RESEARCH ARTICLE

Research about the Fuzzy decision making in a daily life and linguistic bases

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Abstract

As the title suggests, this paper is about making decisions based on our daily life and linguistic foundations. When we examine the decisions that depend on us and those that do not depend on us in everyday life, when do more fuzzy investigation, we can see which decisions are right or wrong and the transition between right and wrong. Our goal is to make the right decisions by reconsidering already made decisions. The article also conducts some linguistics research in the direction of fuzzy logic, and some examples are given of the development of synonymous sets in linguistic naming. It is clear that, in our fast-paced life we are faced with a multitude of alternatives to choose from and sometimes it is up to us to select the finest choice within our criteria. Therefore, a method in decision making is crucial as it facilitates our lives. Fuzzy logic has given tremendous help on this issue. Not only on the everyday life situations but also on the decisions we make to explain ourselves adequately through our utterance. As the name suggests, this article is about making decisions based on our daily life and linguistic foundations. When we examine decisions that depend on us and those that do not depend on us in everyday life, when we do more fuzzy research, we can see which decisions are right or wrong, and the transition between right and wrong. Our goal is to make the right decisions by reviewing the decisions already made. The article also conducts linguistic research in the direction of fuzzy logic, and provides some examples

of the development of synonymous sets in linguistic naming. It is clear that in our fast-paced life, we are faced with many alternatives from which to choose, and sometimes we ourselves have to choose the best one within our criteria. Hence, the method of making decisions is critical as it makes our life easier. Fuzzy logic has been of immense help in this matter. Not only about everyday life situations, but also about the decisions we make in order to adequately explain ourselves with our statements.

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1. Introduction.

As we know in every step of our lives we make decisions and choices, some evaluated options are seem to be crucial, but rest of them is not so important or stands between them.

As we know, at every stage of our life we make decisions and make choices, some of the evaluated options seem to be decisive, but the rest are not so important or stand in between.

Starting from the morning we make choices about what to eat for breakfast, what time to wake up and what to do during the day. Making all these decisions can help us to add comfort to our lives. There are, however, some decisions which are out of our control, especially the year 2020 taught us planning doesn't always mean that it will definitely happen, therefore we need to take into account whether the plan A doesn't work or faces any hindrance we will have another options to implement it. This paper indicates adaptation of fuzzy sets in groupings of linguistic elements and importance of decision making processes in learning and speaking of the second language. In addition to this, this paper reflects the importance to differentiate between the traditional and fuzzy logic. A method called Multi Criteria Decision Making is also mentioned in this paper which has provided immense help in the decision making matter, considering the fact that uncertainty and vagueness are some of the main obstacles while decision making. The conclusion can be drawn that, usage of fuzzy logic in decision making process increases the precision and accuracy of achieved results.

2. Decision Theory.

There are some decisions that you can't immediately be sure whether there are right choices or not, it takes some time to figure out them. As prof. Lotfi Zadeh states "imperfect information is information which is in one or more respects is imprecise, uncertain, incomplete, unreliable, vague or partially true. (Yibo W., Xiuqin M., Hongwu Q., Yuanyuan Ch., Jemal H. A. (2025)"

Making decisions doesn't always mean that it's well researched and analyzed. According Prof. Rafik Aliev made decision without careful scrutiny can be the beginning of many regrets. Not all the decisions are made comfortably; some are made with risky, ambiguity or uncertain situations.

Prof. Rafik Aliyev in his book "Decision theory with imperfect information" generally formulated decision making as follows: [1]

The set of alternatives – A

The set of states of nature - S

The set of outcomes – X (p3)

The term fuzzy logic was introduced with the 1965 proposal of fuzzy set theory by Lotfi Zadeh. Fuzzy logic is a very important concept in artificial intelligence and can be taught as a single entity or along with artificial neural networks and this is a part of soft computing methods and also helps us in dealing with uncertainty situations and can be used in different fields such as automatics systems that can be used in domestic goods and as well as environmental control, decision making, etc.

Crisp value -The term crisp means precise and it deals with values that have a strict boundary i.e. true or false.

