Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 548-552 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Exhaust Fan Control Design As Air Cleaner Based On Microcontroller

Frinto Tambunan[1], Bambang T.J. Hutagalung[2], Nurhayati[3]

Technical Information,
University Potensi Utama, Jl. K.L. Yos Sudarso km. 6.5 No 3A Tanjung Mulia, Medan, 20241, Indonesia

Email : frintoaja@gmail.com, bambangtjh@gmail.com, izzkyir@yahoo.co.id

ARTICLEINFO

Article history:
Received: 25/01/2020
Revised: 02/02/2020
Accepted: 06/02/2020

Keywords:
Artificial Intelligence, Fuzzy Logic Control, Exhaust fan Microcontroller

ABSTRACT

The use of Exhaust fan is a device that we often encounter in our daily lives. And in its use is still controlled by humans themselves and classified as manual, so manual use is very inconvenient to exhaust fan users, so that if it is controlled systematically using fuzzy logic, where the logic to be implanted is, to accelerate the exhaust fan rotation rate if a value is obtained that will refer at the high level of impurities detected by sensors that have been setup and determined in such a way, so that exhaust fan can work in accordance with what is instructed by the logic that is embedded in the microcontroller system.

1. Introduction

Analysis of WHO (World Health Organization), the body of the world health organization shows that the bad effects of cigarette smoke is greater for passive smokers than active smokers. When smokers burn a cigarette and suck it, smokes smoked by smokers are called mainstream smoke and smoke coming out of the cigarette tip (the burning part) is called side steam. This secondhand smoke proved to contain more tobacco burning than the main smoke. This smoke contains Carbon Monoxide 5 (five) times larger, Tar and Nicotine 3 (three) fold, Ammonia 46 (forty six) fold, Nickel 3 (three) fold, and Nitrosamina (cancerous substance) reaching 50 (fifty) times greater on secondhand smoke than with levels in primary smoke.

Smoking place will be used every day and will be used by many smokers, therefore the place must be kept clean including in terms of air circulation entering the room smoking area. In general, the smoking area only uses ventilation and air circulation becomes less. This condition results in accumulation of gas in the room and difficult to return to normal condition.

2. Research Methods

The method [2] used in the design of this exhaust fan using fuzzy logic[3] method because this method is very good in handling the problem of artificial intelligence[1][5].

2.1. Sensor Utilization

There are several problems that occur in the design of Exhaust Fan control system using fuzzy logic method [4], then needed solution or problem solving, among others: By utilizing MQ-3 sensor to know the air content in a room that will give the value back to the system to activate motor Exhaust Fan. By utilizing the features provided by the cvavr software the activation process of Exhaust Fan can be done automatically and according to the air content in the room.

2. 1.1 System Planning

Broadly speaking, the indoor air control system using a MQ-3 sensor, 16x2 LCD, minimum ATMega8535 microcontroller system. The block diagram of the Exhaust Fan control system simulation using the fuzzy logic method is shown below.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 548-552 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

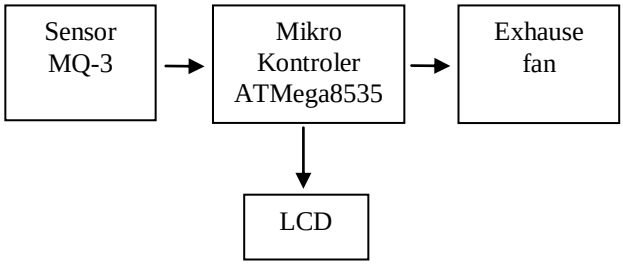

Fig 1. Microcontroller system diagram

2. 1.2 Math formula

Based on the factory specification data, the smallest rotating fan speed is 100 rpm (rotary per minute) and spreads 500 rpm, the sensor capability is in the 100mg / L to 600mg / L interval, while the fan rotation frequency source is only capable of providing 200 rpm 7000 rpm. If the room control system uses the following four rules,

