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APPLICATION OF CANCER DATA USING TOPSIS METHODS

G.D.Praveenkumar[1], G.Sathishkumar[2]
[1,2]Asst .Professor, Department of Computer Science,
Bharathiar University Arts and Science College, Gudalur

ABSTRACT

A cancer is a group of disease involving abnormal cell growth with potential to invade as spread to cell other part of the body. Electronic medical record has been introduce into health care organization is used to aid decision making and to facilitate the search of medical solution. This paper describes the multi criteria decision making models to measure the cancer data using TOPSIS method. The TOPSIS method is mostly used in medical data; we implement these methods in cancer data to find out the ranking level of different types of cancers levels in India and comparing the ranking result of different optimization methods.

Keyword: cancer, cancer data set, TOPSIS.Ranking rate.

I.INTRODUCTION

Cancer is a disease of the genes. A genes is a smallest part of DNA, which is the master molecules of the cell gene make protein are the alternative workhorse of cells. An operation research project [2] on control of cancer through the multidisciplinary approach is proposed for introduction of elements of common cancer to country through the existing health infra structure. The collaborative cancer research between India and Germany are co-ordinated by ICMR in India and German science foundation in Germany. The project covered major cancer in India namely like oral, stomach, melanoma ,breast ,lungs[1][3].The cancer data are evaluating the TOPSIS method, is a process of finding the best solution among all practical alternative , finally research will help to allotted ranking rate of cancer in India.

II. REVIEW OF LITERATURE

Using MADM techniques for improving decision making results are not a novel idea. There are several researches using MADM such as, TOPSIS [3], SAW, AHP, and Entropy. To the best of the author's knowledge, there is no any applied MADM techniques for ranking and selecting the different combination of sensors allocation. Bayesian Network models are powerful tools for reasoning and decision-making under uncertainty, but BNs can provide different options of sensors allocation in terms of their probabilities from Bayes' theorem calculation in order to estimate state of a hypothesis node through informational (intermediate) nodes. However, (re-)ranking the different combination of sensors allocation can be considered as a MADM problem.

Chen-Tung Chen extended the concept of TOPSIS to develop a methodology for solving multi-person multi-criteria decision-making problems in fuzzy environment. Considering the fuzziness in the decision data and group decision making process, linguistic variables are used to assess the weights of all criteria and the ratings of each alternative with respect to each criterion. Decision matrix can be converted into a fuzzy decision matrix and construct a weighted normalized fuzzy decision matrix once the decision makers' fuzzy ratings have been pooled. Ac-cording to the concept of TOPSIS, They defined the fuzzy positive ideal solution (FPIS) and the fuzzy negative ideal solution (FNIS). Finally, they calculated a closeness coefficient of each alternative is defined to determine the ranking order of all alternatives. The higher value of closeness coefficient indicates that an alternative is closer to FPIS and farther from FNIS simultaneously

Advantages of TOPSIS [4]:

- It is simple to use.
- It take into account all types of criteria
- It is rational and understandable
- The computation processes are straight forward.

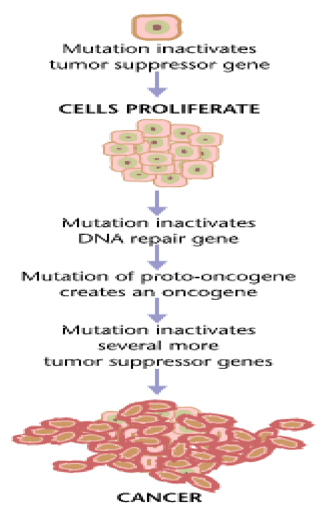

Figure.1 Cancer gene development

III .METHODOLOGY

A. TOPSIS METHOD

This study uses the TOPSIS method. A positive ideal solution maximizes the benefit criteria or attributes and minimizes the cost criteria or attributes, whereas a negative ideal solution maximizes the cost criteria or attributes and minimizes the benefit criteria or attributes. The TOPSIS method is expressed in a succession of six steps as follows:

Step 1: Calculate the normalized decision matrix. The normalized value r_{ij} is calculated as follows:

$$r_{ij} = x_{ij} \sqrt{\sum_{i-1}^{m} x_{ij}^2} \quad i = 1, 2... \text{ m and } j = 1, 2, ..., n.$$

Step 2: Calculate the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as follows:

$$v_{ij} = r_{ij} \times w_j \quad i = 1, 2... \text{ m and } j = 1, 2, ..., n. \quad (1)$$

Where w_j is the weight of the j^{th} criterion or attribute and $\sum_{j=1}^{n} w_j = 1$.

