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Design and Implementation of General Conflict Analysis System to Study Syrian Problem Conflict

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Abstract: ***The Syrian problem started in 2011 as peaceful demonstrations demanding the Government with political and economic reforms. The Government acknowledged many of those demands; therefore, internal opposition is invoked for dialogue and negotiation, but the demonstrations quickly turned into civil war due to illegal penetrations of neighboring countries and major powers in the world on Syria due to its military, economic, and geographic significance and to its important role in the Palestinian issue. The Syrian problem has been changed to conflict of interest among countries. In this research, USA, Russia, Israel, Turkey, Iraq, KSA, Qatar, and Iran are taken as the main players in the Syrian issues. In addition, seven issues related to Syrian problem are studied to discover the coalitions and conflicts among those agents depending on conflict theorem using rough set and Pawlak's model. The proposed model discovers novel coalitions and conflicts depending on the issues which may reflect the future solutions.***

Keywords: Conflict system, Conflict function, Rough sets, Pawlak's Conflict modelConflict theorem

1. Introduction

This section contains two subsections; the first one related to the Syrian conflict, and the second one produces an elucidation for the conflict theory.

1.1 Syrian Conflict

Undemocratic influence of Arab spring or Democracy spring, which began on December 17, 2010 in Tunisia, arrived to Syria in 2011 and changed it to a conflict area between the Government of President Bashar Al-Assad and fragmented, (not united), opposition consisting of many factions with different States dependencies. The cost of this armed civil conflict is the lives of 100,000 people and forced over two million to flee to the relative safety of neighboring countries, therefore it captures the attention of the world. Syria reached this situation due to the intervention of regional countries such as Iran, Gulf countries, Iraq, Turkey, Israel in addition to European union and great power such as USA and Russia. Each of these countries has its own economic, political, security, religious, and/or military interests. Some of these countries produced economic, political, and military support to the government and others created terrorist military factions. However, there is no real support to moderate or diplomatic oppositions. The conflict excreted many issues that became far from or may be not related to the original demands of peaceful protesters such as political and economical reforms or in worst case changing the President. Therefore, these issues and priorities of solving them became parts of the conflict of the active players' interests in Syrian problem. In this research, some of issues and some of energetic powers are considered to analysis the Syrian problem to discover the main coalitions and conflicts related to Syrian problem agents depending on the rough sets and conflict theorem, therefore section 1.2 will present an elucidation for rough sets and conflict theorem.

1.2 Rough set and conflict theorem

Rough set theory is considered as a powerful new mathematical, non-statistical approach for representing and extract knowledge from incomplete or noisy data, it was evolved by Zdzislaw Pawlak [1],[2],[3] in (1982).

In real life many problems are imprecise naturally, Zdzislaw Pawlak presented Rough set theory that used to deal with imprecise and uncertain problems in information systems with modeling interaction between units as indiscernibility relations. These interactions can be viewed as conflicts. Pawlak offered a conflict system based on rough set as a mathematical model.

Conflict analysis has an important function in the practical and theoretical areas. It has been used in various remarkable fields like business, economic, governmental and political dispute etc., especially in areas that require decision-making. There is many methods to process these problems using different approaches like Rough set theory [1], Fuzzy set theory [4] and others as in (e.g. [5])

Generally uncertainty in conflict situation exist in three binary relations i.e. alliance (coalition/favorable), neutrality, and against (conflict) among agents, consequently, various mathematical models of conflict situations have been proposed and investigated to model uncertainty in conflict situations [6].Firstly conflict analysis had been studied by Zdzisław Pawlak (In 1984) [6]who proposed a simple and intuitive mathematical model of conflict analysis depending on three binary relation between the units that enables alliance and conflict relations to be identified.

LaterPawlak [7] summarized a conflict as a graph model based on rough sets using discernibility relation, then in [8], a new approach had been suggested to conflict analysis. Later an enhancement of the model proposed by Pawlak in[6] had been presented by Deja[9]which taking into account the local aspects of conflicts. Finally, many

enhancements to this problems had been appeared and proposed that seeks to achieve the goal.