[R1] IF speed SLOW And gas HIGH THEN SMALL frequency;
[R2] IF speed SLOW And gas LOW THEN SMALL frequency;
[R3] IF speed FAST and gas HIGH THEN BIG frequency;
[R4] IF Fast speed And gas LOW THEN BIG frequency;

What is the source of the fan rotation frequency that the control system produces when the gas sensor shows the number 300 mg / L, while the fan rotates with 400 rpm speed ? solve this problem with the method:

Sugeno, but the rule changed to the following;

[R1] IF LATE speed And gas HIGH THEN frequency = 0.5 * speed + 1700;
[R1] IF LATE speed And gas LOW THEN frequency = 2 * speed - 4000;
[R1] IF speed QUICK AND gas HIGH THEN frequency = 0.5 * speed + 2000;
[R1] IF speed FAST and gas LOW THEN frequency = speed + 700; [R1] IF speed SLOW And gas HIGH Then frequency = 0.5 * speed +1700;

α rating 1 = μ slow ^ high
= min μ slow [4000] μ high[300]
= min (0.25; 0.4)
= 0.25
Value z1: z1 = 0.5 * 4000 +1700 = 2000 +1700 = 3700

[R2] IF LATE speed And gas LOW THEN frequency = 2 * speed - 4000;
α rating 2 = μ slow ^ low
= min μ slow [4000] μ low [300]
= min (0.25; 0.6)
= 0.25
The value of z2: z2 = 2 * 4000 - 2000 = 4000

[R3] IF HEIGHT speed And gas HIGH THEN frequency = 0.5 * speed + 2000;
α rating 3 = μ fast ^ high
= min μ fast [4000] μ high [300]
= min (0.25; 0.6)
= 0.25
Value z3: z3 = 0.5 * 4000 + 2000 = 4000

[R4] IF Speed FAST And gas RENDAHTHEN frequency = speed + 700;
α rating 4 = μ fast ^ low
= min μ fast [4000] μ low [300]
= min (0.25; 0.6)
= 0.25
Value of z4: z4 = 4000 + 700 = 4700
Firm Value Z

Z = (αpred1 * z1 + αpred2 * z2 + αpred3 * z3 + αpred4 * z4) / (αpred1 + αpred2 + αpred3 + αpred4)

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 548-552 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Z = (0.25 * 3700 + 0.25 + 4000 + 0,4 * 4000 + 0,6 * 4700) / (0,25 + 0,25 + 0,4 + 0,6) = 6345/1, 5 = 4230

So the source of rotary frequency (exhaust fan) produced 4230 rpm control system.

3. Results And Discussion

To find out whether the circuit Microcontroller ATMega8535 has worked well on the tool, then tested by giving program commands on the Microcontroller by inputting data from the computer into the microcontroller. In the installation of connect first connect the computer with download through the USB cable to the microcontroller circuit. To perform the testing tool with the command can be done with several steps, among others, The first step is to run the CVAVR software, After the application load then it will look like a Figure1 :

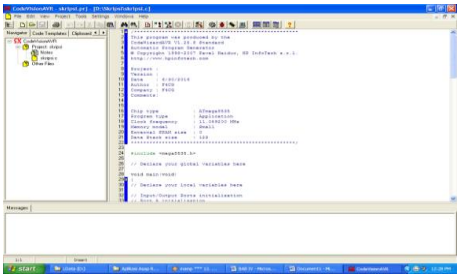

Fig1. Display Software CVAVR.

Next to program mikrokontroler ATMega8535 is by typing the program in accordance with the required on the tool. As shown in Figure 2.

:

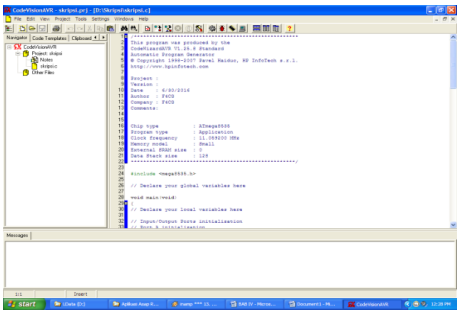

Fig 2. Program View

To continue the installation phase of the microcontroller, the program is first checked by clicking on the "Compile" button or icon. This process works for setting the program into ChipMikrokontroler. Can be seen whether the created program has errors or not, if successful it will be written "No errors". Compile process can be seen in figure 3

