Using Clustering Analysis to Improve Iraqi Law Procedures

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Abstract— In general, routine procedures in the Iraqi courts are complex, time-consuming and effort-intensive. Therefore, the Iraqi government has been carrying out reforms in the judicial sector in general and with the National Criminal Justice Commission in particular. Model has been proposed as consultative system that is able to give legal advice to the program user which can be judge, lawyer, or user. Where the proposed system takes the case as an input and then presents the court's course of action as the scenario for listening to each legal case. Moreover, the system has the ability to determine the court's decision and give legal back ground to judgment. The used Machin learning was implemented based on Clustering analysis. The proposed model used the algorithm of (Fuzzy C mean) and it give (61.1%) accurate results.
Keywords— Decision Support System, legal reasoning, Fuzzy C mean, IRAQI Law, Clustering analysis.

I. INTRODUCTION

Any case in Iraqi courts or police stations may take long time and procedure until the judge or responsible person takes a decision. This is attributed to many reasons related to the conditions of each case and the experience of the judge. From other hands, the taken decision maybe not the proper decision [1].

The core of this problem is how to achieve a criminal justice in the Iraqi courts and police stations by using the Techniques of AI . THE main idea of PAPER is designing and implementing a criminal justice system based on artificial intelligence (AI) techniques. The proposed system has been trained on a real case with their final decision based on using its knowledge base. It has the ability of analyzing the legal problems depending on the available knowledge base and taking the proper decision to user (judge, lawyer, client). Where the proposed system takes the legal case as an input, and then it provides the court with hearing scenario for each given legal case. Furthermore, the system has the ability of determining the court decision and afford the legal clarification to user (judge, lawyer, client).

II. RELATED WORK

The first who used the term artificial Intalegint (AI) and law was McCarty1977 and here we will use in our legal advisory system more than one strategy in machine learning approach like case based reasoning (CBR) and a hyper systems .

The authors of [2] proposed a Hypo system which is an case-based reasoning system. Hypo system has been developed to addresses the trade secrets law. Likely, this system is well known and good documented among all the proposed systems of case-based reasoning. Hypo can analyses the case conditions in the trade law area and use case base to retrieves relevant cases to construct them as legal arguments.

The author of [3] suggested Malicious Prosecution Consultant (MPC) system named as kowalski's ystem. MPC is a CBR system that deals with cases in the field of malicious prosecution .

HELIC-II (Hypothetical Explanation constructor by Legal Inference with Cases by 2 inference engines) is a system that developed by the authors of [4]. This sytem is hybrid legal that operats in the domine of penal code and utilising the applied legal rules (the law) with cases (precedents).

The PhD dissertation in [5] presented a system named JUDGE. This system is a case based reasoning system that aims to simulate the sentencing achived by real-life judges on criminals through comparing current cases to previous cases with thier penalities. This sytem based on interviewing the judges to explor their opinion and procedures in specific hypothetical cases to conclude the influence factors.

The author of [6] developed a system named IKBALS that deals in the domine of workers compensation law. IKBALS is applied by combining the rule based and case based system so it's a hybird system.

The authors of [7] suggested case-based reasoner system called as OPINE. OPINE operates in generic legal cases. This system affores estimation of likely case outcome by using only one function. This features makes it different from the afornmentioned CBR systems.

The authors of [8] proposed an earlier system called as Legal Expert System for Termination of Employment Review (LESTER). LESTER is a case-based reasoning system operates in a sepicific domin which is unjust discharge from employment under collective bargaining agreements.

Author of [9] proposed a fuzzy CBR system that deals with legal inference. This system is implemented by combining the fuzzy charactristics and case rules for the cases of legal contracting.

Authors of [10] developed a system called HILDA that extractes the knowledge by using Artificial neural networks (ANNs). It used the extracted knowledge to lead the rule inferences and cases retrieval [10].

Another neuro-fuzzy approach in legal reasoning is developed by the author of [11]. This approach attempts to determine structure in precedent decisions in addition to sepisfying legal precedents.

SHYSTER is a system that developed by author of [12]. It is a case-based legal expert system which has the ability to act as a hybrid by linking with rule-based models. It can operats in multiple legal domains, such as the laws of Australian copyright aspects, contract, personal property and administrative.

TAXMAN is a system developed by author of [13] and its a rule-based system. It can perform a basic form of legal reasoning by classifying cases based on a particular category of statutory rules in the domain of law concerning corporate reorganization.

III. MACHINE LEARNING

The machine learning techniques in the computer science, contract with learning algorithms and are accomplished to handle multifaceted difficulties over a set of experimentation and can grow its performance mechanically [14].

The customary technique of the machine learning is divided into supervised, unsupervised and reinforcement learning. The supervised learning is knowledge by a straight judgement between the input named (actual network) and output named (desired output). Although unsupervised learning does not comprise any actual network, it be governed by associations amid the actual input without the assistance of a teacher [15].

