Decision Trees in Decision Analysis

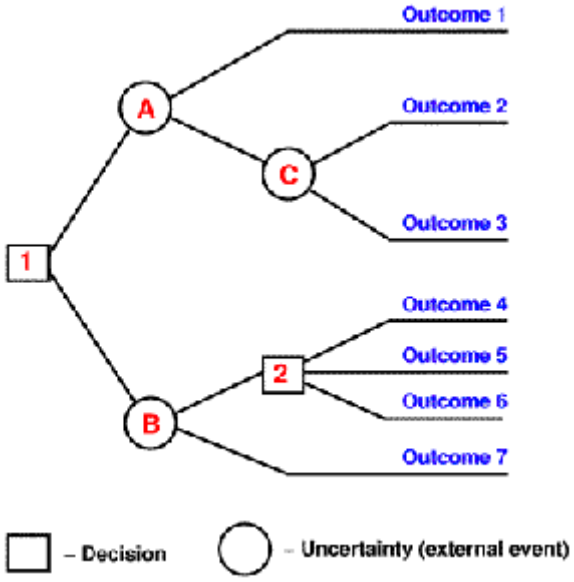
About

Definition

A decision making tree is essentially a diagram that represents, in a specially organized way, the decisions, the main external or other events that introduce uncertainty, as well as possible outcomes of all those decisions and events.

Components of a decision tree

1. Decision node: a square node; represents decisions you can make
2. Chance (uncertainty) node: a circle node; shows the occurrence of events over which the decision maker has no direct control
3. Consequences (outcomes: utilities or costs



Process of building a decision tree

1. Interview decision makers and construct a preliminary tree
2. Present the tree and show how various concerns are caputred
3. Solicit a list of new concerns
4. Revise the tree

Advantages

Some of the advantages of using decision trees for decision making and planning are the following:

- Clear lay out of the problem so that all options can be challenged
- Full analysis of the possible consequences of a decision

- Provide a framework to quantify the values of outcomes and the probabilities of achieving them; white box model - If a given result is provided by a model, the explanation for the result is easily replicated by simple math
- Help us to make the best decisions on the basis of existing information and best guesses

Disadvantages

Some of the disadvantaged of using decision tress for decision making and planning are the following:

- Even a small change in input data can at times, cause large changes in the tree
- Decisions contained in the decision tree are based on expectations, and irrational expectations can lead to flaws and errors in the decision tree
- Large decision trees can be unwieldy and complex to us

Tools

Decision trees which purpose is to facilitate decision making could easily be drawn **manually** on a piece of paper. However, it could be more convenient for a user to use **computers** because it is easy to make changes or to make some computations. **Simple text editors and table sheets** could serve for that purpose, i.e. MS Word and MS Excel. Additionally, **other specialized software** was developed to support decision making. Once a user learns how to use the software decision trees are quick and efficient. In fact,visual communication can be six times more effective than communication with words only. Nevertheless, we should always keep in mind that the software is only as good as the user. It is not the program that makes decisions because it is simply following user's instructions, thus a user should learn how to give good instructions.

Here is the list of some specialized decision tress tools:

1. Insight Tree

- easy to use if you are familiar with decision trees; it allows you to quickly add branches, optimize sub nodes, use different style sheets; free for personal use
- http://www.visionarytools.com/index.htm

2. Lumenaut

- add-in to MS Excel
- provides a range of tools (Monte Carlo simulation software and Decision Tree analysis software) allowing you to build decision tree models from within Excel
- allows for different types of sensitivity and statistical analysis
- http://www.lumenaut.com/

3. Vanguard Studio

- a standalone program and is described as combining features of artificial intelligence, math applications and spreadsheets
- the decision tree software aspect has a nice wizard which takes you step-by-step through creating the whole decision tree
- it also offers Monte Carlo simulation, another wizard for forecasting, statistical decision tree

analysis and other methods
- http://www.vanguardsw.com/products/vanguard-system/components/vanguard-studio/

4. SmartDraw

- popular for business graphics and allows you to quickly and easily draw various diagrams
- http://www.smartdraw.com/

Applications

Decision tress are used in the field of operational research, a discipline that deals with the application of advanced analytical methods to help make better decisions. Some examples of the fields where it is used:

- business and economics; project management
- health economics
- public health
- law suits

Bibliography

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