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Neurofuzzy Mathematical Logic Quality (NMLQ) in a Fourth Dimension View with ISO Standard 25000 (SQuaRE) and Scale Likert Applied in Diabetes Control

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Abstract: ***A modeling that uses Neurofuzzy Mathematical Logic Quality (NMLQ) methods in a Fourth Dimension View with ISO Standard 25000 (SQuaRE) and Scale Likert can be justified when it is desired to analyze behaviors of non-linear systems, time and training of an artificial neural network (RNA). Also, allow your results to be interpreted, as the techniques are based on human reasoning and linguistic or graphic descriptions. The NMLQ training process is based on adjustments of its parameters in a fourth dimension view, presented by networks arranged in layers and spreadsheets for each layer, adapted by the parameters or weights of an RNA for the adjustments between the desired and presented outputs. to the network during your training. Its algorithm is based on the application of functions in the fourth dimension. The method maps the various networks laid out in layers or levels and registered with their respective synaptic values, according to the linguistic variables of the fuzzy logic and domains, contradictions and images of the functions of several variables, in the set of real numbers. The linguistic rules and variables of Fuzzy Logic define your knowledge in relation to the high, medium and low levels to assist in decision making. In addition, they are associated with degrees of belonging or membership functions. This representation of their behavior is established by the rules of linguistic variables through the use of the conditional (if ... then). It is applied in the construction of the Likert scale to assist in measuring the attitudes of the interviewees in order to know the degree of opinion and the degree of intensity in the decision-making process of each of these interviewees. The fundamentals of the Fourier series or polynomial functions and the construction of data in the fourth dimension view of the type (x, y, z, t) are also applied. A fourth dimension view allows you to analyze and record changes in your value updates as time changes. The Fourie series, on the other hand, allows you to update analog and digital data during the transmission of your data, both quantitative and qualitative, in addition to storing lots of information in each digital pulse for a given frequency and period and also adding several different wave patterns. In this work, the objective is to propose a new qualitative application technique based on quantitative data that is capable of handling a lot of information in a fourth dimension view in a spatial way in relation to time, linguistic variables, Likert Scale, Square, polynomial functions, Series and Fourie transforms.***

Keywords: Biological systems, fuzzy systems, Neurofuzzy, Fourth dimension view, Fourie series, Fourie transform, polynomial functions, Intelligent computational mechanism

1. Introduction

An autonomous control system allows the transfer of information received through the input and output data. Responses are defined according to their roles established during their projects. In an intelligent system, in their outputs, they provide answers or information that are often not foreseen in their projects and can also be compared in parts with biological systems. Biological signals and information are constructs human behavior in sinusoidal forms, because decisions and human understanding are made up of frequencies and wavelengths.

In human decision-making, we usually deal with uncertainties and inaccuracies in solving various problems. To simulate the same form of biological reasoning in an intelligent computational machine, fuzzy logic resources were used to solve problems that cannot be solved by applying only the digital logic of current computers, because the information manipulation must be dealt with with records and extractions of execution both in the input and the output of this information, in digital and analog form. The application of a Neurofuzzy, on the other hand, aims to use approximation of forecasts. The proposal of this work used for the construction of a Neurofuzzy, is in the third dimension format (x, y, z) and layer levels, where each sheet arranged in the axes (x, y), are slices of a neuron made up of several cells and the axis (z) is recorded the synaptic values of each worksheet with its sets of cells. In the fourth axis (t), the time recording line, which corresponds to the fourth dimension view, thus forming the mathematical structure of spatial function f: (x, y, z, t).

The fuzzy logic allows assisting in making decisions that approach deductive reasoning to infer conclusions based on known information. This technique allows you to design systems that adapt and learn from the experience gained with your environment and can be modified and adjusted according to your needs. Its application can be extended to analyze quality projects in production lines, services and several other areas of scientific and commercial applications. A view that complements the idea of analyzing these linguistic variables in a computational way used in fuzzy and Neurofuzy logic is in the use of series mathematics and

Fourie transforms and time view in the fourth dimension view.

In this work, the objective is to propose a new application technique of Neurofuzzy for quality control and adjustment of uncertainties in an intelligent machine, in addition to assisting in the analysis of critical decision making in relation to time in a fourth spatial dimension view. The use of the Likert scale to measure qualitative measures and quality standards 25000 SQuaRE (Requirements and Quality Evaluation of Systems and Software), polynomial functions and series and Fourie transforms for the control and adjustments of service quality in data collection and transmissions information is also applied in this work.

Neurofuzzy Mathematical Lógic Quality (NMLQ) in a fourth dimension view with ISO Standard 25000 (*SquaRE*), 9000 Model and Scale Likert

Intelligent systems have attributes of coupling between the agent and its environment, because its quality is defined according to its behavior with its interaction and interaction environment, to fit the required states and actions. In mathematical modeling the behavior of an intelligent system is defined through the agent function in which the sequences of perceptions are mapped to the execution of a specific action. It also requires the concept of rationality, performance measurement, learning, autonomy, knowledge of its environment and definition of the types of agents for the definition and application of Artificial Intelligence techniques to solve their problems. For that, they are necessary to understand the concepts of pertinence and operations of sets, the functions of relevance of fuzzy logic, foundations of Neurofuzzy, Artificial Neural Networks, Artificial Intelligence, Knowledge base, views in the fourth dimension, polynomial functions, series and Fourier transformations , ISO / IEC 25000 Standard (SquaRE), ISO 9000 model and Likert scale.

A. Likert scale, ISO / IEC 25000 standard (*SquaRE*) and ISO 9000 model

1) Relevance and operations of sets

A set operation allows mapping of inputs and outputs for the operation of a system. For that, the concepts of belonging elements of sets are used. The membership function μ (x) indicates whether or not this element can belong to its set as specified. If μA (x) = 1 then element x belongs to the set, otherwise μA (x) = 0, then it does not belong to the set.

