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APPLICATION OF FUZZY MAMDANI LOGIC IN DETERMINING TEACHER PERFORMANCE TO THE LEARNING SYSTEM AT PUBLIC HIGH SCHOOL 6 BENGKULU MIDDLE

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ABSTRACT

Nowadays, the process of assessing teacher performance at State High School 6 Bengkulu Middle is still manually, namely by filling in the scores on each criterion consisting of 14 competencies, then the values are added together to get the final result of the teacher performance assessment. However, this takes quite a long time, besides that the assessment of teacher performance is only by looking at teachers who are active in various fields in the school. The application of teacher performance in State High School 6 Bengkulu Middle can help provide the results of teacher performance assessment of the learning system in schools through a fuzzy Mamdani logic approach. The application of teacher performance to the learning system at State High School 6 Bengkulu Middle was created using the Visual Basic .Net programming language and SQL Server 2008r2 Database. Based on the black box testing that has been carried out, it was found that the functionality of the teacher performance application to the learning system at State High School 6 Bengkulu Middle went well as expected and was able to analyze teacher assessment data through the Fuzzy Mamdani Method to determine teacher performance against the learning system in schools.

Keywords: Fuzzy Mamdani Logic, Teacher Performance, State High School 6 Bengkulu Middle

1. Introduction

The rapid development of information and communication technology makes us aware of the importance of information (Chen & Sivakumar, 2021). Information media and telecommunications are media that can be used in the process of information transactions. In everyday life, information technology is very useful, with information it will help us to make a decision more precisely based on the data obtained in the form of information (Szymkowiak et al., 2021; Hamzah et al., 2022).

In the learning process, teachers are required to manage so that the learning process can run well. In order for the functions and duties attached to the functional position of the teacher to be carried out in accordance with applicable rules, an assessment of teacher performance is needed. Performance appraisal is a method or tool used to record and assess the achievement of the implementation of activities carried out based on goals, objectives and strategies, so that the progress of the organization can be known. Teacher performance proves the success rate of a teacher in delivering learning materials to students. Teacher performance appraisals usually take place over a period of time once a year (Bone et al., 2021; Lohman, 2021).

High School 6 Bengkulu Middle is one of the high schools in Bengkulu City. So far, the process of assessing teacher performance in schools is still manually, namely by filling in the scores on each criterion consisting of 14 competencies, then the values are added together to get the final result of the teacher performance assessment. However, this takes quite a long time, besides that the assessment of teacher performance is only by looking at teachers who are active in various fields in the school (Mito et al., 2021).

Therefore, in this study, system development was carried out by making applications in determining teacher performance of the learning system at High School 6 Bengkulu Middle through a computerized-based mathematical approach to Fuzzy Mamdani Logic (Ningrum et al., 2021; Mavani et al., 2021; Ashiedu, 2022).

Fuzzy logic is one of the components that make up Soft Computing. The basis of fuzzy logic is fuzzy set theory. In fuzzy set theory, the role of the degree of membership as a determinant of the presence of elements in a set is very important (Serrano-Guerrero et al., 2021).

Fuzzy logic was first introduced by Zadeh in 1965. The basis of fuzzy logic is fuzzy set theory. In fuzzy set theory, the role of the degree of membership or the value of membership as a determinant of the presence of elements in a set is very important. In the crisp set, the membership value is only two possibilities, namely 0 and 1, while in the fuzzy set, the membership value is located in the range of 0 to 1 (Rasulova, & Salieva, 2021; Thakkar, et al., 2021).

Fuzzy logic is used to map an insert variable into the process and will generate output using the IF-THEN rule. The use of fuzzy logic can be developed as an expert system, because it can produce output as if it were an expert. In addition, fuzzy logic can store the knowledge of experts stored in the knowledge base and can predict future events (Sharma et al., 2021).

Teacher performance is the ability of a teacher to carry out learning tasks at school and is responsible for students under his guidance by improving student learning achievement. Therefore, teacher performance can be interpreted as a condition that shows the ability of a teacher to carry out his duties at school (Chen et al., 2022; Dumitrescu et al., 2021).

Visual Studio 2010 (Microsoft Visual Basic .Net) is a tool for developing and building applications that move on top of the .Net Framework system, using the basic language. Using this tool, programmers can build windows form applications, ASP.Net-based web applications and also command-line applications. The Visual Basic .Net language itself adheres to the object-oriented programming language paradigm which can be seen as an evolution of previous versions of Microsoft Visual Basic implemented on top of the .Net Framework.