IV. ADVISORY SYSTEMS

The advisory system is the system that provides advice to decision-makers through its architectural. so The system feeds from previous experience, previous cases, and knowledge engineering. that's feed to the knowledge base through which the process of inference, which is controlled by the monitoring agent, For the best advice. Investigations in advisory systems have determined that decision makers require identifying and framing the issue in order they can make proper decisions [16].

V. ADVISORY SYSTEMS DECISION SUPPORT

Advisory systems give support to decisions of both classes intelligent and unstructured. They are having the characteristics of novelty, complexity, and open end. Additionally, unstructured decisions are characterized with contextual uncertainty, which resulting in increases the complexity of the decision-making process when combined exponentially [18]. Fig (1) shows the architecture of advisory systems.

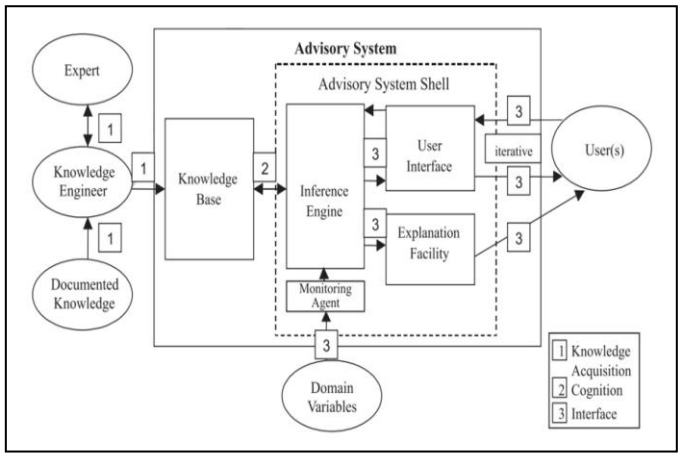

Fig (1) Advisory Systems Architecture. [17]

VI. CLUSTERING

Clustering are the process of assembling similar situations or groups of objects in some way to form a mass in the same group and are more similar to each other than the rest of the other groups and are used in many fields, including machine learning [19].

Clustering are an important step in the development of many decision support applications as well as pattern recognition [20].

VII. FUZZY C-MEANS ALGORITHM

The fuzzy c-means (FCM) algorithm is a clustering algorithm advanced by Dunn, and future developed by Bezdek. It is valuable when the essential amount of clusters prepare-determined; thus, the algorithm efforts to set each of the data points to single of the clusters [21]. What marks FCM die rent is that it does not agree the absolute association of a data point to an assumed cluster in its place, it computes the likelihood (the point of relationship) that a data point will fit to that cluster. Hence, contingent on the accuracy of the clustering that is required in training, suitable tolerance measures can be put in place. Meanwhile the absolute relationship is not calculated, FCM can be very fast since the amount of repetitions required to attain a specie clustering exercise corresponds to the essential accuracy [22][23].

VIII. FRAMEWORK OF PROPOSED SYSTEM

Goal based agency is an appropriate process, used to achieve the goal of proposed system.
Goal based agency is expanding abilities by utilizing goal information. This information goal is used to describe the desired situations that allows the agency in a way to choose from several possibilities that connects to the goal. Planning and search in this type of agencies are dedicated to do action sequences that achieve the agency goals. Fig (2) shows a flowchart of the proposed system.

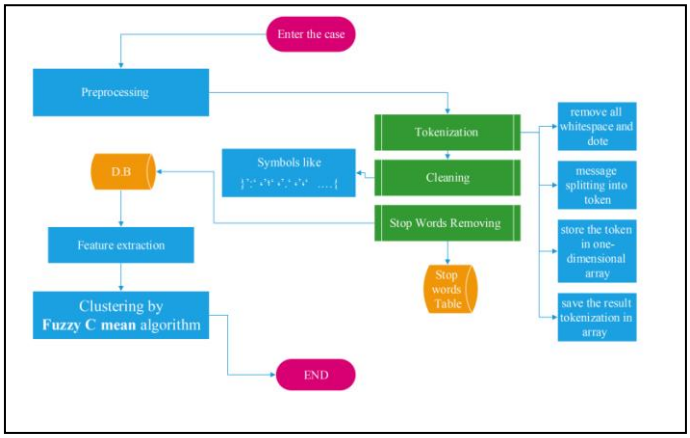

Fig (2). The Flow Chart of the Proposed System

The proposed Advisory decision support for criminal justice system has been implemented in four stages.

There are four stages to achieve the goal

1- The Preprocessing
2- Feature extraction
3- Fuzzy ISODATA ALGORITHM
4- The actuator which represents the output.

1- Preprocessing

It is the second step in the proposed agency program. The acquisition input stage enters the data for preprocessing.
The entered data is various in their type and size because the t types of article used in Iraqi Law are different. Some cases have details more than other cases, some cases have a lot of name Complainant and complainer, dates, actions, places, etc.
Preprocessing is the proper procedure to beat this issue.
Preprocessing remove the unwanted word like what that mentioned in the first paragraph and because we used a real case that write in ARABIC language. This includes the following steps:

a- Tokenization

In order to transform a sentence into tokens (discrete words) the sentence passes through two phases: Sentence segmentation and Cleaning.