The application of fuzzy set theory is based on the existence of imprecise and undefined values, but that is capable of dealing with possibilities and probabilities. Set A can be described as A = {(x1,0), (x2,1), (x3,1), (x4,0) ..., (xn, 1)}, where xn represents the values of pertinence set and values zero (0) or one (1) logical values. However, their operations are part of the logical Boolean operators.

The application of fuzzy logic techniques allows the implementation in intelligent systems to be more efficient, since they allow the insertion of knowledge and human experiences. The principle of fuzzy logic is based on the concept of multivalence, logic of uncertainty and the application of intuitive logic, in addition, real numbers can be translated into percentages (%) for the representation of intelligence (through a fuzzy inference) in a machine intelligent. A fuzzy operation allows quantitative values to be classified into qualitative values (such as: high, medium, low), which define the information required for the activities of the human brain and vice versa (qualitative and quantitative) for intelligent machines. The representation of knowledge is defined by the behavior, use of linguistic variables, relationships between these variables and the application of rules and conditions obtained by specialists or extracted from their data. We often call it expert systems and its main elements are: data entry, the fuzzifier (data that is transformed into information), a knowledge base (defined by rules and decisions) and the defuzzifier (they are the information in numerical forms).

Fuzzy logic uses linguistic variables (symbolic elements) to represent their knowledge (can be: high, medium or low) and measure a measure. They are also associated with degree of pertinence or functions of pertinence. In addition, the representation of its behavior by the variables is established by the rules of its linguistic variables of the type (If ... then), as shown in table-01.

Functional adequacy and linguistic variables	"X" OU "( )"	Punctuation	Relevance (μ)	Assigned values
Totally disagree (DT)	( )	10	[0,1]	
Disagree (D)	( )	20	[0,1]	
Indifferent (I)	( )	30	[0,1]	
I agree (C)	( )	40	[0,1]	
Totally Agree (CT)	( )	50	[0,1]	

Figure-01 Rules of *fuzzy* linguistics variables.

2) Neurofuzzy and Artificial Neural Network

The fuzzy logic describes how it is possible to associate uncertainty with the definition of its linguistic variables to establish a relationship with Boolean values of zero (0) and one (1) with the application of the use of if ... So, rules and operators Booleans for the solution of intelligent systems.

Fuzzy relevance functions

The main functions of fuzzy pertinence are z, type π, type λ and type S. These are the functions in which they define the degree of pertinence (μ) for a given linguistic term, which can vary between 1 (100% of relevance) to 0 (0% relevance), however it is known that there are other types of membership functions. Figure 3 shows the graphical model for the description of the "triangular" type membership function, in which it was used to exemplify the use of ISO 90001 and ISO / IEC (*SQuaRE*) models with fuzzy logic. The figure-04 is the definition of the linguistic variables.

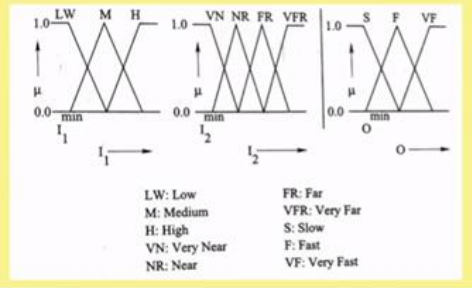

Figure 2: *fuzzy* graphical function and linguistic variable

The Figure-05 shows the aggregation table of the linguistic variables for the management of the activities of the ISO 9001 model. The main linguistic variables defined are: DT (totally disagree), D (Disagree), I (Indifferent), C (I agree) and CT (I totally agree). The figure shows the aggregation of linguistic variables applied with fuzzy logic.

SquaRE								
Safety	Compatibility	Funcional Adequance	DT	D	I	C	CT	Value	Risk
x						x		0,35	Risk: Medium/High
	x					x		0,4	Risk: Medium/High
		x				x		0,7	Risk: Medium/High

Figure 3: Application of *SquaRE* rules.

Spreadsheet Structure												
Record Data								Glucose Control				
Year	Month	Total Days	Date	Ideal-Mesure	Measure	Time-Morning	Amplitude	Normal(N) N < 99	Pre Diabetes(PD) 100<= PD <=126	Diabetes(D) D>126	Fuzzy (0< μ <1)	Linguistic Variables
2019	Dez	1	19	110	151	2	46,15			x	(D)>=127	Diabetes
2019	Dez	2	19	110	137	8,3	24,62			x	(D)>=127	Diabetes
2019	Dez	3	20	110	142	3	32,31			x	(D)>=127	Diabetes
2019	Dez	4	20	110	133	7,4	18,46			x	(D)>=127	Diabetes

Figura 4: Application of *fuzzy* rules

It is known that a Neurofuzzy system allows extractions of knowledge to be made that are based on forms of inferences rules of the fuzzy logic, in addition, it allows to solve different types of real-world problems, applying Mamdani approximation fundamentals. Its structure of a Neurofuzzy can be classified in layers of the type Entry, fuzzification, AND operation, inference of fuzzification and defuzzification. Together with Artificial Intelligence, a Neurofuzzy system allows the development of knowledge acquisition and representation, the formation of production systems and the application of search techniques. An Artificial Neural Network allows you to create biological models through mathematical modeling to simulate human behavior. In this work, the proposal to apply a Neurofuzzy is associated with vision in the third dimension space, as shown in the figure below.