2. Research Methodology

The research method used by the author is the Waterfall method. The waterfall method is often called the classic life cycle, which describes a systematic and sequential approach to software development, starting with the specification of user needs and then continuing through the stages of planning, modeling, construction, and system delivery to customers/users (deployment), which ends with support for the complete software produced. The stages of the waterfall method can be seen in figure 1 (Alsagaby & Alharbi, 2021).

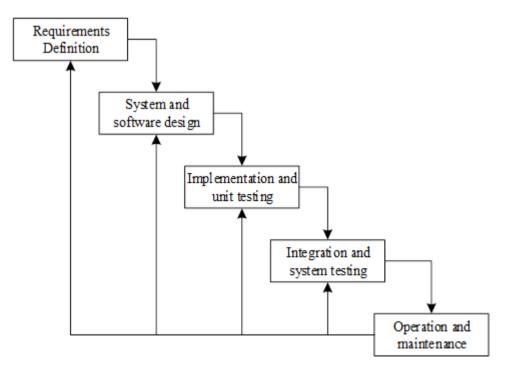


Fig. 1 Stages of the Waterfall Method

Mamdani's Fuzzy Logic Method

The Mamdani method is often also known by the name of Max-Min Method. Using Min on the implication function and Max on the composition of the Interfunctional implications. There are 4 stages to get the output, including

 \checkmark Formation of fuzzy sets

In the Mamdani method, both input variables and output variables are divided into one or more sets.

✓ Function app Implications

In the Mamdani method, the implication function used is Min

✓ Composition of rules

There are 3 methods used in inference of fuzzy systems, namely:

- 1). Max Method (maximum)
- 2). Additive Method (Sum)
- 3). Probabilistic OR Method (Probor)
- ✓ Affirmation (Defuzyy)

The input of the defuzzy process is a fuzzy set obtained from the composition of fuzzy rules. In contrast, the resulting output is a number in the domain of the fuzzy set. If given a fuzzy set in a certain range, it must be able to take a certain crisp value as output. in this study using the Centroid method.

3. Knowledge Acquisition

$$\mu_{Bad}(z) = \begin{cases} 1 & x \le 0\\ \frac{25-x}{25-0} & 0 \le x \le 25\\ 0 & x \ge 25 \end{cases}$$

$$\mu_{Not \ Good \ Enough}(z) = \begin{cases} 0 & x \le 25 \ or \ x \ge 50\\ \frac{x-0}{25-0} & 0 \le x \le 25\\ \frac{50-x}{50-25} & 25 \le x \le 50 \end{cases}$$

$$\mu_{Good \ Enough}(z) = \begin{cases} 0 & x \le 25 \ or \ x \ge 75\\ \frac{x-25}{50-25} & 25 \le x \le 50\\ \frac{x-25}{75-x} & 50 \le x \le 75\\ \frac{75-x}{75-50} & 50 \le x \le 75 \end{cases}$$

$$\mu_{Good}(z) = \begin{cases} 0 & x \le 50 \ or \ x \ge 100\\ \frac{x-50}{75-50} & 50 \le x \le 75\\ \frac{100-x}{100-75} & 75 \le x \le 100\\ \frac{x-75}{100-75} & 75 \le x \le 100\\ 100 & x \ge 100 \end{cases}$$

Sample data on the performance assessment of teacher Eka Septi Kusmeriyati, S.Pd where the scores obtained in the 14 competencies are as shown in Table 1.

Table 1 - Data of Competen	cies
Membership Degree Value	:

Competency Code	Value	Excellent	Good	Good Enough	Not Good Enough	Bad
K1	75	0	$\frac{75-50}{75-50}$ = 1	0	0	0
K2	75	0	$\frac{75-50}{75-50}$ = 1	0	0	0
К3	75	0	75 - 50 75 - 50 = 1	0	0	0
K4	77	$\frac{77 - 75}{100 - 75} = 0,08$	$\frac{100 - 77}{100 - 75} = 0,92$	0	0	0
K5	71	0	$\frac{71-50}{75-50}$ = 0,84	75 - 71 75 - 50 = 0,16	0	0
K6	75	0	$\frac{75-50}{75-50}$ = 1	0	0	0
K7	70	0	$\frac{70-50}{75-50}$ = 0,8	$\frac{75 - 70}{75 - 50} = 0,2$	0	0
K8	70	0	$\frac{70-50}{75-50}$ = 0,8	$\frac{75 - 70}{75 - 50} = 0,2$	0	0
K9	70	0	$\frac{70-50}{75-50}$ = 0,8	$\frac{75 - 70}{75 - 50} = 0,2$	0	0
K10	75	0	$\frac{75-50}{75-50}$ = 1	0	0	0
K11	67	0	$\frac{67 - 50}{75 - 50} = 0,68$	$\frac{75 - 67}{75 - 50} = 0,22$	0	0
K12	67	0	$\frac{67 - 50}{75 - 50} = 0,68$	$\frac{75 - 67}{75 - 50} = 0,22$	0	0
K13	67	0	$\frac{67 - 50}{75 - 50} = 0,68$	$\frac{75 - 67}{75 - 50} = 0,22$	0	0
K14	75	0	$\frac{75-50}{75-50}$ = 1	0	0	0

