

5.15 Following Human Footsteps: Proposal of a Decision Theory Based on Human Behavior

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Abstract. Human behavior is a complex nature which depends on circumstances and decisions varying from time to time as well as place to place. The way a decision is made either directly or indirectly related to the availability of the options. These options though appear at random nature, have a solid directional way for decision making. In this paper, a decision theory is proposed which is based on human behavior. The theory is structured with model sets that will show the all possible combinations for making a decision. A virtual and simulated environment is considered to show the results of the proposed decision theory

1.0 INTRODUCTION

When we eat, move or work, it is natural that we are driven by some will power of our own. Sometimes this will power is guided or supported by available options. These options though appearing as random nature, have a solid directional way for decision making. No matter what we choose to do, our action is based on sets of decisions that influence our will power. It is also true that human behavior to make a decision for the same goal may vary from time to time. There have been done various types of work related to human behavior and decision making. Stewart Robinson has been investigating the use of artificial intelligence methods as a means for representing human decision-making in simulations since mid-1990s. One motivation for his work for modeling human decision-making was to add extra complexity to a model in order to improve its accuracy. The goal of this paper is quite different than the previous works. The aim of this paper is to establish a theory which is based on human behavior for decision making. The theory itself is developed by observing human acts in real-life and field surveys. It should be mentioned that the results presented here are not yet supported from a psychological point of view by the experts in that field; rather, an engineering analysis with field level

observation is put together to support the study.

2.0 METHODOLOGY

2.1 Approach for Analysis

Consider a simple scenario like this - a person wants to go from one place to another, suppose from home to work (home based work trip). He/she has the choice from three modes of alternatives - (1) by walk, (2) by car or (3) by public transport like bus. Now let's look at when the person will choose a specific mode of transportation to reach the destination.

- (1) The person will walk from origin to destination when -
 - Other two options are unavailable
 - Those options will take more time than walking when he/she is in a hurry
 - Relative cost
 - He/she is prescribed by a doctor to walk for this particular trip
 - On his/her way to the work, it requires to do another work which is easy if walking option is chosen.

(2) The person will choose car from origin to destination when -

- This option is available to him/her
- It will take less time than walk or by taking bus
- Relative cost
- Weather condition
- On his/her way to the work, it requires to do another work which is easy if car option is chosen
- If he/she can drive or someone will drive for him/her
- It is comfortable as well as safe and secured.

(3) The person will choose bus from origin to destination when -

- This option is available to him/her
- It will take less time than walk or by taking car
- Relative cost
- Weather condition
- Taking bus than car is a better option for this particular trip
- It is comfortable as well as safe and secured
- He/she is supposed to take the bus rather than car because there is a special bus service for the office where he/she works.

Now, if we go for an analysis for this example, we can identify some common matches within these three particular options -

- Availability of the options
- Relative cost
- Time required for the trip
- Safety, security and comfort.

Again, if the person has equal availability to all three alternative options, then the way

he/she can decide to go for a particular option depends on -

- Better available option within the options or
- Random choice.

This random choice is also a factor which is related to other specific taste factors like style, job position and protocols, or simply a person's own desire at that very time and day.

This example reveals the fact that human decision for a particular thing (in this case home based work trip) may vary depending on the availability of the options as well as by random choice. To create a structured decision tree in this regard may give a solid base to explain human behavior in making decision theory.

3.0 DECISION TREE

In order to put all available options together for a particular decision making, the following decision tree is shown:

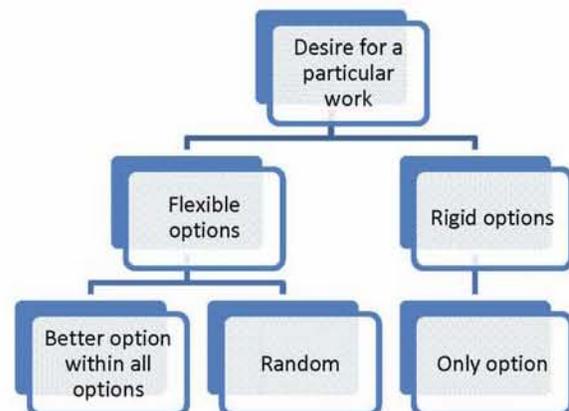


Figure 1: General Decision Tree for Making a Particular Decision.