The Synapse axis corresponds to the values in the set of real numbers, where the respective calculated synaptic values are recorded and each set of spreadsheets contains the sets of cells that correspond to the constructions of the necessary information registered in different types of formats. Both worksheets and sets of third-dimensional views are part of the fourth-dimensional view that are located in different spaces and times, according to their location. These sets of synapses can suffer time dilation and space contraction according to their reference, when the processing speed is very fast.

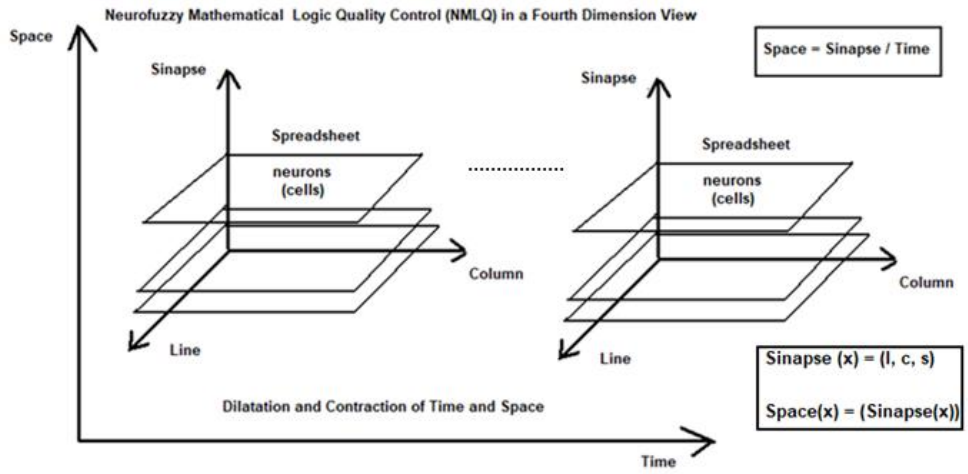

Figure 5: Fouth dimension view of NMLQ

3) Knowledge base

For the area of artificial intelligence the representation of knowledge and reasoning are part of the study center of the science of autonomous automation for action and interaction with its environment. This is because often these interactions are not observable and can not be described. Logic and learning, as well as knowledge, may be the only way to represent it, for it is necessary to create a knowledge base.

It is known that a knowledge base is formed by a set of sentences and relations between them. In addition, they should be able to be added, consulted and inferred. A sentence can be formed by syntaxes, semantics, logical relations, operations on the relations and some algorithm for its handling of its rules and restrictions established by specialists of the subject of each area to be carried out and according to the needs of the moment.

A logical reasoning is the way one structures and organizes the thought to reach an objective and solution of some problem, applying rules and norms acquired over time. Lets make inferences, argue, analyze, justify and prove their accuracy.

It is known that an information is the result of the manipulation and processing of the data, besides its organization of qualitative and quantitative form of the input data received. However the information received is individual, since the value of this information can vary according to the need of each person. It is known that information can be classified into stimulus information for the senses, pattern, message, transformation, data or record.

4) Fourth dimension

In the study of mathematics a view in the third dimension must be formed by three axes of the type (x, y, z) where the axes (x) can be the width, the axis (y) the depth and the axis (z) the height in addition, it corresponds to volumetric formulas. However, living beings coexist at all times with the third dimension to satisfy their needs. The feeling of duality in the third dimension (figure-06) allows you to carry out and feel the experiences and emotions of the reality in which you live. The fourth dimension, on the other hand, constitutes the relationship of space with a certain period of time. Thus, time dilation and space contraction are considered, in which they are formed by 4 axes in the type graph (x, y, z, t).

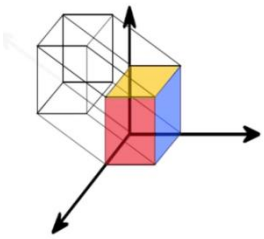

Figure 6: Fourth view dimension in motion with time on the axis (x, y, z, t)

5) Polynomial Functions and Series Transform and Fourier Transform

A polynomial function has the form of type, where P (x) is a function of the value x and each value assigned to this variable exists value in y, this is because the variable x is the domain of the function while the variable y is its image. The degree of a polomium is described by its greatest natural exponent among the monomials that form it,

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x^1 + a_0 x^0 = \sum_{i=0}^{n} a_i x^i,$$

The Fourier series aims to obtain all the components that form the original function, since a periodic sign is the representation of the sum of sines and cosines in simpler functions, as shown in figure-07.

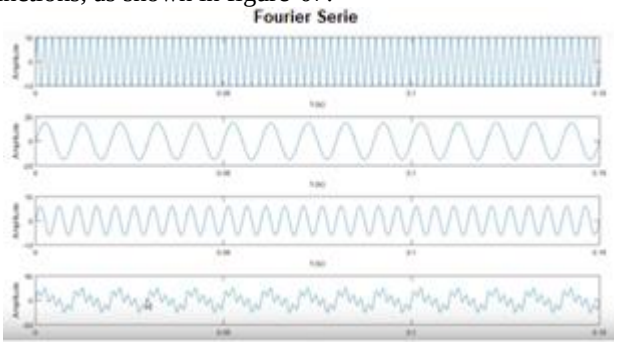

Figure 7: Fourie series ghaphics

A Fourier transform relates the time domain (any function of a signal or information) to the frequency of that signal. Shows all frequencies and amplitudes generated during the transmission or reception of information. Thus, it is understood that a signal from a frequency domain allows the frequency of each component and its amplitudes to be shown from the signals generated from the time domain to their frequencies or from each sinusoid formed during the transmission or reception of analog signals, as shown in figure-08.

$$F(\omega) \equiv \mathcal{F}\{f(t)\} = \int_{-\infty}^{\infty} f(t)\, e^{-i\omega t}\, dt$$

