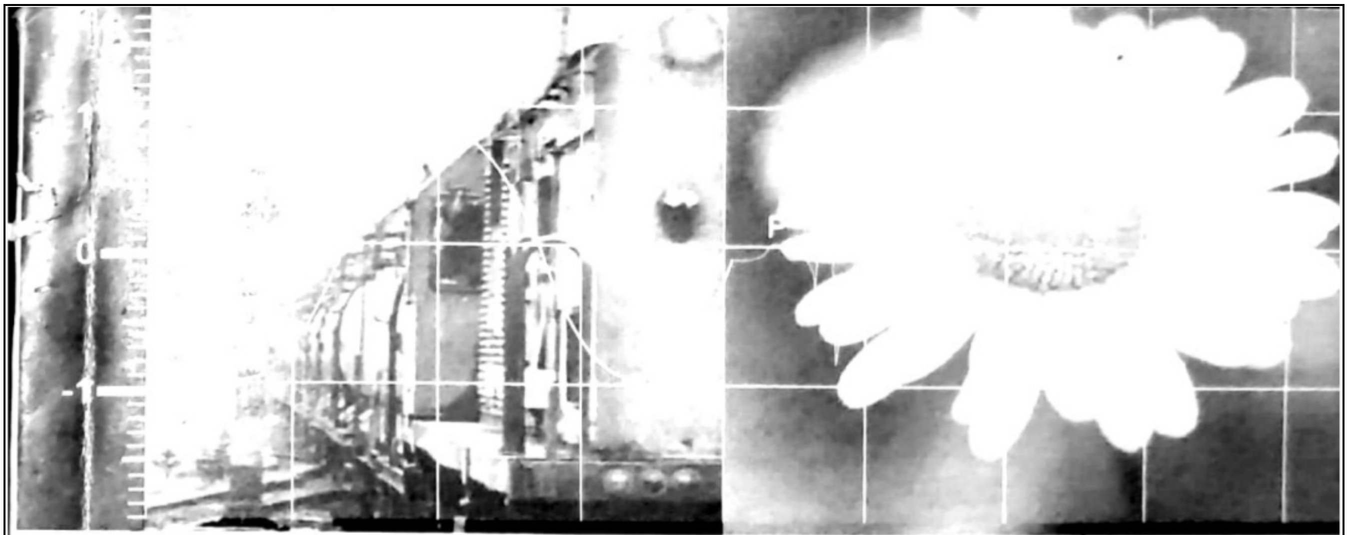
the temperatur

By M. TOIFUR

WORD COUNT 33

TIME SUBMITTED 09-MAY-2020 11:14AM

PAPER ID 58498000



Proceeding of The International Seminar on Natural Sciences and Applied Natural Sciences

Auditorium Kampus III UAD, February 17, 2007

Hosted by:

FMIPA
Universitas Ahmad Dahlan
Yogyakarta

ISBN:978-979-3812-09-0

International Seminar on Natural Sciences and Applied Natural Sciences

Auditorium Kampus III UAD, Yogyakarta
Saturday, February 17, 2007

Proceeding

Hosted by
Fakultas Matematika dan Ilmu Pengetahuan Alam
(Faculty of Mathematics and Natural Sciences)
Universitas Ahmad Dahlan

Proceeding of The International Seminar on Natural Sciences and Applied Natural Sciences

ISBN 978-979-3812-09-0

Honorary Chairman

Rector of Ahmad Dahlan University
Dean of Faculty of Mathematics and Natural Sciences

Organizing Committee

Dr. Hj. M. Dwi Suhartati, M.Si (Chair)
Nanang Suwondo, M.Pd., Dra. Listiarie B.U., M.Sc., Tutut Hermawan, S.Pd. M.Si., Margi Sasono, M.Si., Mrs. Yuli Kusnandari, Mr. Ridwan, Dra. Sumargiyani. M.Pd., Shantiana TE, M.Si, Mursid W. Hananto, S.Kom., Mr. Rohmat, Mr. Sugiyanto, Drs. Hadi Sasongko, M.Si., Agung Budiantoro, S.Si., Suprihatin, M.Kom., Yudi Ari Adi, M.Si., Tawar AG, M.Kom., Mr. H. Agus Riadi, Mr. Erwin Kurniadi, Imam Riadi, M.Kom., Mr. Budi Utomo

