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A Model of Hybrid Approach for FAHP and TOPSIS with Supporting by DSS

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Abstract
Nowadays major decision are introduced as a milestone in the life of organizations. The purpose of this paper is to provide a hybrid model to decide the optimal way of solving problems based on fuzzy AHP (FAHP) and prioritization techniques based on similarity to ideal solution (TOPSIS) and support the model using decision support system.Theresults ofeachcasewill be consideredseparately and the result ofthe combinedapproachis shown. The output of the combination approach can prove due to its high power. Application of our model to different organizationsand companies show a fine improvement and fair agreement for output proficiency of the systems.
*Keywords:*Fuzzy Analytical Hierarchy Process (FAHP), Multi–criteria Decision-making (MCDM), Technique of prioritized by similarity to ideal solution (TOPSIS), Intelligenceand Decision support system.

I. Introduction

Making decision in the government organizations is so important that some pundits call the organization as the network of decisions. Today, using technique of MCDM is so common that is such a standard technique algorithm that there is some interaction with decision makers in some of them. MADM is in many cases in order to choose one option from a limited number of options, need to sort out its priorities in terms of benefits on each other, which is usually done on the basis of certain criteria.
Thus position of each option is compared to other options and, decision makers can insure superiority from each option to select, prioritize and rank. Thus providing a method that can rank as a result of decisions based on condition of all criteria further, and in addition had has higher reliability is important.

II. Fuzzy Analytical Hierarchy Process, (FAHP)

AHP introduced for the first time by Thomas L. Saati (1980). This technique combines expert option and evaluation, and complex decision-making system to make a simple hierarchy. Then, the evaluation method is used according to a scale to determine the relative importance of paired comparisons between each of the criteria [1-2].

In AHP dependence should be linear, from top to bottom or vice versa. Ifthedependence was mutual, means Weight of the criteria depend onalternatives weigh andcriteria weightalsodependonweight, its removed from the hierarchy and serves as a non-linear system with feedback, that in this case, linear systems cannot be rules and formals use

to calculate the weightof elements. Because dependence is between parameters, ANP method must be used.

Although this technique is evaluated qualities and quantities indictor, and all the benefit that has, includes some storage, like:
1. Basically, has been used in crisp decision application
2. Scale unbalance judgment examine
3. Do not consider Unreliability consider in individual judgment
4. Rating of this way is almost incorrect
5. Subjective judgment, selection and the decision-makers are so important as a result

Moreover, AHP was not able to reflect human thought (for example almost better, probably so bad and etc) as a result in order to modeling such uncertainly in human preference, fuzzy set theory(which for first time was introduced officially by professor Lotfizadeh to address the ambulation in human thought) was combined with paired comparisons-fuzzy analytical hierarchy as a development of AHP-then the better result was obtained (Ayang&Ozdemir).Thus in order to use the advantages of both techniques (AHP & fuzzy) and overcome to their weaknesses, Van Horn and Pidriyzeused FAHP in analysis of issues for the first time.
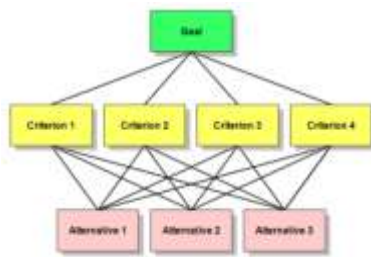
Fig. 1.FAHP based on the comparisons options for mutually carried out and for equality in terms of decision-makers on option is selected.

III.   Technique prioritized by similarity to ideal solution(TOPSIS)

TOPSIS is one of the most easier and useful technique for decisions that was mentioned by Huang and Yun at 1981 for solving MADM problems. This technique was described based on this idea that the selectedoptionshould betheshortestdistance to thepositiveideal solution and negative solution is the farthest distance [2-4]. In other words, positive ideal solution combines the best value in the negative ideal solution[5].