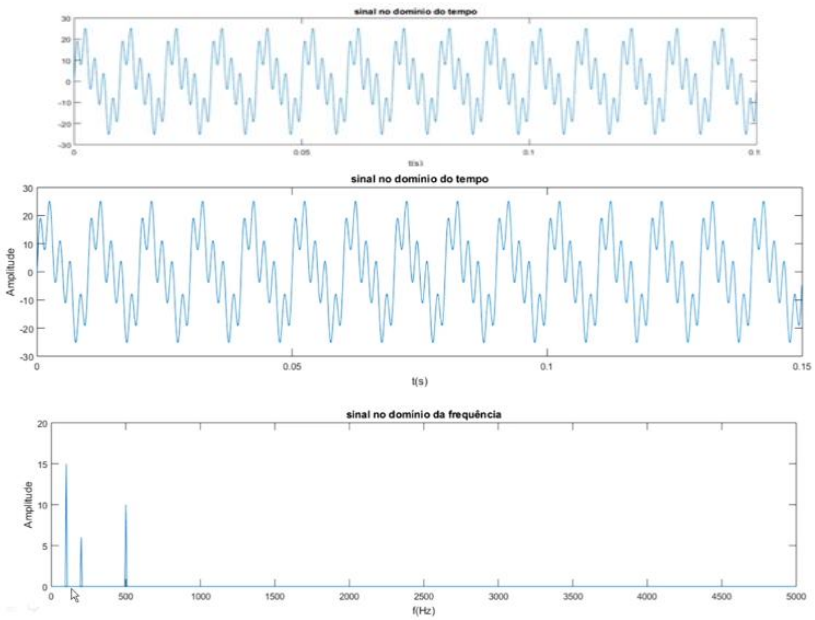

Figure 8: Domain graphics signals of a Fourier transform frequency

6) Control of Diabetes

Diabetes is considered a disease and its cause is the insufficient production of hormones that regulates blood glucose and is also responsible for providing energy to the body. Diabetes cause an increase in blood glucose that can cause complications in several parts essential for the proper functioning of the body's systems such as: the heart, arteries, kidneys, eyes and nerves. Serious consequences caused by diabetes can lead to death. The best way to prevent this is in the practice of physical activities, healthy eating. Type 1 diabetes usually occurs in childhood or adolescence, whereas type 2 diabetes can be related to overweight, physical inactivity, hypertension and unhealthy habits. The reference values for fasting glucose tests are: Normal, when it is below 99 mg / L. Pre-diabetes, when the values are between 100 and 125 mg / L and diabetes, when it is greater than 126 mg / L on two different days

B. Likert scale, ISO / IEC 25000 standard (SQuaRE) and ISO 9000 model

A Likert scale, uses an opinion rating scale for research whose answers to the questions are of the psychometric type. In your questions, questionnaires are developed based on Likert scales. Respondents demonstrate their levels of agreement and statements according to the questions already elaborated. Usually only five question levels apply.

Dealing with the fundamental of quality requires a lot of complexity because it is not just about following some specification or description of the development needs of a product or meeting the requirements of the customers. Often the key quality features are not clear when it comes to services or qualitative metrics. The key steps in service management can be classified into assurance, planning and quality control. As ISO 9000 standards, quality management, are sets of standards that can be applied within various organizations to develop products or services. According to ISO 9001, the generic model of quality processes and definitions of standards and procedures that should be part of an organization. The main areas defined by ISO 9001 for quality assurance are specified in Figure-09 below.

C. ISO Standard 25000 (SQuaRE)

The ISO 25000 (SQuaRE-Systems and software Quality Requirements and Evaluation) is a combination of several model standards to define models of software development qualities, in addition to defining processes and products to follow their evolution. The main ones of this model are divided into: quality of management, models, metrics, requirements and evaluations.

ISO / IEC 25000: 2014, provides 5 divisions which are: quality management (2500n), quality model (2501n), quality measurement (2502n), quality requirements (2503n) and quality evaluation (2504n). Figure-02 shows the ISO / IEC 25010 Software quality system model for the application of the main quality features.

Table of totalization Model ISO / IEC 25000: 2014 *(SQuaRE)*

Quality model division	DT	D	I	C	CT
Funcional adequancy					
Compatibility					
Usability					
Confiability					
Safety					
Maintenance / Maintainability					
Portability					

Figura 9: Application of *SquaRE* model

The figure-09 shows the aggregation table of the linguistic variables for the management of the activities of the ISO / IEC 25000: 2014 (*SQuaRE*) model.

D. Application and analysis of Neurofuzzy Mathematical Logic Quality (NMLQ) in a Fourth Dimension View with ISO Standard 25000 (SQuaRE) and Scale Likert Applied in Diabetes Control

In this phase of the work on NMLQ, a practical application of the main fundamentals described above will be presented. The proposal is based on collecting data on glycemic control and analyzing whether it is possible to improve control and obtain answers in a qualitative way and not just make quantitative readings of data that does not contain information to assist in the treatment of diabetes control, and that it is possible to improve the quality of life of people living with diabetes.

Figure 10: Main screen of NMLQ.

Figure-10 shows the main computational screen for the interaction of a medical specialist with his patient. Then, in figures 11 to figure 15, the entities of the NMLQ project are structured for the registration, alterations and data retrieval that will be generated and managed with quantitative and qualitative information.

Spreadsheet Structure													
Record Data							Glucose Control						
Year	Month	Total-Days	Date	Ideal-Mesure	Measure	Time-Morning	Normal(N) < 99	Pre Diabetes(PD) 100<D<127	Diabetes(D) >127	Fuzzy (0< μ <1)	Linguistic Variables	SquaRE/Model 9000	Managment SquaRE/Model 9000 (Average)

Figure 11: Spreadsheet Structure of NMLQ.