Transcript-Selecting Team

Prof. Dr. Sumadji
Prof. Dr. Hj. Nurfina Aznam, S.U., Apt.
Prof. Dr. Mustafa Matderis
Prof. Dr. Ismail bin Mohd.
Dr. Abdul Fadlil, M.T.
Dr. Moh. Toifur
Dr. H. R. Oktova
Dr. Hj. M. Dwi Suhartanti
Dr. Julan Hernadi
Dr. Talib Hasyim, M.Si., M.A.

The Temperature Control System on AT89S51 Microcontroller-Based Lens Saver Dry Box

Imam Yudiantoro[1], Muchlas [2], Mohammad Toifur[3], Shantiana Tri Erawati[3]

[1] Student of Magister of Physics Education, Ahmad Dahlan University, Yogyakarta
[2] Department of Electrical Engineering, Ahmad Dahlan University, Yogyakarta
[3] Department of Physics, Ahmad Dahlan University Yogyakarta

Abstract

We have designed the temperature control system for lens saver dry box where the control action is driven by AT89S51 microcontroller and we have found out the performance of this system. The hardware of this control system is an integrated system consists of a dry box, ADC circuit (ADC0809), microcontroller (AT89S51), and temperature sensor (LM35).

The measured temperature is converted into voltage by LM35 then the data is changed in to digital by ADC0809. If the temperature is higher than the set point (30 ± 1)°C, the control system will turn off the heating system in the dry box and turn on the cooling system. If the temperature is below the set point, the control system will turn off the cooling system of the dry box and turn on the heating system.

This control system is able to read the voltage in range 0 – 5 V. The relation between this voltage and the output voltage of ADC0809 is linear. The result of temperature reading and the analogue voltage shows a linear relationship too which means this system is served as a control system of the temperature in a dry box.

Keywords: temperature, control, microcontroller.

I. INTRODUCTION

Manual control systems is applied on a relatively unchangeable and uncritically processes but now in almost industrial processes need automatic devices to control the process parameters (Gunterus, 1997)

A dry box is a box that protects a device keep in it from moisture and dust. The moist air and temperature can make the growth of mold getting more aggressive and this is not good for certain devices because the mold will destroy them (Rahyudi, 2003). As an example, mold can destroy the surface lens of a camera or a handy cam. It is a serious damage because it influences the quality of picture that will be taken. One must take this fact into account when he designs a dry box as a safety box for lenses. So he needs to keep the temperature in that box in order that it resists the mold growth and protects the lens from physical damage.

A microcontroller is an integrated circuit contains of microprocessor and other peripherals (RAM, PIO, EEPROM, timer, UART, ADC etc.). It can be used as an electronic controller of any process. This research aims to design an automatic temperature control system on a lens safety dry box which the controlling thing is done by AT89S51 microcontroller. We also want to know how the performance of this system.

II. THEORY

Controller functions to compare the truth value of a plant with the expected value, to define deviation, and to product control signal that decrease the deviation. The AT89S51 microcontroller has 40 pins and internal RAM of 128-256 bytes. The block diagram of AT89S51 as follows:

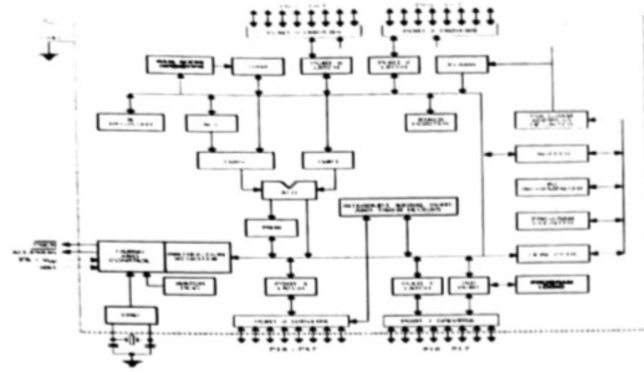


Figure 1. The block diagram of AT89S51(Anonim, 1995)