Step 3: Determine the ideal (A^*) and negative ideal (A^-) solutions.

$$A^* = \{(\max_i v_{ij} \mid j \in C_b), (\min_i v_{ij} \mid j \in C_c)\} = \{v_j^* \mid j = 1,2,...,m\} \quad (2)$$

$$A^- = \{(\min_i v_{ij} \mid j \in C_b), (\max_i v_{ij} \mid j \in C_c)\} = \{v_j^- \mid j = 1,2,...,m\} \quad (3)$$

Step 4: Calculate the separation measures using the m-dimensional Euclidean distance. The separation measures of each alternative from the positive ideal solution and the negative ideal solution, respectively, are as follows:

$$S_i^* = \sqrt{\sum_{j=1}^{m} (v_{ij} - v_j^*)^2}, \; j = 1,2,...,m \quad (4)$$

$$S_i^- = \sqrt{\sum_{j=1}^{m} (v_{ij} - v_j^-)^2}, \; j = 1,2,...,m \quad (5)$$

Step 5: Calculate the relative closeness to the ideal solution. The relative closeness of the alternative A_i with respect to A^* is defined as follows:

$$RC_i^* = \frac{S_i^-}{S_i^* + S_i^-}, \; i = 1,2,...,m \quad (6)$$

Step 6: Rank the preference order.

In this section, we work out a cancer data set in TOPSIS method for decision making problems. The data are collected from ICMR [2] during the year of 2010 -2015. The given below TABLE I: is used to construct the method of TOPSIS steps.

TABLE 1: TOPSIS CALCULATION STEPS

TOPSIS STEPS	**TABLE NO**
DECISION MATRIX	TABLE –II
WEIGHTED VALUES	TABLE-III
NORMALIZED DECISION MATRIX	TABLE-IV
NEGATIVE IDEAL SOLUTION	TABLE-V
POSITIVE IDEAL SOLUTION	TABLE-VI
CALCULATESEPARATION MESAURE	TABLE-VII
RELATIVE CLOSENESS TO THE IDEAL SOLUTION	TABLE-VIII
RANK ORDER	TABLE-IX

TABLE 2: THE COLLECTED DATA OF CANCER

Cancer types/year	2010	2012	2013	2014	2015
Oral	17890	23415	65432	21345	43521
Stomach	19500	21134	56789	67543	67821
Melanoma	19890	21321	70342	26543	34567
Breast	15678	43212	32145	54321	65437
Lungs	23456	32145	76523	76500	78213

TABLE 3: CRITERIA WEIGHTED VALUES

Cancer types	**weight values**
Oral	0.081
Stomach	0.1189
Melanoma	0.2432
Breast	0.2702
Lungs	0.2864

TABLE 4: NORMALIZED TABLE

Cancer types/year	**2010**	**2012**	**2013**	**2014**	**2015**
Oral	0.4113	0.3550	0.4705	0.1771	0.3236
Stomach	0.4483	0.3204	0.4083	0.5604	0.5043
Melanoma	0.4573	0.3233	0.5058	0.2202	0.2570
Breast	0.3604	0.6552	0.2311	0.4507	0.4866
Lungs	0.5393	0.4874	0.5502	0.6347	0.5815

TABLE 5: NEGATIVE IDEAL SOLUTION

Cancer types/year	2010	2012	2013	2014	2015	V_i -	(A^-)
Oral	0.00002	0.00002	0.00339	0.00000	0.00546	0.00889	0.094273
Stomach	0.00005	0.00000	0.00186	0.01072	0.00049	0.01312	0.114534
Melanoma	0.00006	0.00000	0.00446	0.00013	0.00865	0.01331	0.115351
Breast	0.00000	0.00158	0.00000	0.00546	0.00074	0.00779	0.088236
Lungs	0.00021	0.00039	0.00602	0.01528	0.00000	0.02191	0.148007

TABLE 6: POSITIVE IDEAL SOLUTION

Cancer types/year	2010	2012	2013	2014	2015	V_i^*	(A^*)
Oral	0.00011	0.00127	0.00038	0.01529	0.00036	0.01741	0.131945
Stomach	0.00005	0.00158	0.00119	0.00040	0.00502	0.00825	0.090818
Melanoma	0.00004	0.00156	0.00012	0.01254	0.00000	0.01426	0.119418
Breast	0.00021	0.00000	0.00602	0.00247	0.00432	0.01303	0.114128
Lungs	0.00000	0.00040	0.00000	0.00000	0.00864	0.00904	0.095072