SquaRE							
Safety	Compatibility	Funcional Adequance	DT	D	I	C	CT	Risk

Figure 12: *SquaRE* Structure of NMLQ.

Model 9000								
Document Control	Process Control	Product Control	DT	D	I	C	CT	Risk

Figure 13: *Model 9000* Structure of NMLQ.

Totally Disagree (DT)
Disagree (D)
Indifferent (I)
I Agree (C)
Totally Agree (CT)

Figure 14: *SquaRE* and *Model 9000* Rules.

Fourth Dimension (Structure)					
Sinapse Value	Function Value	Spreadsheet	Frequency	Time	Amplitude

Figure 15: Fourth dimension view structure.

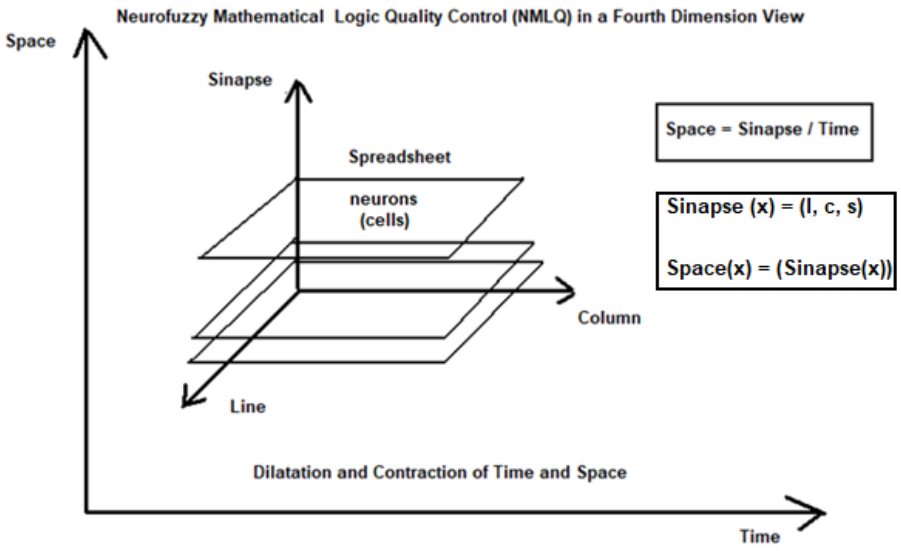

Figure 16: Visual graph of NMLQ.

Linguistic Variables	
Value < 99	Normal
99 < Value < 127	Pre-Diabetes
Value > 127	Diabetes

Linguistic Variables	
Value < 126	Normal
126 <= Value <= 200	Pre-Diabetes
Value > =200	Diabetes

SquaRE/Model 9000	
Risk: Adequate/Low	[0,0; 0,2]
Risk: Medium/High	[0,25; 0,8]
Risk: Inadequate	[0,75]
Valores =[0,.....,1]	

Figure 17: Rules of linguistics variables

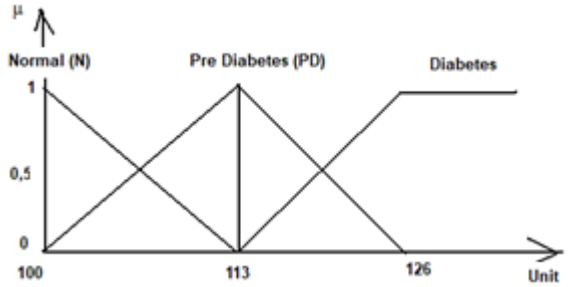

Figure 18: Graphical structure of linguistic variables.

Figure-08 presents the results of an analysis and application of *fuzzy* logic with the ISO 9001 model for the management of its activities and descriptions of services and products. Linguistic variables, rules and risk levels were defined through the fundamentals of *fuzzy* logic. The structure of the forms can be used as a standard for the application of *fuzzy* logic to the models of quality standards of services and products.

In this work were simulated with 3 specialists from the areas of product development and service rendering to analyze the quality of software. The values assigned to the linguistic variables show the results of 10 tokens filled out by experts in the area. Next, you present the mean and compare the risk levels. The risk level values were applied: *fuzzy* inference, fuzzification and defuzzification, function of pertinence and type of function, for the application of the ISO 9001 model and *fuzzy* logic, for quality assurance.

The result of the application compares the results of the means with the levels established by the rules that are defined by the specialists of each management area. Similarly, the procedures for the results presented in figure-09 of ISO / IEC 25000: 2014 (*SQuaRE*) with *fuzzy* logic were performed. These results are transformed and stored in the form of knowledge or *fuzzy* subsets associated with each linguistic variable and its *fuzzy* set operations.

The application of the logic and reasoning is inserted by the specialists of each area, during the establishment of the rules and inferences for the decisions of levels of risks for the definition of all the activities described by standards and quality models ISO 9000, ISO 25000 and Likert scales , for the definition of linguistic variables and fuzzy logic inferences. The classification of pertinence values is calculated by the values of each level established by each cell of its linguistic variables. The information of the variable "Average" describes the information of the results of the level of risk in relation to each of the activities of the division of the quality model.

The result of the information "Average" is obtained through the relations of the linguistic variables, rules and the levels of risks. By storing this information in the knowledge base, we establish the degrees of intensity between the relationships in which they represent the levels of values of that information. In this way it is possible to store and retrieve the behavior recorded at the time of its capture, through space, action and time, simultaneously in three dimensions of the space plane, as shown in figure-19 and figure-20. In the figures its shows the execution of the activities, variables and the information are generated.