The value should either be true or false to be called as a crisp value and it can't contain any in-between values. In the Boolean system truth value- 1 represents absolute truth value and 0 represents absolute false value.

In fuzzy logic we can be anywhere in between 0 &1 so we could have something that's true but only partially true with 0.7 or false it's mostly false as 0.3. However, in the case of a fuzzy logic system we have intermediate values present which are partially true and partially false. This theory allows us to represent value judgments that a user makes when this one tries to modify something for example sentences like wrong, right, less, more high, low etc. If something is not good, it does not mean that it is concretely bad .It can also be in the position between good and bad. Fuzzy logic is like Boolean logic but more fuzzy, instead of asserting that things are either on or off or black or white but, fuzzy logic asserts the shades of grey that exist between these traditionally binary facets.

Take a banana, is it a banana or is not? It seems like an easy question but it is more complicated than one might think at first glance, but half of it is blackened, is it still a banana? Obviously right, now we cut its blackened (musty) part, half the banana is remaining.

1. Is it still a banana now?
2. What about when only the banana peel remains?
3. At what point in other words does the banana cease being a banana?

Fuzzy logic allows us to treat a changing banana as part of a banana, although it is still in the process of being cut. First, our entire banana is 100 percent banana, and our half banana is 50 percent banana. When a banana is fully eaten, it is a 0 percent banana, with fuzzy logic we assume shades of gray that allow the banana to go from whole to peel. So the banana example illustrates how fuzzy logic allows us to break down a problem.

There were some questions that could be answered differently, such as asking someone to tell you about the weather or identifying a color, in other words, fuzzy logic is meant to approximate how we think when we approach a problem like " what is color? Similar problems exist all over the world." engineering and by trying to mimic human heuristics and thinking, fuzzy logic could allow us to create much more powerful systems.

3. Difference between traditional and fuzzy logic controllers.

Traditional controllers need to know detailed physical properties of the system and this can be difficult. Most systems are too complex and to be idealized to develop a traditional controller. It means that you don't have a full 0 is assigned to the worst result and 1 to the best.

representation of the system when they design the controller and the conditions when traditional controllers' work is usually fairly limited.

Fuzzy logic controllers don't need to know much detailed knowledge of the system and what the controller should do is determined by linguistic rules and this is very easy to do for humans to know what the controller should implement in certain situations and if optimization tools are used like Genetic Algorithms, can get away with not knowing much of anything about the system?

The system also doesn't need to be reduced or idealized to develop a working Fuzzy Logic Controller. The conditions when Fuzzy Logic Controllers will work are much more robust because they can account for more variability in the inputs.

Fuzzy logic is as limitless as the sky. It can create image processing, decision making, route planning and it's still development and testing for safety-critical systems like auto-pilots and also has already been tested in some instances like small satellite attitude control. Fuzzy logic also helps students to select and apply appropriate techniques and methods, so as to get appropriate solutions to provide an easier and understandable manner of explaining the concept. Therefore, those students are able to apply the knowledge in solving complex problems.

Fuzzy logic in decision making is a tool to structure the decision making processes and to assist in finding the optimal choice between conflicting goals in this analysis, different possibilities are reviewed and compared. Multi-criteria analysis takes into account diverse and possibly conflicting criteria the importance of the different criteria are taken into account and the alternatives are reviewed when all material is put together and being analyzed can be generated.

For example: a student is trying to decide where to study.

In this case, decision-making assists him or her to compare some decisions by consisting of several steps, the first step is formalizing and grouping the different criteria. A student is thinking about studying in England, in Germany, in the Czech Republic, in Amsterdam. The student wants to take into account: the housing costs, university ranking, and student life and study facilities.

After choosing the criteria, the students must determine the scores for the alternatives, and the next step is standardization, in order to be able to compare and combine different scores, they should be displayed on the comparison scale. Housing cost criteria are difficult to compare with university rankings. Standardization displays the criteria on a new similar scale between 0 and 1.