TABLE 7: MEASURES OF SEPARATION OF EACH ALTERNATIVE SOLUTION

Cancer types/year	s^-	s*	si^*-si-
Oral	0.09427	0.131945	0.22622
Stomach	0.11453	0.090818	0.20535
Melanoma	0.11535	0.119418	0.23477
Breast	0.08824	0.114128	0.20236
Lungs	0.14801	0.095072	0.24308

TABLE 8: MEASURES OF SOLUTION

s^-	si^*-si^-	s^-i/si^*+si
0.09427	0.22622	0.4167
0.11453	0.20535	0.5577
0.11535	0.23477	0.4913
0.08824	0.20236	0.4360
0.14801	0.24308	0.6089

TABLE 9: RESULTS OF CLOSENESS COEFFICIENT AND RANK

CANCER	TOPSIS	RANK
Oral	0.4167	5
Stomach	0.5577	2
Melanoma	0.4913	3
Breast	0.4360	4
Lungs	0.6089	1

TABLE 10:
COMPARISON OF DIFFERENT OPTIMIZATION TECHNIQUES IN RESULT AND RANKING

CANCER	SWM	WPM	PROMETHEE	TOPSIS	RANK
Oral	.5688	0.5242	-2.7296	0.4167	5
Stomach	.7928	0.7810	0.8828	0.5577	2
Melanoma	.7066	0.6789	0.0272	0.4913	3
Breast	.5711	0.5284	-0.9459	0.4360	4
Lungs	.9622	0.9654	2.7619	0.6089	1

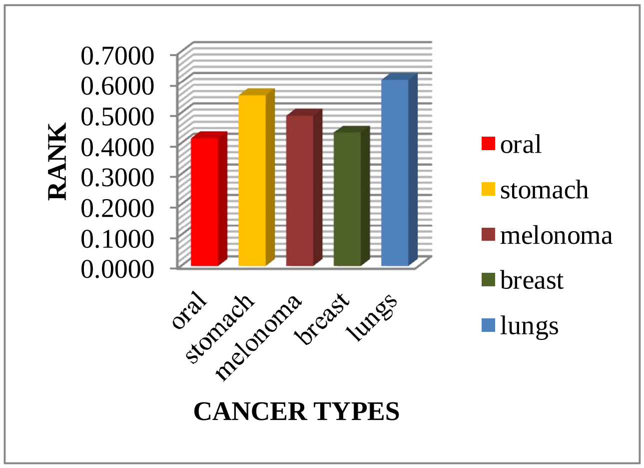

Figure.2 Ranking rate of cancer types

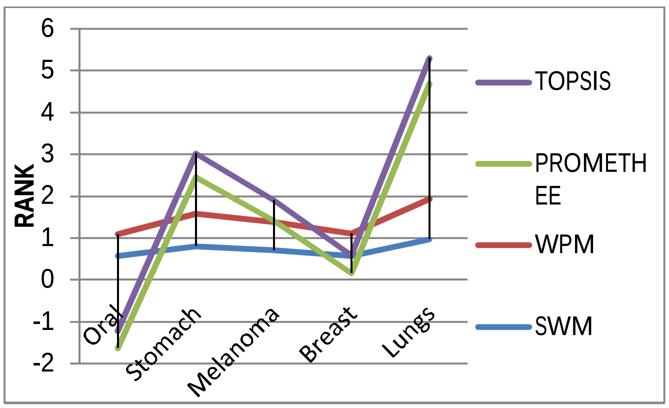

Figure.3 Comparison of cancer result in optimization techniques

IV. CONCLUSION

Cancer is not controlled disease but cancer can causes result of death. In India cancer rate is increased by year to year and death rates are also increased. Developing or forming new types of cancer from human uses of tobacco , drinking alcohol, diet and obesity, infection, radiation, environmental pollutants other health problem. The government provides more fund to control the cancer on research foundation. The research group implementing new technology in human tissues that is help to control cancer gene. In this paper we measures the ranking levels of cancer data are lungs (1), stomach (2), melanoma (3), breast (4), oral (5). The lungs cancer affected 14% -49%,1,65,000 teen ages are identified stomach cancer(25%-40%), 30%-35% women are suffer from breast cancer, the skin cancer and oral cancer minimum numbers of people are affected in India

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