Figure-19, 20 and 21 shows the new level adjustment of the space for new knowledge base learning. The behavior of knowledge registers the new changes and dimensions of the current states. Represents the new information acquired in real time. Also shows the risk management information from Quality Management for the activities corresponding to Nonconforming Product Control (Medium and High Risk), Handling, Storage, Packaging and Delivery Purchasing,

Spreadsheet Structure												
Record Data								Glucose Control				
Year	Month	Total-Days	Date	Ideal-Mesure	Measure	Time-Morning	Amplitude	Normal(N) < 99	Pre Diabetes(PD) 100<= D <=126	Diabetes(D) >=127	Fuzzy (0< μ <1)	Linguistic Variables
2019	Dez	1	19	110	151	2	46,15			x	(D)>=127	Diabetes
2019	Dez	2	19	110	137	8,3	24,62			x	(D)>=127	Diabetes
2019	Dez	3	20	110	142	3	32,31			x	(D)>=127	Diabetes
2019	Dez	4	20	110	133	7,4	18,46			x	(D)>=127	Diabetes
2019	Dez	5	21	110	162	8,3	63,08			x	(D)>=127	Diabetes
2019	Dez	6	22	110	161	6,3	61,54			x	(D)>=127	Diabetes
2019	Dez	7	23	110	138	8,2	26,15			x	(D)>=127	Diabetes
2019	Dez	8	24	110	186	6	100,00			x	(D)>=127	Diabetes
2019	Dez	9	25	110	180	3	90,77			x	(D)>=127	Diabetes
2019	Dez	10	25	110	148	8	41,54			x	(D)>=127	Diabetes
2019	Dez	11	26	110	183	8,2	95,38			x	(D)>=127	Diabetes
2019	Dez	12	27	110	136	3	23,08			x	(D)>=127	Diabetes
2019	Dez	13	27	110	121	9	0,00		x		100<= D <=126	Pre Diabetes
2019	Dez	14	28	110	121	8,45	0,00		x		100<= D <=126	Pre Diabetes
2019	Dez	15	30	110	133	5,15	18,46			x	(D)>=127	Diabetes
2019	Dez	16	31	110	142	8,3	32,31			x	(D)>=127	Diabetes

Figure 19: Results generated for morning records.

SquaRE									
Safety	Compatibility	Funcional Adequance	DT	D	I	C	CT	Value	Risk
x						x		0,35	Risk: Medium/High
	x					x		0,4	Risk: Medium/High
		x				x		0,7	Risk: Medium/High

Figure 20: Results generated for morning for *SquaRE* model risks.

Model 9000									
Document Control	Process Control	Product Control	DT	D	I	C	CT	Value	Risk
x						x		0,1	Risk: Adequate/Low
	x					x		0,35	Risk: Medium/High
		x				x		0,65	Risk: Medium/High

Figure 21: Results generated for morning for model 9000 model risks.

The results presented in figure-22, 23, 24 e 25 show the graphic and structural results of the applications proposed in this work of NMLQ. Graphs and polynomial functions were used to define the domain of time and frequencies, since the generated curve formats do not correspond to the harmonics and sinusoidal ones. This was the reason why the Fourier series and transforms were not used. This demonstrates that the fundamentals of an NMLQ can be applied with different types of graphical functions. The functions generated in this phase of the proposal correspond to the Synapse axis of the third dimension view, which belong to the domain of Real numbers, thus forming sets of spreadsheets that can contain different types of different formats. The following functions were generated: f1 (t) = - 0.5119t2 + 7.8583t + 129.44, f2 (t) = - 0.7875t2 + 12.09t + 12.989, f3 (t) = 1.2133t2 - 17.794 t + 294.04 and f4 (t) = 1.8666t2 - 27.375t + 266.22. Each of these functions manages its respective spreadsheets that are formed by sets of cells or neurons interconnected with each other. These spreadsheets correspond to several slices of the same model of intelligent mathematical computation (mathematical brain in the form of spreadsheets).

The graphs generated in figures 22 and 24 correspond to the results of the Fourier series in the time domain, applied using polynomial functions, as they correspond to overlapping functions of various information in the time domain of days. Figure 25, on the other hand, corresponds to the Fourier transform in the frequency domain, applied to polynomial functions, as they correspond to the overlapping of various information in the domain of data collection.

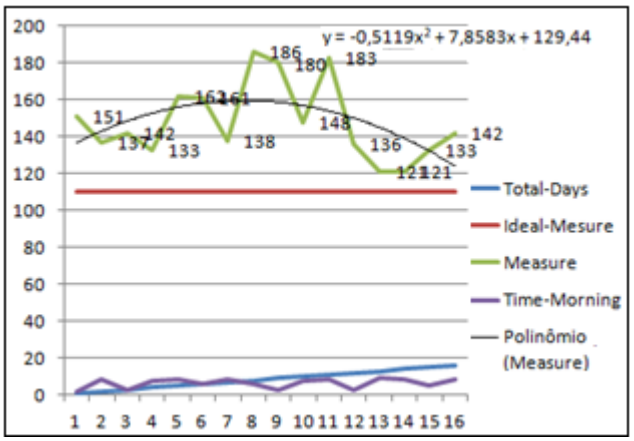

Figure 22: Graphical results by the application of NMLQ by time domain in the morning

Figure-22 shows the graphical representation in the time domain (in days) through the polynomial function and the measurements performed during the morning in 16 days.