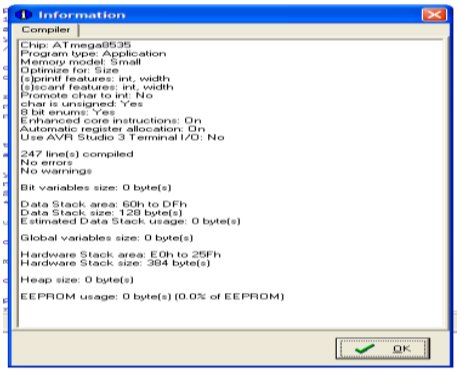

Fig 3. Compile Results.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 548-552 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Figure 3. Display Download File On AVR-DUDE Next press Execute to download the program from PC to microcontroller, if successful then can be seen in figure 4

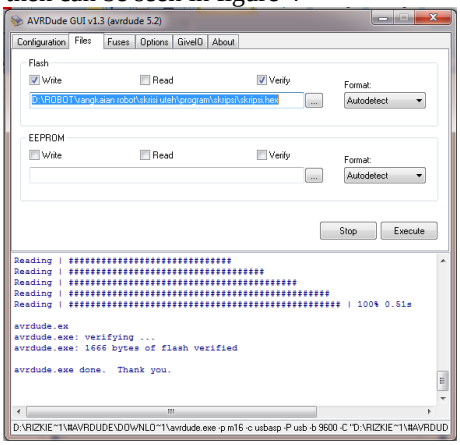

Fig 4. Finished View Download Files To Microcontroller

After the hardware device in the program to the microcontroller and already in execute using the downloader then the program automatically entered into the microcontroller. first set the port. then the data of air quantity sent in send to microcontroller will be displayed by LCD 16x2. If the power generation decreases the current that has been set then the activation will be done by logical fuzzy rules.

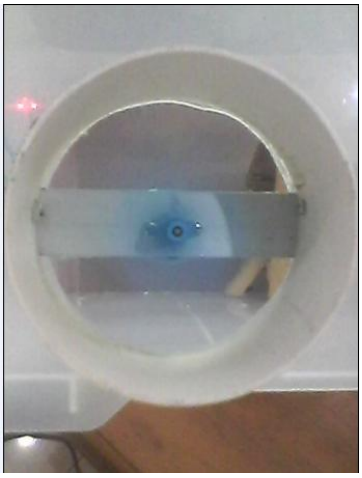

Fig 5. The activation corresponds to fuzzy logic

4. Conclusion

From the research conducted on the tool Exhaust fan Fuzzy logic method can be concluded, among others: Disposal can be done quickly depending on how much air is not good in a room. Using the logical fuzzy method can maximize the performance of a system because it will work when needed.

5. References

[1] Azlan, N.Z., Zainudin, F., Yusuf, H.M., Toha, S.F., Yussoff, S.Z.S., Osman, N.H., 2007, *Fuzzy Logic Controlled Miniature LEGO Robot for Undergraduate Training System*, International Islamic University Malaysia, Kuala Lumpur, Malaysia

[2] Ibrahim, D., Alshanableh, T., 2009, *An Undergraduate Fuzzy Logic Control Lab Using a Line Following Robot*, Wiley Periodicals, Inc., Lefkosa.

[3] Sivanandam, S.N., Sumathi S., dan Deepa S.N., 2007, *Introduction to Fuzzy Logic using MATLAB*, Springer-Verlag, Berlin.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 548-552 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

[4] Solikin, F., 2011, Aplikasi Logika Fuzzy dalam Optimalisasi Produksi Barang menggunakan Metode Mamdani dan Metode Sugeno, *Skripsi*, Jurusan Pendidikan Matematika, UNY, Yogyakarta.
[5] Tambunan, F., 2019, Design of Artificial Neural Networks to Recognize Fingerprint Patterns, IJISTECH (International Journal of Information System & Technology). 3

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.