According to Pawlak in [7] that considered a conflict between at least two parties, called agents, are in dispute over some issues. Pawlak considered that rough sets are the perfect for modeling conflict. In this conflict model, agents may be individuals, groups, companies, states, political parties, institutions etc.

A conflict situation is represented in the form of amatrix in which rows and columns are considered and labeled as agents and offered issues respectively.

This matrix contains agent's opinions to specific issue using one of three values: −1 means that an agent is against, 0 neutral toward the issue, and 1 means favorable.

This matrix is regarded as an example of an information system, IS = (AG, I), which consists of two finite non-empty sets of agents, AG, and issues, I, respectively. I is a set of issues, and the set of possible values of i∈I is plain-possible-value-of-i={against, neutral, favorable}, representing agent's opinion, view, voting about discussed issue, and numerically represented as V^i={-1, 0, 1} or shortly V^i={-,0,+} [10].

Let v(ag, i) is a function returning the value of opinion of agent ag about the issue i, where ag∈AG, i∈I. For each i∈I, there is a function f(x, y, i): AG × AG → {−1, 0, 1}, which is defined as follows:

$$f(x, y, i)=\begin{cases} 1 \text{ if } v(x,i)\times v(y,i)=1 \text{ or } x=y, \\ 0 \text{ if } v(x,i)\times v(y,i)=0 \text{ and } x \neq y, \\ -1 \text{ if } v(x,i)\times v(y,i)= -1. \end{cases} \quad \ldots\ldots\ldots(1)$$

Where x and y∈ AG and x ≠ y, while i∈ I.
Then over AG × AG,three relations are defined: R_i^+alliance, R_i^0 neutrality, R_i^-
conflict, that express the relations between agents:
R_i^+ (x, y) if and only if f(x, y, i)= 1,
R_i^0 (x, y) if and only if f(x, y, i) = 0,
R_i^-(x, y) if and only if f(x, y, i)= −1.

Relation R_i^+ is an equivalence relation. Each equivalence class of alliance relation $R_i^+$is called coalition on i. Now depending on concept of a discernibility matrix assumeINF = (AG, I), IS⊆I. By a discernibility matrix of IS in INF, denoted M_{INF}(IS), or M(IS), if INFis understood, we will mean n x n, n = |AG|, matrix defined thus:

$$\delta_{IS}(x,y) = \{i\in IS: i(x) \neq i(y)\} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Soδ_E(x, y), in shortδ(x,y), is the set of all attributes thatdistinguish objects x and y.

The discernibility matrix for conflict presented later in theexample below see Table.2each entry of the table offers all issues for which the corresponding agents have different opinions.Each pair of objects x and y that specify by the discernibility matrix M(IS) are asubset of attributes δ (x,y) ⊆IS, with the following properties:
(i) δ (x,x) = ∅,
(ii) δ (x,y) = δ(y,x),
(iii) δ (x,z) ⊆ δ(x,y) U δ(y,z).

In order to evaluate views between agents x and y with respect to the set of issues IS⊆I, now define a conflict function based on discernibility matrix

$$\rho_{IS}(x,y)= \frac{|\delta_{IS}(x,y)|}{|IS|} \quad \text{Where} 0 \leq \rho_{IS}(x,y) \leq 1 \quad \ldots\ldots.3$$

- $\rho_{IS} \neq 0$, x and y are in conflict over IS(issues) in a degree ρ_{IS} (x, y)
- ρ_{IS} (x, y) = 0, x and y are in coalition over IS.

We can write ρ_{IS}as just ρ.

To specify approximate (rough) conflict relation RS, The distance function can be used in the following way: RS^P (x,y) iff ρ (x,y) > 0.

If RS^P(x,y) we say that x and y are in conflict to the degree ρ (x,y).