Weights need to be ascribed to the different criteria. What is the difference in importance for a criteria?
Once the scores have been standardized and the weights have been ascribed a ranking of alternatives can be established as our example when all the criteria and weight have been taken into account Germany would be a student's choice.
Regarding splitting fuzzy decision-making into two components: Fuzzy logic and decision making as a classical logic something can be represented either by 0 or 1, but in fuzzy logic this can be anywhere between 0 and 1. By looking at an example, fuzzy logic doesn't stop at "white or black" concept; it differentiates every shade of grey between them (Ubaid ur R., Tahir M., Hafiz M.W. (2025).

Decision making is a mental human process where one evaluates the alternatives, their preferences and values in multiple situations based on their possible outcomes. A decision is determined according to the environment where it is going to function within and it is characterized by its possible values, specific traits and information that is accessible at the time of the making decision. Decisions that are made collectively are much more operative and functioning apart from the ones that are made individually. When making a decision with a group of people, different people with different expertise will come up with a new perspective towards the problem.

Nowadays, in our modern world people stumble upon many difficulties and confusions while decision making due to uncertainty, imprecision and vagueness of the qualities of options. When decision making there is no exact way to be known as the outcomes or objectives precisely. Fuzziness is a type of imprecision which is associated with fuzzy sets, that is, classes in which there is no sharp transition from membership to nonmember ship. [3] A class with the same color, form, quality etc. can be a fuzzy set.

Checklist	England	Germany	Czech republic	Amsterdam
Housing costs	650$-the most expensive (0.35)	350$-cheap (0.75)	400$-medium (0.60)	550$-expensive (0.45)
University ranking	2 (0.80)	5 (0.50)	6 (0.40)	4 (0.60)
Student life	very good (1)	good (0,75)	medium (0.50)	good (0.75)
Student facilities	good (0.75)	very good (1)	poor (0.25)	medium (0.50)

There could be some situations where information can't be evaluated exactly by numbers but with words. For instance when reviewing a written material readers may evaluate it by using labels such as difficult, puzzling, simple or problematic whether to assess its difficulty level, vocabulary or overall the topic of the text. Hence, making a scientific decision based on linguistic information is very important given the fact that in some scientific decisions evaluation with linguistic variables is more suitable.
The goal in the appearance of Multi Criteria Decision Making (MCDM) was the need for a technique to help decision makers to come up with an ideal decision. To make a Multi Criteria decision one must list the alternatives, which are the choices, then define the criteria. Decision makers choose the importance of each criteria. Then must gather adequate amounts of data and after that there would be possible alternatives to select from and dismiss the ones that are not suitable.

Criteria	Price	Storage	Camera	Design
Alternatives:				
Alt. 1	450$	32GB	18MP	Good
Alt. 2	700$	128GB	24MP	Average
Alt. 3	400$	64GB	18MP	below average
Alt. 4	350$	16GB	12MP	Average
Alt. 5	500$	64GB	24MP	Excellent

Let's have an example of Multi Criteria Decision Making. Considering that you are going to purchase a phone. If you are going to purchase the most affordable one in that case you will get the alternative 4 (Table 1). However, if you want to have a decent phone then you will have to decide which one. You will have different alternatives to decide from and they will have different criteria such as in price, storage, camera etc. These qualities are known as criteria or attributes, and this is called Multi Criteria Decision Making.
(Assessment 1)
It is desirable to have the lowest cost but highest storage, camera quality or design. Designs are presented by linguistic units. In this case it is more suitable to evaluate them by linguistic units rather than numbers. They can be average looking, excellent looking and so on.
To choose the best possible phone out of the 5 of them we firstly must replace the linguistic units with numbers:

1 is below average
2 is average
3 is good
4 is excellent
Now the alternatives' design quality is as follows on the table 2.

Criteria	Price	Storage	Camera	Design
Alternatives				
Alt. 1	450$	32GB	18MP	3
Alt. 2	700$	128GB	24MP	2
Alt. 3	400$	64GB	18MP	1
Alt. 4	350$	16GB	12MP	2
Alt. 5	500$	64GB	24MP	4

(Assessment 2)
The lowest price is preferable, but in other criteria like storage, camera, design highest is better. That's why we divide the minimum price of the phone to other phones prices. But in other categories we divide their measures to the maximum measure of that category because of the highest storage, camera, design are the better choice.
We must keep in mind that 0 is the lowest point, 1 is the best point.

