MEPCO SCHLENK ENGINEERING COLLEGE

A GROUP DECISION MAKING MODEL FOR INTEGRATING HETROGENEOUS INFORMATION

Version <1.0>

Revision History

Date	Version	Description	Author
05/12/2018	1.0	A GROUP DECISION MAKING MODEL FOR INTEGRATING HETROGENEOUS INFORMATION	Pragathi.S
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Requirements Management Plan

1. Introduction:

The purpose of these documents is to give a detailed description of the requirement for the **"A GROUP DECISION MAKING MODEL FOR INTEGRATING HETROGENEOUS INFORMATION"** software intended for group decision making (GDM) method for integrating heterogeneous information. This GDM method used to avoid information loss, the heterogeneous information should not be transformed into a single form. . Two processes are required in GDM 1) Consensus process 2) Selection process .Consensus processes in GDM are defined as iterative and dynamic group-discussion processes that help experts or decision makers to bring their opinions closer A high degree of group consensus is desirable when individual opinions are integrated into group opinions. In selection process the heterogeneous positive ideal solution (HPIS) and the heterogeneous negative ideal solution (HNIS) using which we calculate the degree of similarity between the ideal solutions. Finally TOPSIS is used to select the best decision-making alternative.

1.1 Purpose

GDM processes are characterized by choosing the best option or opinions from a set of alternatives. It integrates heterogeneous information using a weighted-power average operator. The consensus degree between the individual-decision matrix and the group decision matrix is then calculated based on the deviation degree. In addition, the feedback mechanism with the iterative algorithm is used to adjust the individual decision matrix. Furthermore, a ranking formula with heterogeneous technique for order preference by similarity to an ideal solution is adopted to select the best alternative. A fuzzy evaluation method was proposed to deal with uncertainty and manage heterogeneous information. The proposed consensus method not only avoids the problem of information loss, but also takes account of the feedback mechanism necessary to adjust the inconsistent attributes if the GDM process fails to achieve consensus.

1.2 Scope

This project provides method for integrating heterogeneous information. To avoid information loss, instead of transforming heterogeneous information into a single form, the proposed method integrates heterogeneous. Decision makers may come from different field and have different characteristics therefore, reaching a maximum degree of consensus among decision makers is important. A high degree of group consensus is desirable when individual opinions are integrated into group opinions. A systematic method was developed to solve the heterogeneous GDM with information based on attribute ratings, including linguistic labels, real numbers, interval numbers, and fuzzy numbers, and provided a comparison analysis between the proposed approach and fuzzy TOPSIS. To avoid information loss, the heterogeneous information should not be transformed into a single form. The power-average (PA) operator is used to integrate the individual-opinions matrix into a group-opinions matrix.

1.3 Definitions, Acronyms, and Abbreviations:

Expert	someone who interacts with this software
Decision maker	any person who interacts with the system to make the necessary decision
AHP	Analytic Hierarchy Process
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution
GA	Genetic Algorithm
PA	Power-average

1.4 References

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1.5 Overview

This document contains specific details and strategies for managing the requirements of the "**A GROUP DECISION MAKING MODEL FOR INTEGRATING HETROGENEOUS INFORMATION**". The document details how requirements are organized and administrated within our project. It also describes how requirements will be identified, assigned weights and priorities that will be traced, optimized and modified.

The document describes the change management processes for requirements. It describes the workflows and activities associated with maintaining control of our project requirement.

It specifies milestones to be reached and standards to be adhered to so that we can ensure and evaluate fulfillment of the requirements we specify.

The remained of this document includes chapters and appendixes. This chapter also introduces different types of stakeholders and their interactions with the system. Further it also mentions the system constraints and assumptions about the product. Different specifications are used in order to specify the requirements more precisely for different audiences. The appendixes in the end of the document include some supporting information.

2. Overall description

2.1 Product perspective

Initially the PA operator to integrate the heterogeneous information. After the aggregation process, the consensus process is presented. If every individual opinion reaches a consensus, the ranking should be continued. Otherwise, a simple and intuitive feedback mechanism is used to adjust the inconsistent attributes until the individual opinions reach a consensus. In the consensus process, a degree of deviation is used to measure the degree of consensus between each individual decision matrix and integration group-decision matrix, and the intermediate-value method is applied to adjust the inconsistent attributes. The technique for order preference by similarity to an ideal solution (TOPSIS) is used to rank the heterogeneous group-decision matrices when consensus is reached. The weight generated is given as a input for AHP. From the judgment values, obtained the pair wise comparison matrix will be generated. From this matrix, weight will be generated and the consistency will be evaluated. The weight will further undergo Genetic Algorithm to yield the optimized result. These values will be given into TOPSIS, there we generate the weighted normalized matrix. The positive and negative ideal solution for each row in the matrix I identified. Relative Proximity for each value is calculated. Finally, the values are ranked.

2.2 Product Function:

- PA operator used to integrate the heterogeneous information.
- In the consensus process, an algorithm for obtaining the consensus solution is introduced based on the degree of deviation between an individual decision-making matrix
- Feedback Mechanism is used to reach the consensus, an objective method based on an intermediate value is proposed to modify the experts' opinions
- Selection process is done by using Topsis mechanism
- In Topsis method heterogeneous positive and negative ideal solution are identified and then ranked.

2.2 User characteristics:

The user must have a knowledge about the project since they have to identify the proper criteria and alternative. They should be aware of the weight age given to the each criteria based on

their needs. They must define the criteria and alternatives. The concept of maximization and minimization which is applied in the criteria must be known.

2.3 Constraints:

In GDM the threshold value must be 9.5 and in AHP the consistency value should be 10% if consistency value is not reached the values should be regenerated till they meet the consistency. The weight is generated based on the preference matrix. In topsis maximization and minimization should be applies based on the criteria.