The following properties are obvious:
1. ρ (x,x) = 0,
2. ρ (x,y) = ρ (y,x)
3. ρ (x,z) ≤ ρ (x,y) + ρ (y,z),

Thus the ρ (x,y) is the distance between x and y. Instead of function ρ we can define function p*, which defines distance betweenagents more precisely, by assuming that distance between agents being inconflict is greater than distance between agents which are neutral, i.e.,a function of distance between agentsρ^*_{IS}: AG × AG → [0, 1] is defined

$$\rho^*_{IS}(x, y)= \frac{\sum_{i\in IS} f^*(x, y, i)}{card\ \{IS\}} \quad \ldots\ldots\ldots4$$

Where:

$$f^*(x, y, i) = \frac{1 - f(x, y, i)}{2} \quad \ldots\ldots\ldots5$$

If we apply f^*(x, y, i)based on the value auxiliary function f(x, y, i)then obtain:

$$= \begin{cases} 0 \quad \text{if } v(x, i) \times v(y, i) =1 \text{ or } x= y, \text{ if } f(x, y, i) =1 \\ 0.5 \text{ if } v(x, i) \times v(y, i) = 0 \text{ and } x\neq y, \text{ if} f(x, y, i) =0 \\ 1 \quad \text{if } v(x)\times v(y) = -1, \text{ if } f(x, y, i) = -1 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots6$$

- If two agents x and y are similar in opinions then the value of relation auxiliary function *f*(x, y, i) =1,put this value in distance function ((1-1)/2) to obtain 0,in other meaning, there is no conflict between these two agents under study.
- If at least one agent x or y has aneutral opinion on thespecific issue, then the value of relation auxiliary function *f*(x, y, i) =0,put this value in distance function ((1-0)/2) to obtain 0.5.
- If two agents x and y have different opinions then the value of relation auxiliary function *f*(x, y, i) =-1, put this value in distance function ((1-(-1))/2) to obtain 1,in other meaning, there is a conflict between these two agents under study.

The distance function between agents is assumed that distance between agents that are in conflict is greater than the distance between agents which are neutral.

Now we can in a more general way than before, without reference to specific issues, define the relations between agents.

A pair x, y ∈AG is said to be:

- Allied $R^{+}(x, y)$, if $\rho(x, y) < 0.5$,
- In conflict $R^{-}(x, y)$, if $\rho(x, y) > 0.5$,
- Neutral $R^{0}(x, y)$, if $\rho(x, y) = 0.5$.

2. The Designed System and Proposed Model for Syrian Conflict

To build and implement a Syrian conflict model, a general conflict system was designed which can be used for another conflicts. Figure.1 shows the main steps of the proposed system.

Algorithm: general conflict system
{
1. Enter No. of issues and No.of agents.
2. Read on of the issues from dataset, Current Issue.
3. Identify condition and decision attribute from decision table.
4. Apply the granularity and indiscernibility using the strength, certainty, and coverage factors for all agents and Current Issue.
5. Repeat steps 2, 3, and 4.
6. Construct the Information System
7. Apply the conflict theory depending on discernibility matrix to know the degree of conflict, alliance, and neutral.
8. Discover conflict and alliances using flow graph.

}

Figure 1: Main steps of the general conflict system

The proposed system is used to investigate the current situation of the conflict in Syria and its impact on the region and the relationships among related states depending on the vital and emerging issues related to this region.

It is wealthy to be mentioned is that the proposed system is scalable for the dimensions sizes of the information system, but for presenting the results, eight agents are considered and enumerated as follows:

U = {1, 2, 3, 4, 5, 6, 7, 8}.

Table 1: Agent list

Code	1	2	3	4	5	6	7	8
Agent	USA	Turkey	Russia	Iran	Saudi Arabia	Qatar	Iraq	Israel

In addition, seven issues are considered and coded as follows: A = {a, b, c, d, e,f,g}.