The temperature sensor IC LM35 has such linearity that it raises 10 mV for every 1°C of temperature increasing and the voltage will be 0 volt when the temperature is 0°C. The accuracy of LM35 is 0,5 °C in room temperature and it can read temperature in the range of –55°C to 150°C. It consumes less power and has impedance of 0,1 Ω for 1 mA (Anonim, 2000). ADC0809 is an IC for changing analog voltage into digital with eight channel input. It converses the analog temperature data to 8 bit digital data and the conversion process can be done in controlled mode or free running mode. It has accuracy of 1 bit LSB or ½ bit LSB for more accurate conversion (Anonim, 1995). The ADC data is voltage data in hexadecimal and it will be displayed to seven segment as temperature data in decimal. The conversion process is done with following equation:

*temperature value = result of ADC * increasing voltage for each bit* ....(1)

The seven segment needs seven LEDs in one package to display a number. It needs a seven segment decoder to translate from BCD code to certain decimal number.

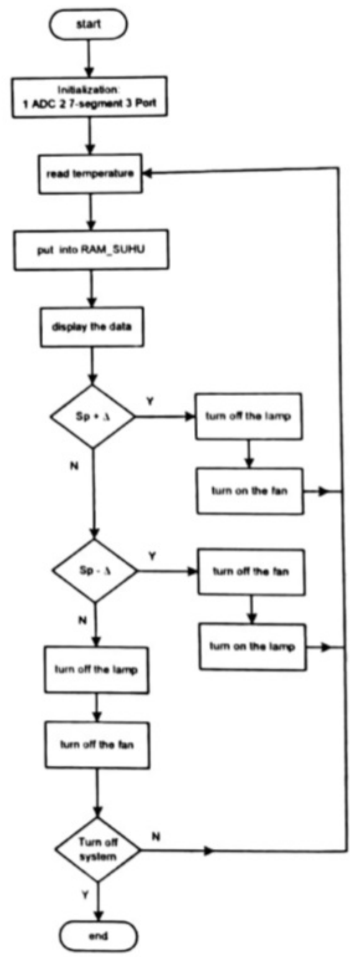


Figure 3. Flow chart of the main program

III. METHOD

Designing

A dry box is made with dimension of 20 x 25 x 35 cm from acrylic. This box has a lamp of 5 watt, a fan, and a unit of control system. The control system has 2 parts: the hardware and the software. The hardware consists of AT89S51 microcontroller, LM35 as temperature sensor, ADC0809 as analog to digital converter, and seven segment displays. The software is made according to the flow chart in Figure 3.

Check the linearity of ADC0809 and LM35

Before the system runs, we must convince that the ADC0809 and LM35 are linear. LM35 can detect temperature changing of 0,5°C. If the data is 8 bit long then it collects 256 data. The interval is 0,5°C and the temperature measurement begins at 0°C so this sensor can measure temperature up to 127,5°C. The value of voltage at 0°C is 0 volt and for temperature increasing of 1°C the voltage will increase by 10 mV so at 127,5°C the voltage must be 1,275 volts.

Calibrate the system

The temperature value that is shown at seven segment displays must equal to the temperature value of a conventional thermometer. This system has no amplification module so the reading of LM35 is the real data.

Collecting Data

We took the data including the temperature data, the voltage data, and the conversion data.

Analyze The Data

The data analyzing process starts with determine the equation for ADC conversion and linearity, that is

$$Y = ax + b \quad (2)$$

The accuracy of this conversion process can be determined by this following equation:

$$Accuracy = \sqrt{\frac{\sum_{i=1}^{N}(\Delta T_i)^2}{N}} \quad (3)$$

IV. RESULTS AND DISCUSSION

The linearity of ADC0809 is given by this following equation:

$$Y_1 = 0{,}025X + 0{,}127 \quad (4)$$

The graph below is the graph we have when applying this equation to the digital data of ADC output. This proves that the ADC0809 is linear and it served to use as analog to digital converter for this system.