2.4 Assumptions:

The system must have net beans or eclipse platform.

3. Specific Requirements:

This section contains all the type of functional and quality requirements of the system. It gives a detailed description of the system and all its features.

3.1 External Interface requirements

This section provides a detailed description of all the inputs and outputs received or released from the system. It also gives a clear description of the hardware, software and communication interface and provides basic prototype of the user interface.

3.1.1 User interface:

The first page of our project used for obtaining experts opinion. The best alternative will be chosen according to the consistency composite weight. The ranking will be generated and displayed on the output screen, through which the decision maker makes the better decision.

3.1.2 Hardware interface

Since it's a software application it does not require any hardware interfaces.

3.1.3 Software interfaces:

The application communicates with experts to get the criterion values in order to make new decision. Communication between user and application consists of read only operation.

3.1.4 Communication Interface:

The communication between user and software is important since we obtain dataset from the

user. However, the communication is handled by underlying operating system

3.2 Functional Requirements:

The section includes all the requirements that specify fundamental actions of the REPLACE scheme.

3.2.1 User class1- HETEROGENEOUS GDM

3.2.1.1 Functional Requirement1.1

ID : FR1

TITLE : Consensus Process

DESC : The input values are normalized the consensus solution is introduced based on the degree of deviation between an individual decision-making matrix and a GDM matrix.

RAT : In order to determine the GDM matrix.

DEP : none

3.2.1.2 Functional Requirement1.2

ID : FR2

TITLE : Feedback Mechanism

DESC : Modify expert opinion decision making matrix, and if the degree of consensus α, then the decision-making process has reached a consensus

RAT : In order to determine the new GDM matrix NGV and the new degree of consensus

DEP : FR1

3.2.1.3 Functional Requirement1.3

ID : FR3

TITLE : Selection Process Based on Heterogeneous TOPSIS

DESC : Calculate the degree of similarity between the ideal solutions

RAT : Rank according to descending order, and select the best decision making alternative

DEP : FR2

3.2.2 User class2-AHP

3.2.2.1Functional Requirement2.1

ID : FR4

TITLE : Experts Judgments

DESC : The experts can post their opinions over each criterion.

RAT : In order for the user to submit their judgments.

DEP : none

3.2.2.2 Functional Requirement2.2

ID : FR5

TITLE : Priority Vector Generation

DESC : The priority vector can be generated with the help of scaling numbers.

RAT : In order for normalizing the inputs.

DEP : FR4.

3.2.2.3 Functional Requirement2.3

ID : FR6

TITLE : Weight Generation.

DESC : With the help of priority vector matrix, the consistency will be evaluated. Based upon the consistency, the weight will be generated.

RAT : In order for Expert to generate the weight.

DEP : FR4, FR5.

3.2.3 User class3-GA

3.2.3.1Functional Requirement3.1

ID : FR7

TITLE : Population Initialization

DESC : The population will be generated based upon the generated weight values. RAT : In order for the decision maker to make an optimized result.

DEP : FR6

3.2.3.2 Functional Requirement3.2

ID : FR8

TITLE : Fitness Value Calculation

DESC : The Fitness value is calculated for each chromosome.

RAT : In order for the evaluator to evaluated the optimized weight.

DEP : FR7.

3.2.3.3 Functional Requirement 3.3

ID : FR9

TITLE : Cross over

DESC : The best parent will be selected based upon the fitness value and the crossover of the chromosome will be undertaken.

RAT : In order for generating new population

DEP : FR8

3.2.3.4 Functional Requirement 3.4

ID : FR10

TITLE : Mutation

DESC : Sudden change in the chromosome might happen.

RAT : In order for maximizing the population.

DEP : FR9

3.2.4 User class4-TOPSIS

3.2.4.1 Functional Requirement 4.1

ID : FR11

TITLE : Standardized Decision Matrix

DESC : Transforms various attribute dimensions into non-dimensional attributes. Each column of decision matrix will be standardized.

RAT : In order for generating weighted normalized decision matrix.

DEP : FR10

3.2.4.1 Functional Requirement 4.2

ID : FR12

TITLE : Ideal Solution Determination

DESC : The set of maximum and minimum values for each criterion will be obtained.

RAT : In order for obtaining the relative proximity.

DEP : FR11

3.2.4.3 Functional Requirement 4.3

ID : FR13

TITLE : Alternative Ranking

DESC : Rank the alternatives based upon the relative proximity value.

RAT : In order for choosing the best alternative.

DEP : FR12

3.3 Performance:

The Evaluator evaluates the consistency of each criterion. If the consistency reached, then it undergoes Optimization. Otherwise the Evaluator has to re-ask the Experts to give a new set of values. Based on the optimized result, the ranking will be generated. From the obtained ranking, the decision maker can make a decision.

4. System Requirements:

4.1. Hardware Requirements:

- Hardware -Pentium.
- Speed -1.1GHZ
- RAM -2GB
- Hard disk -1TB.
- Floppy drive -1.44MB.
- Keyboard -Standard Windows Keyboard(Querty model).
- Monitor -SVGA.

4.2.Software Requirements:

- Operating system – Windows or linux
- Language - Java
- IDE -Netbeans.
- Simulator -ONE simulator

4.3. Non-Functional Requirements:

4.3.1. Availability Requirements:

The system is available 100 % for the user/admin and it can be used 24 hrs a day and 365 days in a year

4.3.2. Accuracy:

The system should accurately provides real time information and it is 100% reliable

4.3.3. Reliability:

The system has to be 100% reliable and if system suffers any repair it recovers as soon as possible.

5. Release Plan:

The requirements were divided into no of releases based on the prioritization and their dependencies.