Table 2: Issues list

Code	Issue
a	Support to remain government of Bashar Al-Assad
b	Safe zone
c	Kurdish federalism (Rojava)
d	Naming the moderate opposition factions
e	Syrian Democratic Forces (SDF),
f	Useful Syriaproject
g	Hezbollah involvement in the Syrian War

The Information System for Syrian conflict can be constructed from the "voting" or "opinion" for each agent, "country", about a specific issue as shown in Table.3 depending on the algorithm presented in Figure.2.

Table 3: Information system for Syrian conflict

A/U	a	b	c	d	e	f	g
1	-1	+1	+1	-1	+1	0	-1
2	0	+1	-1	-1	-1	+1	-1
3	+1	-1	0	+1	0	-1	+1
4	+1	-1	0	+1	0	0	+1
5	-1	+1	+1	-1	0	-1	-1
6	-1	+1	0	-1	0	-1	-1
7	+1	-1	-1	+1	0	0	+1
8	-1	1	+1	-1	+1	+1	-1

Note that the opinions of agents, states, had beenadopted from statements oftheir official representatives, which are mentioned in articles, presented in the following reliable news websites such as:

1- http://www.reuters.com/
2- http://www.independent.co.uk/
3- http://www.aljazeera.com/
4- http://lobelog.com/
5- http://www.basnews.com/
6- http://aranews.net/
7- http://www.huffingtonpost.com/
8. https://www.washingtonpost.com/
9. https://www.nytimes.com/
10.http://www.ndtv.com/
11.http://www.irinnews.org/
12.http://www.al-monitor.com/
13.https://www.usnews.com/
14.http://dckurd.org/

Now we intendto convert Pawlak function that mentioned in equation.1to proposed algorithm.Figure.2 show this algorithmthat clarify and interpret a conflict situation depend on discernibility matrix:

```
Algorithm: Conflict Function
Input: Information System [Agent#][Issues#];
Output: Conflict_Matrix [Agent#][Issues#];
{
  1.  for(i=1;i<Agent# ; i++)
  2.      for(j=i+1; j<=Agent# ; j++)
  3.       {
  4.         for(k=1; k<=Issues# ;k++)
  5.            If Information System[i][k]!=Information System[j][k]
  6.                        Conflict_Matrix[j][i]= Conflict_Matrix[j][i]+1;
  7.       Conflict_Matrix[j][i]= Conflict_Matrix[j][i]/Issues#;
  8.       }//end for j
  9. }// of Conflict Function
```

Figure 2: The proposed Pawlakmodel algorithm

The algorithm presented in Figure.2 takes the table of information system as a matrix that contains agents in rows and issues in columns with values of the agent's opinions restricted in (1,0,-1) as against, neutral, favorable toward the issues respectively. Then it scans all rows and columns by comparing each row with others depending on the binary relations. If there is a conflict in value between two agents then add 1 to CONFLICT matrix. Then it finally divides the values of the row on a number of issues to obtain the model matrix as output.

Table.4 represented the discernibility matrix offers the disputed issues between agents. Now we can calculate the distance function between each pair of agents to find out alliances and conflicts by applying equation.6 on Table.3 which represent information system that contains opinions for each agent on a given issues.

Figure.3 presents proposed Distance function algorithm which reflects more exactly the differences between views of agents than the previous one:

```
Algorithm: Distance Function
Input: Information System [Agent#][Issues#];
Output: Distance [Agent#][Issues#];
{
 1. for(i=1; i<Agent# ; i++)
 2.    for(j=i+1; j<=Agent# ; j++) {
 3.       for(k=1; k<=Issues# ;k++)
 4.        If  (Information System[i][k] = 0) OR (Information System[j][k] = 0
 5.        Distance [j][i] = Distance [j][i] + 0.5;
 6.        Else if InformationSystem[i][k]! = InformationSystem[j][k]
 7.          Distance [j][i]= Distance [j][i] + 1;
 8.     Distance [j][i] = Distance [j][i] / Issue#
 9.   }//end for j
 10. }// of Distance Function
```