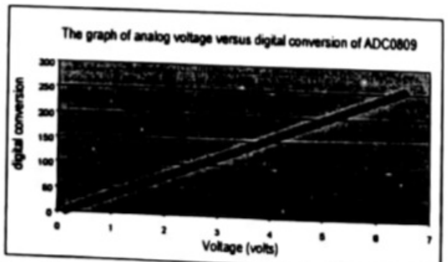


Figure 4. The graph of analog voltage versus digital conversion of ADC0809

The linearity test of temperature analog data that is taken by LM35 shows that the temperature and the voltage have a relationship as follows:

$$Y_2 = 0{,}015X + 0{,}131 \quad (5)$$

The temperature data is taken manually by a usual thermometer. According to this data and equation, we have the value of R^2 is 0,995 that shows a changing of temperature is almost linear. The graph of temperature and voltage relationship is showed by Figure 5.

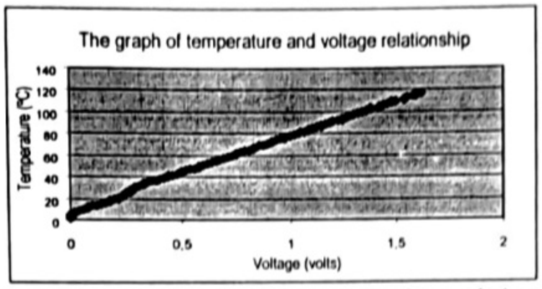


Figure 5. The graph of temperature and voltage relationship of LM35

In this research we are expected the value of temperature is between 29°C - 31°C and the set point is 30°C with its tolerance is 1°C. We consider this set point value because from several references, they all suggest the best value is between 27°C – 35°C and the reason is the mold growing and the risk of physical damage is less(Muchlas, 1995; Rahyudi, 2003). When the set point is 30°C, the heating and cooling systems are off. The heating system will run when the temperature is 1°C below the set point. It turns on the lamp and turns off the fan until the temperature is equal to the set point. When the temperature rises 1°C from the set point then the cooling system will run. It turns on the fan and turn off the lamp until the temperature is equal to the set point. This system will run in such a way that the cooling system and heating system work back and forth to keep the temperature is equal to the set point.

The control system is an on-off type and its characteristic is shown in Figure 6.

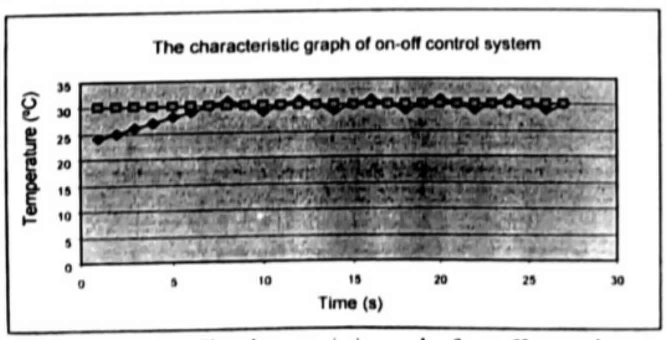


Figure 6. The characteristic graph of on-off control system

V. CONCLUSION

We can conclude from this experiment result that we can build a temperature control system for a lens safer dry box. The linearity of the ADC0809 and LM35 guarantees that the system will work excellently. This system works as an on-off control. The work principle of this system is to keep the temperature in the dry box always equal to the set point that is (30 ± 1)°C.

VI. REFERENCES

Anonim, 2000, "LM35 Precision Centrigade Temperature Sensors", www.National.com/JPN/an/460.pdf.

Anonim, 1995,"National Data Acqusition Data Book", *National Semiconductor Coorporation*, California.

Gunterus, F,1997,"The Process Control System", http://www.centrin.net.id/delta.com

Muchlas, 1995, "The Temperature Characteristic of Silicon Diode Sensor as a Microcomputer-Based Transducer", a research report, Ahmad Dahlan University, Yogyakarta.

Rahyudi, 2003, "A Measuring and Controlling Temperature Based on Microcomputer Through the Parallel Port", *Thesis of ScholarDegree*, Ahmad Dahlan University, Yogyakarta.

the temperatur

ORIGINALITY REPORT

0%

SIMILARITY INDEX

PRIMARY SOURCES

EXCLUDE QUOTES	ON	EXCLUDE MATCHES	OFF
EXCLUDE BIBLIOGRAPHY	ON		