The main disadvantage of TOPSIS, is failure to provide weight and judgment review (see figure 2). Thus, this technique require practice effectively that set the relative importance of various indicators with respect to the other objectives. As a result, need a way to solve the huge vacuum.
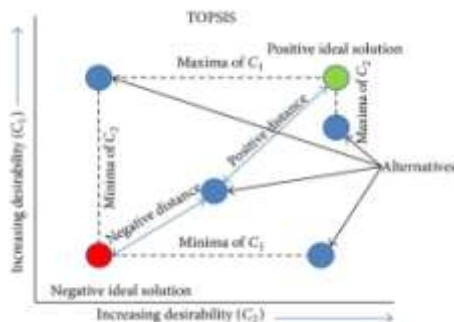

Fig. 2.TOPSIS whit the shrinking of the positive condition, desirability increase.

According to advantage of approach decision compare with current technique ranking, the aim is to provide methods by combining common decision – making technique, Provide hybrid approach that is a higher power and can solve the selection and ranking problem optimally.Application of AHP due to the limited capacity of human information processing are significantly limited and the roof of paired comparisons has arrived to seven plus minus two (7∓2) [5-6]. TOPSIS technique can meet the need of paired comparisons, and as a result capacity constrains in the process is not dominant [7]. However, TOPSIS approach assumes that variable inputs are accurate and are used as numerical data.It

is obviousthatmost ofthe existingawarenessandknowledgeofthe real worldarenot onlyaccurate, butareimprecise.Theinaccuraciesand ambiguitiesthatachieved variety of sources, such as immeasurable information, incomplete information andalsoinformationareunachievabledue toone of the disadvantagesisTOPSIS [8]. ClassicaltechniquesofAHPdue toa lack of accesstodecision-makersneedaccurate, is not perfectto reflect thehumanmind. As a result linguistic ariablesareconsideredinfuzzy numbersto describe theinputs TOPSISandaccessto the needs ofdecision-makersisuseful.

In fact, thehybrid approachcan besummed upin 4 steps as seen in figure 3.

1. FAHP uses hierarchical structure in calculating the weight of each creation (according to expert)
2. Normalmatrixweightedaccording to thevalueofsomeof theslightly criteriatakes shape
3. Positiveandnegativeidealsolutionsare defined.
4. Finally,the Euclidean distanceof each optiontothesolutionis calculatedaccordingtothedistanceandrelative closenesstothe ideal solutionoptionsconsideredtobethe bestjudge, and thus the bestrating.
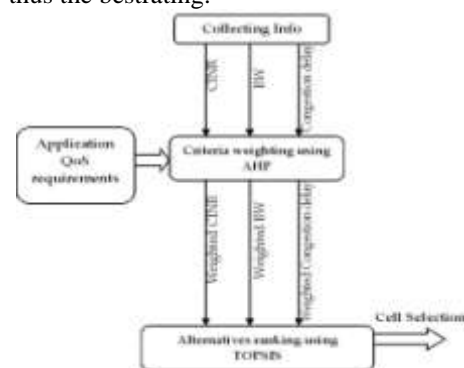

Fig. 3. The flowchart of combining of FAHP and TOPSIS. The inputs of end-stage of topsis are weight that calculate by FAHP.

IV.   Expert systems

Expert systems are programmed system which their databases of information that people make decision about a particular subject on the base of it.Moreachievementsin the field ofartificialintelligence aredecision makingand problem solving;themostexcellentexpert systemsare included.In other words, the kindofartificial intelligencetoreacha level ofexpertisethat can bereplaced by aspecialistin a particular fielddecisions, says expert system.

These systemsareefficient toolsoffera specialstructurethathas beennsummarizedbythe neatly database. Expert systems are one of the most important branches and subsidiaries decision

supports which contribute to human experts, and bye simulating expert special thought help to decision making process and decision making in organization. DSSsystems are systemsthat combine targetedanalytical modelwithoperational dataformanagers whoare facedwithsituationsof semi-structureddecisions. As result contribute to modeling unstructured problem.