Figure 3: The proposed distance function algorithm

This algorithm Figure.3, takes the table.3 of information system as a matrix that contains agents in rows and issues in columns with values of the agent's opinions restricted in (1,0,-1) as against, neutral ,favorable toward the issues respectively. Then it scans all rows and column by comparing each row with others (except with the agent himself) depending on the binary relations. If there is no conflict in value between two agents then do nothing. If one of them or bothequal to 0 add 0.5, else add 1 to the distance matrix that represents conflict to distance matrix. Finally, to obtain a Distance matrix as output, divide its elements by the number of issues.

Table 4: Discernibility matrix for Syrian conflict

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1								
2	a,c,e,f							
3	a,b,c,d,e,f,g	a,b,c,d,e,f,g						
4	a,b,c,d, e,g	a,c,d,e,f,g	f					
5	e,f	a,c,e,f	a,b,c,d,g	a,b,c,d,f,g				
6	c,e,f	a,c,e,f	a,b,d,g	a,b,d,f,g	c			
7	a,b,c,d,e,g	a,b,d,e,f,g	c,f	c	a,b,c,d,f,g	a,b,c,d,f,g		
8	f	a,c,e	a,b,c,d,e,f,g	a,b,c,d,e,f,g	e,f	c,e,f	a,b,c,d,e,f,g	

Table 5: Distance Function for Syrian Conflict

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1								
2	0.42857143							
3	0.78571429	0.7857143						
4	0.78571429	0.7142857	0.2142857					
5	0.14285714	0.4285714	0.7142857	0.7857143				
6	0.21428571	0.3571429	0.7142857	0.7857143	0.1428571			
7	0.85714286	0.6428571	0.2142857	0.3571429	0.8571429	0.7857143		
8	0.07142857	0.3571429	0.8571429	0.7857143	0.2142857	0.2857143	0.7142857	

3. Experiment Result

After execution the algorithm in Figure.3for all issues, we obtain results shown in Table.5 that represent the distance functionand then convert it to the graph to clarify and facilitate the vision. Each node represents agent, "country". The dotted line, which connects between any two nodes, represents the alliance existing between two countries. The solid line represents the conflict.

It is easy to see alliances and conflicts by the graph shown in figure.4, and one can conclude that USA, Israel, Turkey, Saudi Arabia, and Qatar are allied. Iraq, Russia, and Iran are allied too. Whereas Iraq and Israel are in conflict, USA and Iran are in conflict and so on based on distance function in table.5.

If we take each issue separately, the sight and results will vary as shown in (fig.5.a, fig.5.b, fig.5.c, fig.5.d fig.5.e, fig.5.f, fig.5.g) because each graph will depend on opinions of agents just to one issue only but not all together and we can note that a state having a neutral opinion is represented as a circle not connected with others. Taken each issue separately gives a different result depending on agent's opinion to a specific issue for example in the issue a "Support to remain a government of Bashar Al-Assad", which has the graph presented in Fig.5.a,we can note that the USAis in conflict with Russia, Iran, and Iraq. Whileit allies with Saudi Arabia, Qatar, and Israel about this issue. Turkey is neutral. Finally, the USA still in conflict with same states even when taken all issues together.

If we talked about Iraq and Turkey we notice that the relationship is changing from time to time according to the resentissues. Therefore, we can note that the relationship between these two countries isdisputed in issue b and d (fig.5.bfig.5.d)but it is alliedin issue c, so the benefit of this model is that it gives the binary relation in specific degree depending on all issues precisely.

In spite of that, most of the states' opinions are similar on issue efig.5.e, (Russia, Iran, Saudi Arabia, Qatar, and Iraq), there is no relation between these states because their opinions are neutral. So this situation doesn't discover the relation if it is conflict or alliance because they have no obvious opinions.