In Fig. 1, a decision tree is shown for making a particular decision. If we correlate this decision tree with the given example we can find out how human behavior captures the options in making a decision. Each box

in the figure corresponds to different types of decision sets.

4.0 DATA SETS FOR ANALYSIS

The data for this analysis is collected from Dhaka, the capital of Bangladesh. Two months worth of data from different particular locations within Dhaka is used for the analysis. All the field surveys and interviews of public as well as observations are put together for the proposal of the decision theory. For this study, the surveys and observations are conducted for person's trip from one place to another considering different available options. It was checked from public opinions how they react and get used to with the changes of transportation alternatives. Three categories of people were chosen based on their income - (1) High income, (2) Middle income and (3) Low income people. The reason to choose the income category is because it is one of the most influential factors that may control the choice of modes in transportation alternatives.

4.1 Simulated Analysis

In addition to real-life field surveys and observations, a simulated environment was also created to explain the human behavior. Because of the extensive simulation runs with all the decision sets, corresponding results are not yet achieved.

5.0 RESULTS

The results from this analysis can be explained from observed data as well as field surveys. It has been found that flexible option is only available to the people of higher income and in some cases to the middle income people. People with low income have none but the rigid option. Therefore, if we want to investigate the movement analysis of low income people based on the use of transportation alternatives, we do not need to go for further

details - they are accessible to a place by either on feet or by public transportation. Now, let's take into account the high and middle income people. In this case, it is quite uncertain which alternative mode they will consider for travel - personal car, or bus, or by walking? They have the flexible option and when a category of people are within this flexible option, in depth analysis is quite necessary to explain their movement. The analysis result showed that people will choose a better option within all available options if and only if we can control the random choice - which is nothing but a choice based on personal satisfaction. A question may arise why decision theory is proposed based on human behavior or what is the importance of this type of research? First of all, if we can analyze human behavior for a particular action, for an example, in this research choice of alternative modes is the primary area of analysis, we may go ahead to control that behavior and thus do further analysis for controlling specific kind of behavior when we need to do so. Suppose, in the field of transportation engineering, sometimes we need to introduce special types of traffic management policy to a certain route or area for either a special event or to control and avoid traffic jam. A city without proper planning and lack of sufficient roads may suffer a gridlock situation and therefore need to control human behavior in choosing alternative modes of transportation. The study area, Dhaka, is now facing extreme traffic jam resulting in economic loss to the country. An option to solve the system is to control human behavior in selecting alternative modes for travelling. If we can control human behavior to make a decision for choosing a mode in this city area, we may overcome the problem to a certain extent. The way to control this is to control the flexible option of the people. Though this is not a fair way to guide human decision to a particular track, but to some extent it is better. The reason is that, if people become dependants of using private cars by ignoring public transportation and for using private cars by 20% of the people in the city center

causes a problem to the rest of the 80% people, it is better to cut that available flexible option of the 20% people in using their private cars. There may be argument on this matter, but the goal of this paper at this point is not to go for these arguments, rather than to suggest a theory on decision making.

6.0 CONCLUSION

Human behavior is a complex nature to explain with theoretical or simulated analysis. But, real-life observation with practical field survey can help to explain this complex nature in simulated environment. "The motivation is to model human decision-making so it is better understood and it can be improved. This should help to improve the performance of the systems in which the humans are interacting. The concentration is no longer on making models more accurate, but on using the models to assess the effects of human interaction and to look for ways of changing the human interaction in order to improve system performance. Model accuracy plays a secondary role to generating insight and understanding. This is the motivation behind the knowledge based improvement methodology," (Stewart Robinson, Modelling Human Decision-Making, para. 27). The aim of this paper is to do this with supportive evidence. The only limitation that may exist is the psychological analysis of the particular study. Otherwise, this work is a unique approach to propose a decision theory.

7.0 REFERENCE

- [1]. Robinson, S. (2003). Modelling Human Decision-Making. *Proceedings of the 17th European Simulation Multiconference (ESM 2003)* (D. Al-Dabass, ed.). SCS, Delft, pp. 448-455.

8.0 ACKNOWLEDGMENT

The author would like to thank all those who gave their important opinions during the surveys.