R01	$\alpha_1 = \min \{0; 0; 0; 0, 08; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0\} = 0$
	See the set of excellent teacher performance
	(z-75)/100) = 0
	$Z - 75 = 0 \ge 100$
	Z - 75 = 0
	$Z_1 = 75 + 0 = 75$
R02	$\alpha_2 = \min \{1; 1; 1; 0.92; 0.84; 1; 0.8; 0.8; 0.8; 1; 0.68; 0$
	$0,68;1\} = 0,68$
	View good teacher performance set
	(z-50)/100) = 0,68
	$Z - 50 = 0,68 \times 100$
	Z - 50 = 68
	$Z_2 = 50 + 68 = 118$

The last step is to carry out affirmation (defuzzyfication), where in this study defuzzyfication using the Centroid Method, so that crisp values are obtained: $\sum_{n=1}^{n} - w(n)$

$$z^{*} = \frac{\sum_{j=1}^{n} z_{j}\mu(z_{j})}{\sum_{j=1}^{n}\mu(z_{j})}$$
$$z^{*} = \frac{0*75+0.68*118+0.08*58+0*25+0*0+0*0}{0+0.68+0.08+0+0+0}$$
$$z = \frac{84.88}{0.76} = 111.68 \quad (Excellent)$$

4. Results and Discussions

Blackbox testing is one of the software testing methods that focuses on functionality, especially on the input and output of teacher performance applications to the learning system at High School 6 Bengkulu Middle. The results of the black box testing that has been carried out on the application of teacher performance to the learning system at High School 6 Bengkulu Middle, are shown in table 1.