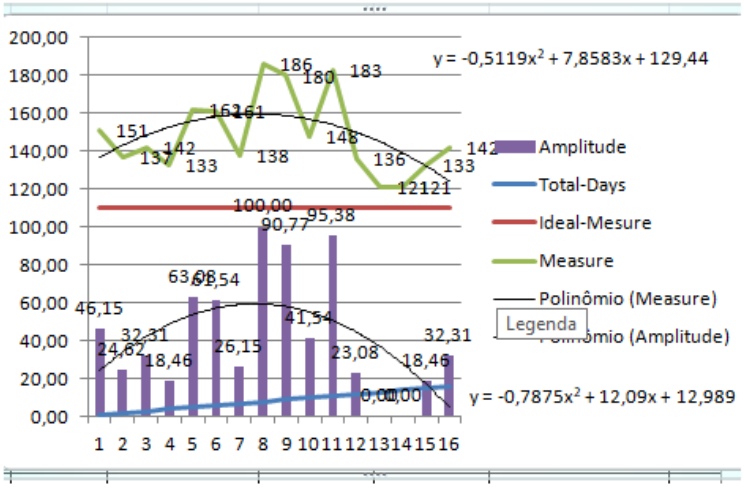

Figure 23: Graphical results by the application of NMLQ by frequency (Amplitude) domain in the morning

Figure-23 shows the graphical representation in the frequency domain (Amplitude) of occurrence through the polynomial function and the data collection performed, during the morning period for 16 days.

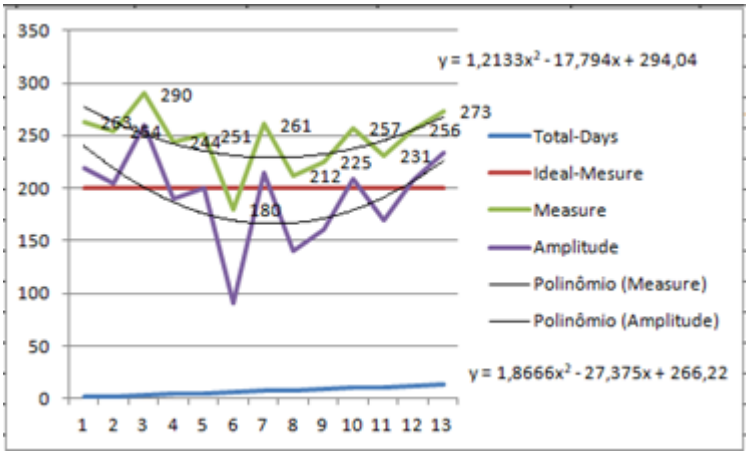

Figure 24: Graphical results by the application of NMLQ by time domain in the night

Figure-24 shows the graphical representation in the time domain (in days), through the polynomial function corresponding to the night period in 13 days.

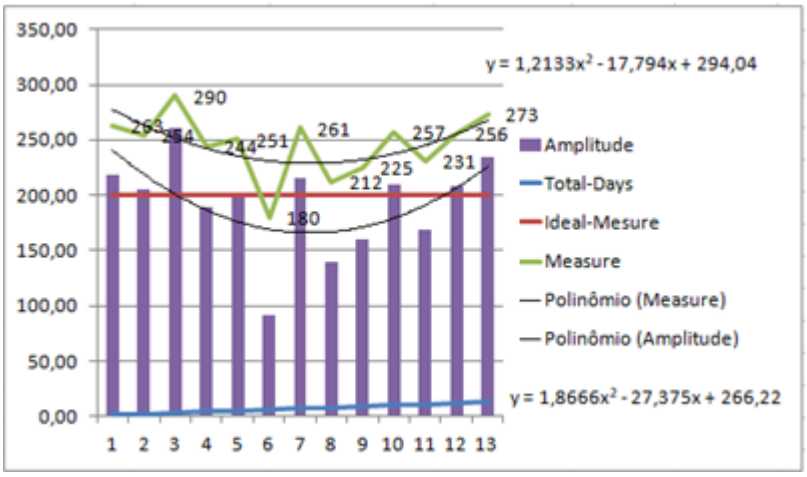

Figure 25: Graphical results by the application of NMLQ by frequency (Amplitude) domain in the night

Figure-25 shows the graphical representation in the domain of time and frequency (Amplitude) through the polynomial function and amplitude, in the night for 13 days and collected for analysis of its results.

3rd dimension vision structure		
Sinapse	**Description of function**	**Spreadsheet (x, y,f(n))**
f1(x)	f1(x)= - 0,5119x² + 7,8583x + 129,44	Spreadsheet (x, y,f1)
f2(x)	f2(x)= - 0,7875x² + 12,09x + 12,989	Spreadsheet (x, y,f2)
f3(x)	f3(x)= 1,2133 – 17,794x + 294,04	Spreadsheet (x, y,f3)
f4(x)	f4(x)= 1,8666x² – 27,375x+266,22	Spreadsheet (x, y,f4)

Figure 26: Vision structure 3ª. Dimension

Figure-26 above shows the results of the analysis of graphs and functions, in which representation in addition to the positions of each worksheet in a 3rd view. Dimensions that were defined according to the results of the graphs and data collected during the periods of time shown in figures 22 to figure 25.

4rd dimension vision structure		
Space	**Description of function**	**3rt dimension**
s1(x)	s1(x)= (f1(x), t1)	f1(x)
s2(x)	s2(x)= (f2(x), t2)	f2(x)
s3(x)	s3(x)= (f3(x), t3)	f3(x)
sn(x)	s4(x)= (f4(x), t4)	f4(x)

Figure 27: Vision structure 4ª. Dimensão.

Figure-27 above shows the basic structure of the 4th view. Dimension and positions occupied in each dimension of space and time. Its graphical view for the proposed NMLQ model is represented in figure-16.

Figures-28 to 30 show the values and simulations of the dilations and contractions of time generated in the 4th view. Dimension and margin of errors presented vary from 0.04% during the tests. These values are of the analog type, which corresponds to the reality of the real world.