Tokenization or splitting the input is the procedure of breaking up a sequence of strings into pieces such as words, symbols, keywords, terms or attributes and other elements that Meaningful element are called tokens, in other words it is a form of text segmentation. Tokens act as an input for further processes like analysis and text mining.

The steps of tokenization as following:

Step 1: remove all whitespace and dote.

Step2: message splitting into token.

Step3: store the token in one-dimensional array.

Step 4: save the result tokenization in array

The tokenization (or named Sentence Segmentation) separating the sentimental sentence to its words, which compose the sentence structure. The proposed system analyzes sentence written in Arabic. As mentioned previously, the proposed systems use case for implementing the training phase

b- Cleaning

The previous phase produced a collection of words, symbols, punctuation marks, and numbers; therefore, it is necessary to remove unvalued words and symbols from the stored words obtained from the previous phase. Some of these words are expressions that contain HARKAT, which are do not have a value, because they are used for special purposes in Arabic

c- Stop Words Table

Till now, the data stored in the table is large data set, and it contains many words that is not useful for the analyzing system which known as stop words.

A list of stop words stored in a tables in the database. Where each token in token table is compared with the content of the stop words database, if a token found in the stop words table then it will be removed.

2- Feature extraction

The operation of feature extraction includes minimizing the amount of resources that are needed to explain a large set of data. Performing analysis for complex data faced a significant issue which is the large of the number of involved variables. In general, analyzing large number of variables consumes a large space of memory and computation power, in addition, it may result in a poor performance of the classification algorithm in training samples and then generates poor new samples

a- Word-Based Features

Knowing the length of the matrix

Calculation of the length of the array. It is one of the most important steps of the program, because its results are used in the statistical processes, on which many steps in the system depend.

Step1: This is done by passing each word of the array one by one, and reading the word whether it is within the rule table or not.

Comparing the read words with words in rule table will increase the count when reading each word to the end of the array.

The count results are sent to the database, in its own table with sending the name of the message (case) that is represented and sequentially.

Step2: Each word is taken and stored in a variable and pass on all matrixes, if there is a matching word that has been stored in the variable; it saves it in a counter after finish the array the last number is saved with the counter.

The process will be repeated on all words and from the first word to the last word. It sends the counter values to the data.

With every word repeated. This gives us an advantage in determining the style of the case.

3- fuzzy ISODATA

Data clustering is the process of dividing data elements that calculated as 90 items into dataset as 6 center value as detection key. So that items in the same class are as similar as possible, and items in different classes are dissimilar as possible. Depending on the separate value for each user that represented in group of data and the purpose for which clustering is being used. Different measures of similarity may be used to place items into classes, where the similarity measure controls how the clusters are formed. In contradistinction to hard clustering, in fuzzy clustering each point has a degree of belonging to clusters, as in fuzzy ISODATA, that algorithm is applied as a tool provided in language program e.g. C#. Just enter data and detected the cluster, and the number of cluster according to the algorithm as show in fig (3).

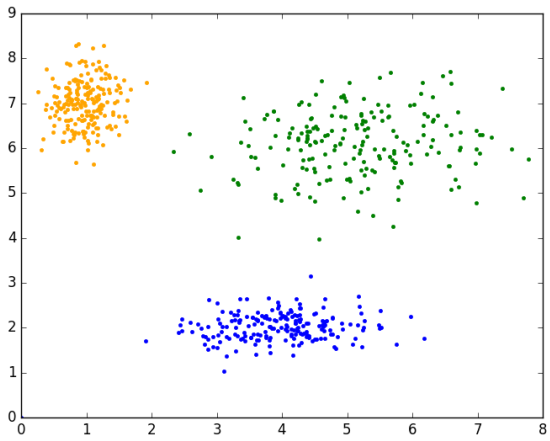

Fig (3). Fuzzy ISO Data

4- The actuator

The actuator represents the output and it is the final stage in the proposed agency system. The actuator as stage will give an advice with suitable decision to the judge. This advice done according to the type of the case.

IX. Result

The result from the proposed system was very good where it achieved (61.1 %) of accurate decision in testing phase. Accordingly, the system can get proper Advisory Judgment and a legal explanation to user for a case after training phase. Fig (4) shows the interface of the proposed system. It is impossible to compare the proposal results with results of the previous research as it is different from them in technique and the applied cases types.

Fig (4) The Interface of the proposed System

X. Conclusion

The system is developed based on using AI mechanism where it includes for main steps: preprocessing, feature extraction, clustering by using FCM and actuator. The system is examined by using a set of real legal cases gained from KUT Court. 90 cases are used in this system where 80% used in training phase and 20% used in testing phase. The system achieved the rate of 61.1% as accurate decision. As a result, the system provides the judge, lawyer or client with correct advice and it reduces the required time for studying the case to taking the proper decision. In addition it reduces the steps of traditional_work in courts. Further, the system has the ability to conclude the legal case where all cases are stored in Knowledge Base (KB). Whereas the traditional work cannot overcome this issue.

This is the contribution of the new structure of the proposed legal knowledge base and the system. Hence, the system is practical to use and gains high acceptance from users.

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