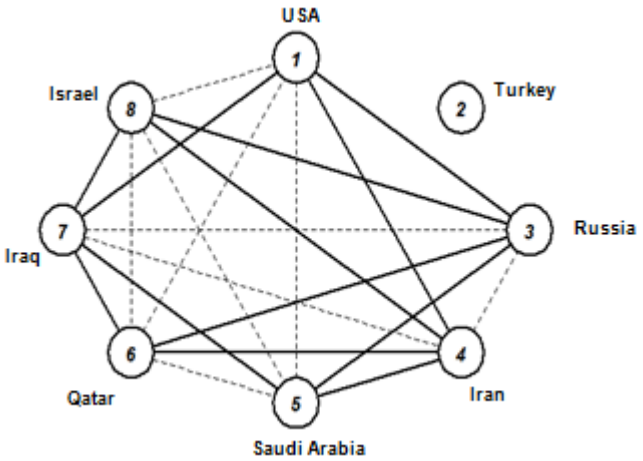

Figure 5 (a): A graphical representation of Syrian conflict, distance between agents issue a

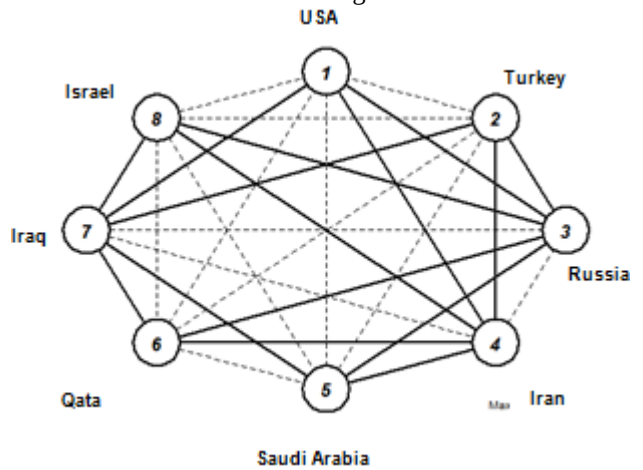

Figure 5 (b): A graphical representation of Syrian conflict, distance between agents issue b

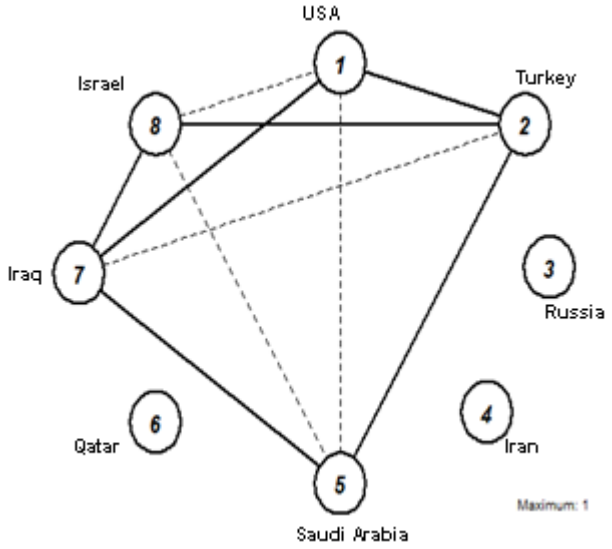

Figure 5 (c): A graphical representation of Syrian conflict, distance between agents issue c

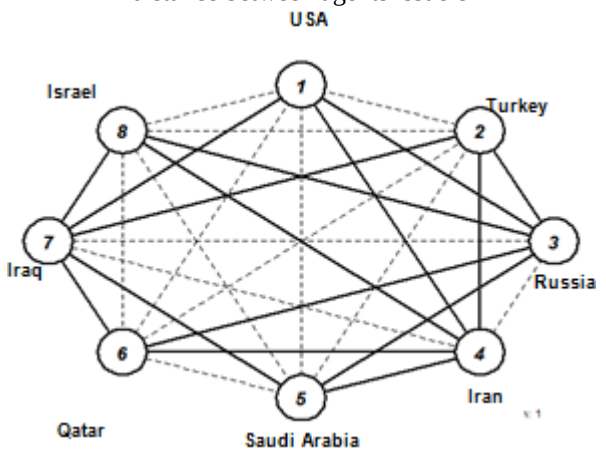

Figure 5 (d): A graphical representation of Syrian conflict, distance between agents issue d