Criteria	Price	Storage	Camera	Design
Alternatives				
Alt. 1	350/450	32/128	18/24	¾
Alt. 2	350/700	128/128	24/24	2/4
Alt. 3	350/400	64/128	18/24	¼
Alt. 4	350/350	16/128	12/24	2/4
Alt. 5	350/500	64/128	24/24	4/4

(Assessment 3)

Criteria	Price	Storage	Camera	Design
Alternatives				
Alt. 1	0.77	0.25	0.75	0.75
Alt. 2	0.5	1	1	0.5
Alt. 3	0.88	0.5	0.75	0.25
Alt. 4	1	0.13	0.5	0.5
Alt. 5	0.7	0.5	1	1

= 2.52
= 3
= 2.38
= 2.13
= 3.2
(Assessment 4)
Therefore, the best option among 5 alternatives is the fifth one.

4. Fuzzy Linguistics Sets.

Inevitably, in any decision, one spoken word or thought can change the whole meaning of the sentence. For this reason, it is necessary to determine what we really need to say, what we want to do when making decisions. As for spoken words, the true meaning of the sentence should be explained during the conversation, otherwise it will be misunderstood. Obviously, there are a number of words in English or other languages that have difficulty in trying to find out their true meaning in our language. For instance; in Russian, the word blue has two forms; blue - blue, blue - blue. However, in English and Azerbaijani languages there is no exact name for this color, so it is called light or dark blue.
Furthermore, when we look at the nature deeply, we can easily observe the various colors which are not correctly named in many languages. Languages are poor or scarce to name all the things correctly, if we are unable to name anything, it doesn't mean that this phenomenon doesn't exist. So, language needs to be improved all the time, and the names and thoughts also need to be called with more appropriate ways. If any scientist or linguist decides about naming the things, it doesn't mean it will last forever. Everything can be called or improved with a better way

during the times. For that reason decision making or changing already made decisions should be accepted.

Applying *Zadeh* and *Lakoff's* work on fuzzy sets to linguistics has demonstrated the efficacy of fuzzy sets to analyze limits of linguistics (Ubaid ur R., Tahir M., Hafiz M.W. (2025).

Fuzzy set is a term applied to a set of elements for which membership in the set is gradual rather than absolute. That is, the question of whether an element belongs to a certain group would traditionally be answered by yes or no; but in fuzzy set terms the element would be assigned a value indicating its degree of association to the certain group (Ubaid ur R., Tahir M., Hafiz M.W. (2025).

Phonemes are fuzzy phenomena and it is a sound that changes the meaning of word, sometimes there is a misunderstanding between different nations that speak the same languages. An inspection of attempts of producing a single sound repeatedly should reveal that several sounds that are produced are not exactly the same but are classified as same if they evince enough of characteristics identified with the target sound. This is linguistic values of classification into meaningful sound. The perception of English /l/ or /r/ for Japanese users of English is difficult as Japanese language has a sound between the two phonemes but not the exact sound. Researchers were held about perception and production of English fricative sounds by advanced Korean EFL learners. However, Korean listeners did not identify /ɵ/ as /s/ in most cases. Korean listeners' substitution of /ɵ/ for /s/ was also found in other studies (Sung, 2009;*Lee*, 2011) [4] The results imply that Korean listeners tend to hypercorrect /s/ as /ɵ/ especially in the final position. In Redford and Diehl (1999), English native listeners made more errors in perceiving /ɵ/ in the initial position than in the final position. It is a rare sound in the world's languages, and for Korean English learners, /ɵ/ was found to be the most difficult sound among English voiceless fricatives [4] In the perception of English stops, /p/ and /t/ were poorly identified in the final position when they were produced by an English native speaker. The error rates for /p/ and /t/ were found to be even greater than those for fricative /f/. The substitution pattern found in the production of English fricatives by Lee (2011) presented that /ɵ/ and /h/ were substituted for /f/. /ɵ/ was replaced by /f/ and /s/, and /s/ was replaced by /ɵ/. Likewise, Azerbaijani speakers have difficulties distinguishing difference between /s/-/th/ or /z/-/th/ as there are no interdental consonants in Azerbaijani. Although, foreign speakers know the difference between the two phonemes, they do not apply the same membership functions as native English speakers would. The listener choses the sounds that most likely to the particular phoneme. In the process of "recognizing the phoneme" sounds that relate to the phoneme in zero-value are dropped and not considered as the particular phoneme. So, both native speakers and second language speakers usually choose the sounds and speech patters that are close to them, it most cases it happens spontaneously, it is already made decisions, but it does not mean that will remain forever. L. Zade mentions as complexity rises, precise statements lose meaning and meaningful statements lose precision meaning.