		Table 1 - Test Results		
No.	Tested Form	Test Scenario	Test result	Conclusion

1				Entering th	he	The system denies access	to the	As expected
Login	Form			wrong usernan	ne	login by displaying an e	rror	
LOGIN				or password		message		
20011					Ī	LogikaFuzzyMamdani	×	
[Password					Username dan Password Tidak Ditem	ukan	
ĺ						c	DK	
		Login					, .	A (1
				Enter the corre		The system receives such		As expected
				username ai	nd a	access by displaying a succ	cessful	
				password		message		
						LogikaFuzzyMamdani	×	
						Username dan Password Ditemuk	an	
						ОК		
2 Teache	er Data	Input	Form	Store existin	ng 7	The system denies access to	o store	As expected
	er Data	Input	Form	Store existin	U	The system denies access to		As expected
Input Data Guru	er Data		Form	teacher data in	U	such data by displaying an	n error	As expected
	er Data	Input Tanggol Lahir 04/11/2022	Form		U	-	n error	As expected
Input Data Guru	er Data	Tanggal Lahir		teacher data in	U	such data by displaying an	n error	As expected
Input Data Guru Kode Guru	er Data	Tanggal Lahir 04/11/2022		teacher data in	U	such data by displaying an LogikaFuzzyMamdani	n error	As expected
Input Data Guru Kode Guru Nama Guru		Tanggal Lahir 04/11/2022 Pangkat/Jabatan/Golo		teacher data in	ı a	such data by displaying an LogikaFuzzyMamdani Gagal	n error	As expected
Input Data Guru Kode Guru Nomo Guru NIP		Tanggal Lahir [04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin		teacher data in database	ı a	such data by displaying an LogikaFuzzyMamdani Gagal Message	×	
Input Data Guru Kode Guru Nomo Guru NIP		Tanggal Lahir [04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin		teacher data in database Store teacher	i a	such data by displaying an LogikaFuzzyMamdani Gagal message The system receives acce	ess to	As expected
Input Data Guru Kode Guru Nama Guru NIP Tempat Lahi		Tanggal Lahir (04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin Pendidikan Terakhir	ingan	teacher data in database	i a	such data by displaying an LogikaFuzzyMamdani Gagal Message	ess to	
Input Data Guru Kode Guru Nomo Guru NIP		Tanggal Lahir (04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin Pendidikan Terakhir	igan	teacher data in database Store teacher	ı a ı't	such data by displaying an LogikaFuzzyMamdani Gagal message The system receives acce	error ×	
Input Data Guru Kode Guru Nama Guru NIP Tempat Lahi Tambah Kode Guru GR001	r Simpon Koreki Nama Guru Zukiral, S.Pd	Tonggal Lahir [04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin Pendidikan Terakhir Hapus Batat NIP 19750508 200604 1 007	ingan ingan v keluoz lanir Ujung Pa	teacher data in database Store teacher data that doesn already exist in	ı a ı't	such data by displaying an LogikaFuzzyMamdani Gagal Message The system receives acce save that data and displa successful message	error ×	
Input Data Guru Kode Guru Nama Guru NIP Tempat Lahi Tambah Kode Guru GR001 GR002	r Simpon Koreksi Nama Guru Zukiral, S.Pd Yunita Daniati, S.Pd	Tanggal Lahir 04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin Pendidikan Terakhir Hapus Batal NIP 19750508 200604 1 007 19840627 201101 2 008	Ingan	teacher data in database Store teacher data that doesn	ı a ı't	such data by displaying an LogikaFuzzyMamdani Gagal Message The system receives acce save that data and displa successful message	error ×	
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Input Data Guru Kode Guru Nama Guru NIP Tempat Lahi Tambiah Kode Guru GR001 GR002 GR003 GR004	r Nama Guru Zukiral, S.Pd Yunita Daniati, S.Pd Sulastri, S.Pd	Tanggal Lahir 04/11/2022 Pangkat/Jabatan/Golo Jenis Kelamin Pendidikan Terakhir Hapus Batal NIP 19750508 200604 1 007 19840926 200804 2 002 19790312 201001 2 003	Impan Keluar Impan Lahir Ujung Pc Bukit Har Ujung Pc Air Umbc	teacher data in database Store teacher data that doesn already exist in	ı a ı't	such data by displaying an LogikaFuzzyMamdani Gagal Message The system receives acce save that data and displa successful message	error ×	
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3	Teacher Performance Data Input Form	Store	existing	The system denies access to store	As expected
		teacher		such data by displaying an error	
		assessn	nent data		
		in a dat	abase		

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Intermediating large Intermediating large	Stores teacher assessment data that is not already in the database	message LogikaFuzzyMamdani × Gagal OK The system receives access to As expected save that data and displays a successful message LogikaFuzzyMamdani × Berhasil
	Store existing rule composition data in a database Store rule composition data that doesn't already exist in the database	The system denies access to store As expected such data by displaying an error message LogikaFuzzyMamdani X Gagal Image: Complexity of the system receives access to save that data and displays a successful message LogikaFuzzyMamdani X
Fuzzy Tsukamoto Method Form	Conducting the Fuzzy Mamdani method process on teacher assessment data based on the	Berhasil OK The system successfully displays the final results of the mamdani fuzzy for each teacher and provides information on the results of the teacher performance

Komposisi At Kode Aturar		12	13	k4	k5		L.		7	18		k9 *						
Kode Aturar			K3 Songat Baik				kó Sacas						asse	ssme	ent			
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P0001	GR001	Zukiral, S		75	75	88	77	79	75	70	70	70					-	
P0002	GR002		Daniati, S.Pd	75	75	75	77	71	75	70	70	70	P0009	GR009	Frenko Sarijaya, S.Pd	90	Sangat Baik	
P0003	GR003	Yuliniar		83	83	75	77	64	75	70	80	70	P0004	GR004	Sulastri, S.Pd	58	Tidok Baik	
P0004 P0005	GR004 GR005	Sulastri,	S.Pd In Najimi, S.Pd	75	75	75	77	71	75	70	70	70	F0004	UR.04	JUIOSTI, J.FO	30	100K BOIK	
<	GROUG	30 00tu	in Najimi, stra	/5	70	75		1	79	70	10	>	P0002	GR002	Yunita Daniati, S.P.d	58	Tidak Baik	
Niai Derajat	Keonggotoon da	n Fire Strength	,															
Kode Nilai	kdguru Afr	de I	Derajat									1	P0003	GR003	Yuliniarfi, M.Pd	58	Tidak Baik	
NIGI P0001	GR001 R05		Keonggotaan		50													
P0001	GR001 R11				50													
P0001	GR001 R19				25													
P0003	GR003 R05				50													
P0003	GR003 R11	0)		50													
	etode Fuzzy Marro	dani							_		_	_						
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P0010	GR010	Emi Astuti,	S.Sos	111,684	2105263	316	Sangat	Baik										
P0009	GR009	Frenko San		90			Sangat											
P0004	GR004	Sulastri, S.F		58			Tidak Ba											
P0002	GR002	Yunita Dan		58			Tidak Ba											
P0003	GR003	Yuliniarti, N	A.Pd	58			Tidak Bo	aik .										