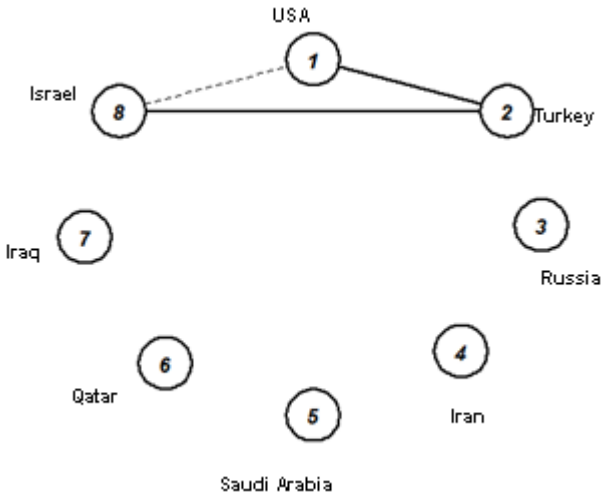

Figure 5 (e): A graphical representation of Syrian conflict, distance between agents issue e

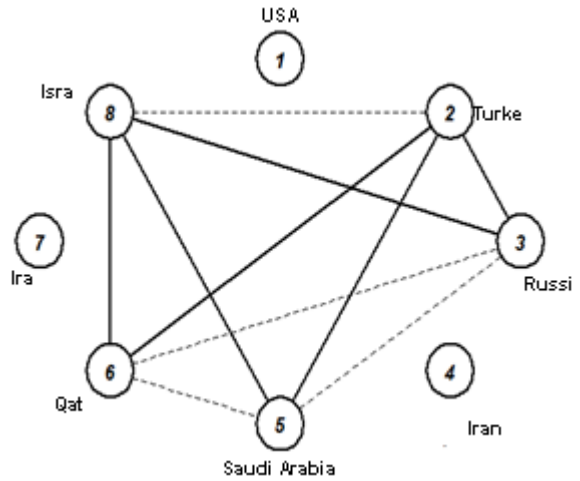

Figure 5 (f): A graphical representation of Syrian conflict, distance between agentsissue f

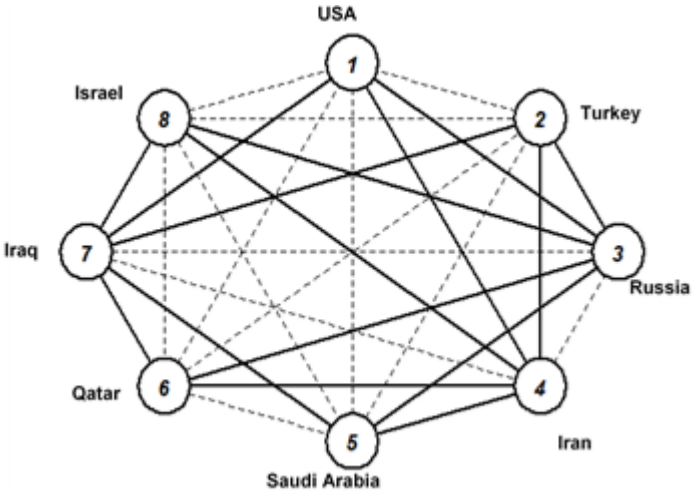

Figure 5 (g): A graphical representation of Syrian conflict, distance between agents issue g