5. Fuzzy spectrum of synonyms.

In linguistics, although, there are many synonyms, their meanings are not exactly the same and can be replaced one-another in all the cases. Each synonym has a special connotation and only appropriate ones mostly used according to the context and attitudes to the people, moreover it alters during the periods. As professor and linguist Arnolds mentions "The more developed the language, the richer the diversity and therefore the greater the possibilities of lexical choice enhancing the effectiveness and precision of speech". (p.194)[10] Thus the words – die, pass away, launch into eternity, become ruined, perish, die away, pass on, close one's eyes - do not have exactly the same meaning, but similar to one another. Therefore, denotative and connotative meanings of these words are totally different and used in various contexts (denotation means literal meaning, connotation means emotional meaning)

Although the verb to die has many synonyms, they cannot completely replace each other. For example, Mr. Jackson died, passed away, launched into eternity, closed his eyes and other synonyms which have similar meanings vary according to personal relationships. The notion that precision in fuzzy logic is not always true and suggests that a synonymous verb chosen for personal relationship may not be the same for everyone.

Regarding professor Ginzburg, he also mentions that some synonyms which have identical meanings can't always replays one-another. "This may be best illustrated by comparing words almost identical in their denotational meaning. For example: parent – father – dad. In comparison with the word father which is statistically neutral, dad stands out as colloquial words, and parent is felt as bookish (page 21 Ginzburg) [11]

Conclusion.

Here we talked about decisions that depend on us and those that do not depend on us. It was noted that in order to make the right decisions, it is necessary to analyze them according to various criteria. When conducting these analyzes, the research methods of Lotfi Zadeh, R. Aliyev and other scientists were used. In addition, the theory of fuzzy logic, its differences and similarities from other theories have been studied. In our daily life, we can choose the right verdict by making fuzzy decisions, while talking about this, some examples were given on these issues and calculations were made. At the final stage, the theory of fuzzy logic and the linguistic study of fuzzy decision making were carried out. The authors then talked about linguistic variables, although English is an international language, not everyone speaks the same way. The pronunciation of words varies depending on the culture and geographic region in which it is found. Each nation chooses a sound close to its language and perception. Therefore, there are different versions of English such as Korean, British, American, Indian English and so on. This document also contains information about some of them. In addition, synonymous sets were mentioned and discussed, it was noted that despite the presence of similar synonyms, each of them has linguistic ambiguity and fuzziness. Thus, when we do any research on a computer, we need to look for the right keywords that correctly denote it.

To summarize, readers will notice that the authors have shown fuzziness in various aspects, from everyday choices to fuzzy decision making. General information about fuzzy logic in comparison with various logics and concepts was discussed separately. The most important point in fuzzy decision making is not just yes or no answers; it is the comparison of every single detail before accepting them as a decision. We also see that in a fuzzy environment, boundaries are not clearly defined; there are many options depending on the goals and consequences. With the previous examples, we tried to indicate the usual and fuzzy solution, which can be given through alternatives. As a final note, we can add the approach of Lotfi Zadeh and Bellman: "The task of developing a general theory of decision making in a fuzzy environment is of very considerable scope and complexity." (p.51) [3]

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