Formula Equation	Measure Projection (NMLQ)			
	Sinapse	Value (Measure)	Qty Measure	Results Goal (%)
f1(x)=-0,5119x2 + 7,8583x + 129,44	f1(x)	124,1264	16	24,06

Figure 28: Projection for analisys of an NMLQ and structure

Figure-28 shows the first test on the structure in a third dimension view for the time equivalent to the 16th. Dia, moreover, represents the percentage level that remains to reach the value established by the 110 units of blood glucose level according to the projection established by the proposed model NMLQ.

Formula Equation	Measure Projection (NMLQ)			
	Sinapse	Value (Measure)	Qty Measure	Results Goal (%)
f1(x)=-0,5119x2 + 7,8583x + 129,44	f1(x)	124,1264	16	24,06
f1(x)=-0.5119x2 + 7,8583x + 129,44	f1(x)	136,7864	1	37,73
f1(x)=-0.5119x2 + 7,8583x + 129,44	f1(x)	143,109	2	44,56
f1(x)=-0.5119x2 + 7,8583x + 129,44	f1(x)	148,4078	3	50,28
f1(x)=-0.5119x2 + 7,8583x + 129,44	f1(x)	152,6828	4	54,90
f1(x)=-0.5119x2 + 7,8583x + 129,44	f1(x)	155,934	5	58,41

Figure 29: Results of test simulation of NMLQ Goals.

Figure-29 shows parts of the results and records in the 3rd view. Dimension to be analyzed and compared with the results generated by the graphs of figures 22 to 25, already described above.

Formula Equation	Measure Projection (NMLQ)			
	Sinapse	Value (Measure)	Qty Measure	Results Goal (%)
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	105,4222	9	3,86
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	167,391	1	70,78
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	163,2282	2	66,29
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	158,0416	3	60,68
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	151,8312	4	53,98
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	144,597	5	46,16
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	136,339	6	37,25
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	127,0572	7	27,22
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	116,7516	8	16,09
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	105,4222	9	3,86
f2(x)=-0,0469x2 -2,6271x + 170,53	f2(x)	93,069	10	-9,49

Figure 30: Results goal of test analisys

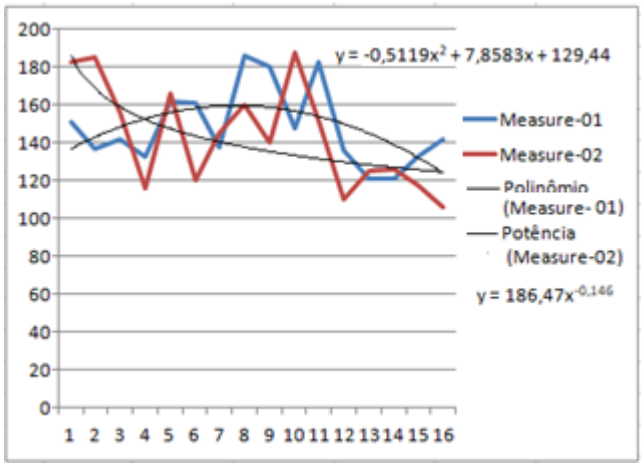

Figure 31: Equation of the expansion and contraction of space and time

Figure-31 represents the 4th view. Dimension for space s1 and s2 and the expansion of time and space with a precision of approximately 0.04%, located between times 4 and 16.

The corresponding limit functions are : $\lim_{x\to 4} f1(t) = 152$ e $\lim_{x\to 4} f2(t) = 159$, with a margin of error of +/- 0.04%.

t =	4,055
f1(t)=	153,13
f2(t)=	153,22
ΔS=	0,09

time(t)	ΔS
1	49,62
1,5	36,02
1,2	43,57
1,8	29,71
2	26
2,5	17,98
3	11,29
3,3	7,75
3,8	2,5
4	0,6
4,01	0,50
4,05	0,14
4,055	0,09

Figure 32: Results of simulation of Equation of the expansion and contraction of space and time

Figure-32 above shows the table of results and simulations of the variations in the expansion of space and time in the 4th view dimension.

2. Conclusion

The main definitions for this work are based on: quality of services and products with the application of ISO 9000 and ISO 25000 (*SQuaRE*) and *fuzzy* logic. In addition, assist in the decision making and participation of specialists from each area to define the essential rules that are compatible with the business rules of each company, to meet their business goals and objectives. The applications allow to present their results in a qualitative and quantitative way to aid in decision making that often appear in nebulous or indecisive form.

The results of the proposal of this work were presented to generate the information, knowledge base, storage form and capture of this information for the ISO 9000 model. of the proposal submitted for ISO / IEC 25000 (*SQuaRE*), in addition, mathematical models and graphs and construction of structures, structures, analyzes and presentation of results in graphical, structural, data form were presented. The qualitative and qualitative relations of the linguistic variables of the fuzzy logic were demonstrated.

The mathematical equations (series and Fourier transforms and polynomials) were described and presented to complement the proposal of this work and the third and fourth dimensions of the proposed model NMLQ. In addition, another way of implementing a system of neurofuzzy, with application of the third dimension view and synaptic value records in sets of spreadsheets and managed by the third axis (Synapse) to facilitate the application of a neurofuzzy and network management of neurons represented by cells in spreadsheets.

It can be observed that the *Fuzzy* to Quality research and development work has contributed to the analysis of risk levels of services and products. Through the input data indecisively or nebulously was able to transform with fuzzy logic and ISO 9000 and ISO 25000 / IEC quality models (*SQuaRE*), generate, store and retrieve information by

applying *fuzzy* logic, inference rules, fuzzification and defuzzification and knowledge base formation. In this way the strategic alignment of companies with quality of services and products was carried out.

For future work the proposal is in the integration with the vision in the fifth dimension to manage systems for applications for teleportation of data, information and simultaneous behaviors in quantitative and qualitative form.