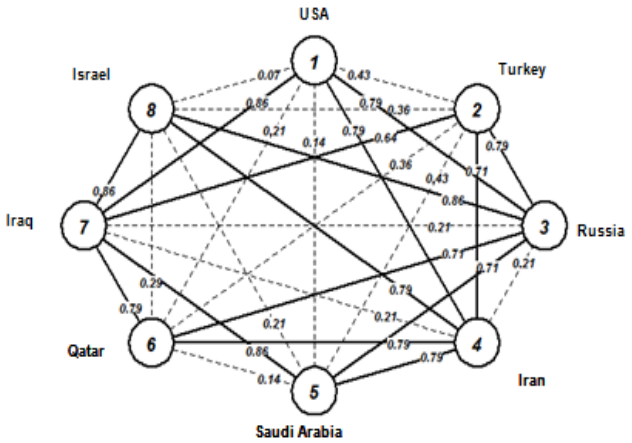

Figure 4: A graphical representation of Syrian conflict, distance between agents for all issues

This analysis of the relation between objects (agents) have an effect to decide about strategy will take out and this model considered a simple mathematical model to represent the basic properties of conflicts.

4. Conclusions

1) The designed system for conflict analysis presented in this research can be used for any conflict situation that may existeitherat the local level, (in one country), or globally at the states level,(more than one countries), with the ability of giving accurate results for future alliances and conflicts that have an effect on decision making.
2) The system has scalability feature to a number of agents and number of issues.
3) Increasing the number of issues leads to outcomes that are more precise and the form of the relationships between agents become clearer.
4) The system can be used to analyze the conflict in different fields such as political, business management, computer simulation of conflict, governmental, military activities, etc.
5) The proposed system presents amathematical and graphical model, which enables studying the main characteristics of the conflict.
6) According to the results of this research, KSA and Israel have no conflict of interests, and this result had been obtained in [7] about the conflict of Middle East conflict.

5. Recommendations for future work

1) Increase the number of agents, (countries), which have positive or negative influences to provide transparent scene for Syrian problem. Examples of such agents are France, United Kingdom, Germany, European Union, etc.
2) Increase the number of current Syrian issues or that may emerge from due to the changing in the military situations inside the Syrian borders or the political changes such as presidency change in the USA.
3) Taking intoaccount the views or opinions of opposition sites such as Riyadh, Cairo, and Moscow site.
4) Testing the scalabilities of the proposed model and the designed system to the augmentation of the number of the agents and the number of issues.

References

[1] Z. Pawlak, “Rough sets,” *Int. J. Comput. Inf. Sci.*, vol. 11, no. 5, pp. 341–356, 1982.
[2] Z. Pawlak and A. Skowron, “Rough sets: Some extensions,” *Inf. Sci. (Ny).*, vol. 177, no. 1, pp. 28–40, 2007.
[3] Z. Pawlak and A. Skowron, “Rudiments of rough sets,” *Inf. Sci. (Ny).*, vol. 177, no. 1, pp. 3–27, 2007.
[4] L. a. Zadeh, “Fuzzy sets,” *Inf. Control*, vol. 8, no. 3, pp. 338–353, 1965.
[5] E. Sutoyo, M. Mungad, S. Hamid, and T. Herawan, “An efficient soft set-based approach for conflict analysis,” *PLoS One*, vol. 11, no. 2, pp. 1–31, 2016.
[6] Z. Pawlak, “On conflicts,” *Int. J. Man. Mach. Stud.*, vol. 21, no. 2, pp. 127–134, 1984.
[7] Z. Pawlak, “An inquiry into anatomy of conflicts,” *Inf. Sci. Elsevier science*, vol. 109, no. 1–4, pp. 65–78, 1998.
[8] Z. Pawlak, “Some remarks on conflict analysis,” in *European Journal of Operational Research*, vol. 166, no. 3, pp. 649–654, 2005.
[9] H. M. D. Dqg and R. O. Dn, “44. Rough Set Theory in Conflict Analysis,” no. January 2001, pp. 349–353, 2001.
[10] A. Wakulicz-Deja and M. Przybyła-kasperek, “Pawlak's Conflict Model: Directions of Development,” vol. 8, pp. 191–197, 2016.