Based on the black box testing that has been carried out, it was found that the functionality of the teacher performance application to the learning system at High School 6 Bengkulu Middle went well as expected and was able to analyze teacher assessment data through the Fuzzy Mamdani Method to determine teacher performance of the learning system in schools.

5. Conclusions

Based on the results of the discussion and testing that has been carried out, it can be concluded that: The application of teacher performance at High School 6 Bengkulu Middle can help provide the results of teacher performance assessment of the learning system in schools through a fuzzy Mamdani logic approach. The application of teacher performance to the learning system at High School 6 Bengkulu Middle was made using the Visual Basic .Net programming language and SQL Server 2008r2 Database. Based on the black box testing that has been carried out, it was found that the functionality of the teacher performance application to the learning system at High School 6 Bengkulu Middle went well as expected and was able to analyze teacher assessment data through the Fuzzy Mamdani Method to determine teacher performance of the learning system in schools.

References

- Alsagaby, S. A., & Alharbi, M. T. (2021). Cancer in Saudi Arabia (CSA): Web-Based Application to Study Cancer Data Among Saudis Using Waterfall Model. *Journal of Multidisciplinary Healthcare*, 14, 2333.
- Ashiedu, F. (2022). Application of Fuzzy Mamdani Model for Cost Optimization in LPG Transshipment System. FUPRE Journal of Scientific and Industrial Research (FJSIR), 6(2), 1-10.
- Bone, A. A., Rachman, A., & Mashudi, I. (2021). the Teacher Performance Appraisal System in Improving Teachers Performance in Limboto District. *Governance: Jurnal Ilmu* Administrasi Publik, 4(1), 30-40.
- Chen, Y., & Sivakumar, V. (2021). Investigation of finance industry on risk awareness model and digital economic growth. *Annals of Operations Research*, 1-22.
- Chen, X., Hu, Z., & Sun, Y. (2022, June). Fuzzy logic based logical query answering on knowledge graphs. In *Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 36, No. 4, pp. 3939-3948).
- Dumitrescu, C., Ciotirnae, P., & Vizitiu, C. (2021). Fuzzy logic for intelligent control system using soft computing applications. *Sensors*, 21(8), 2617.
- Hamzah, M. L., Purwati, A. A., Sutoyo, S., Marsal, A., Sarbani, S., & Nazaruddin, N. (2022). Implementation of the internet of things on smart posters using near field communication technology in the tourism sector. *Computer Science and Information Technologies*, 3(3), 194-202.

- Lohman, L. (2021). Evaluation of university teaching as sound performance appraisal. *Studies in Educational Evaluation*, 70, 101008.
- Mavani, N. R., Lim, C. Y., Hashim, H., Rahman, N. A., & Ali, J. M. (2021). Fuzzy Mamdani based user-friendly interface for food preservatives determination. *Food and Bioproducts Processing*, 126, 282-292.
- Mito, E. A., Ajowi, J. O., & Aloka, P. J. (2021). Teacher Training and Implementation of Teacher Performance Appraisal and Development Policy in Public Secondary Schools in Kenya. *Asian Basic and Applied Research Journal*, 6-16.
- Ningrum, R. F., Siregar, R. R. A., & Rusjdi, D. (2021). Fuzzy mamdani logic inference model in the loading of distribution substation transformer SCADA system. *IAES International Journal of Artificial Intelligence*, 10(2), 298.
- Rasulova, N., & Salieva, D. (2021). Fuzzy logic in creating adaptive intelligent learning. *InterConf*, 262-270.
- Sharma, M. K., Dhiman, N., & Mishra, V. N. (2021). Mediative fuzzy logic mathematical model: A contradictory management prediction in COVID-19 pandemic. *Applied Soft Computing*, 105, 107285.
- Serrano-Guerrero, J., Romero, F. P., & Olivas, J. A. (2021). Fuzzy logic applied to opinion mining: a review. *Knowledge-Based Systems*, 222, 107018.
- Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society*, 65, 101565.
- Thakkar, H., Shah, V., Yagnik, H., & Shah, M. (2021). Comparative anatomization of data mining and fuzzy logic techniques used in diabetes prognosis. *Clinical eHealth*, *4*, 12-23.