Someof the disadvantages ofDSS and expert systems,

1. Limitations insome circumstances
2. Lack of any feeling about decision
3. The lack ofwidespreadvast knowledgebase, because their knowledge Origin ofone or moreparticularexpert
4. Lack ofCreativity
5. Humanresistanceto change
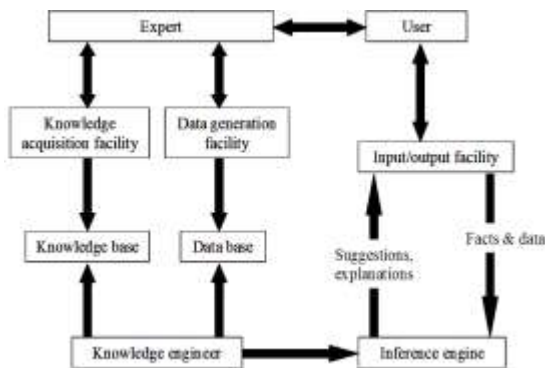6. Failure in case of disorganization or interruption systems

Fig. 4. Expert systemchart and relationship between structural design and engineering specialist database system.

V. Combination of FAHP - TOPSIS and DSS

As was described, FAHP–TOPSIS hybrid systems are the perfect solution for the analysis of MCDM issues, Andthe eyes of manypunditscangreatlyreducepossibleerrors. Butif theDSSusedto support thedecisionrendered, theriskis reducedtoa minimum.Itisonly ifexpert systemsbenefitfrom theexperienceof expert and they constantly update themselves. Whatthese systemsare used, administratorscanchoose awayofofferingsuperiorwayalsohelpbymodel.

VI. Hybrid approach is better or combination approach?

FAHP approachshouldbe designedquestionairethat includeallof binarycombinations.Ofcriteriapair wise comparisonand options. So ifthe number ofcomparisonsincreases,questionnaire will be longer. Fornot making a mistake, the number

ofcomparisonsshouldbe enoughto includea reasonablenumber ofcomparisons.Another point is thatFAHPisbased onexpert opinion andonly ifit issatisfiedthatexistin thepopulation ofa small number ofexperts.Becausemany sample donotneedtoconsider.

TOPSISapproachmore appropriate andeasierto analyzeforbetterandfasterdecision making, butproblemssuch as thelack ofweighting thecriteriato be included.As a result,noneof these isasfollowsabsolutely cannotrespondto allappropriateorganizations.

VII. Results

In order to take advantage of the benefits of a combined approach and offer an approach to the above, the present study common methods of decision making that weaknesses are offset each other strengths, and to support decision-ideal positive has been referred to the DSS system.

Inseveral studies, fusionof AHPandTOPSISis thattheweighting of criteriaand sub-criteria can be calculatedwith the helpofAHP, Then this weight to be enjoying ranking of option in TOPSIS [9].

Mostfuzzy TOPSISmodeldoes not consider the hierarchical structureof themulti-criteriaissues(the main advantage ofPHP) andare not considered.After collectingprimary and secondarystandardsandahierarchyofcriteria,develope dTOPSISmethodinfuzzyhierarchicalTOPSISin are called, are usedto rank theoptions.

VIII. Conclusions

In this paper, I found thatin the case ofsolutionsoroptionsveryclose to each other, ateach otherorconfusingdecision-makers, expert systemsandDSSutilizesartificial intelligenceto choose the bestwaytohelp. Obviously,itmustbe borne in mindthatthese systemsonlybe usedasdecision support. Because Firstly,a computer systemwith all their mightneverreplace humanmultilateralthoughts,Seconddayeventwithcoun tless varietyof manfacedwith the choice ofinfinite variety, which despiteall theextensiveknowledge base of thesystem, fromallaspects of theselectionis notideal. As a result, human capacity should also be considered. Researchon the bestapproach toselecting the bestsolutioncontinues.

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Maryam Mollaeireceived the B. Sc in IT from the Semnan University, Iran in 2011. Her research involves modeling AHP hierarchy for choosing leader. Expert systemmodeland model simulation methods. She is working on discovering of the world's mysteries and combining methods to achieve new ways in engineering and managements organizations.