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An Intelligent Visualized Decision Toolbox IVDT for Muzzy Decision Maker

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Abstract. The importance of decision support systems is still increasing. Decision problems to be solved are often very complicated and require more powerful and often intelligent support tools. Sometimes, it is useful to build an expertise set in some decision steps. Such situation can be met when operating on very large databases and on solving complicated problems. However evolving a convenient intelligent components with visualization aspects in IDSS are big challenges to be developed; but it would provide a muzzy decision taker an insight, preference, and much capability during a decision choice. This paper opt the advanced information visualization schemes for both decision's fact discovery and supporting decision taking processes. It proposes a visualized toolbox for IDSS that integrates DSS and dynamic information visualization within enterprise functionality. Finally this work formulates a viability of implementing such toolbox and presents conclusions.

Keywords: IDSS, Interactive information Visualization IIV, Information Visual Gauge IVG, Muzzy Decision Maker MDM, Visual Decision Toolbox VDT.

1. Introduction

While the human brain can process a limited amount of information, it instantly can recognize hundreds of different visual objects; hence visualization is an important process by which numerical data can be converted to meaningful images. This conversion can be computationally done. Information visualization (IV) became an IS researchable area that has received an increased attentions in developing techniques for exploring databases, attempting to extract a relevant hidden relationships among variables or among causes and effects [6]. The emerging results from IV community can be an important contribution to IDSS community if it can provide novel techniques enable IDSS to utilize a wide range of available information in databases. Unfortunately information visualization is still facing several serious challenges.

During this research, several information visualization works are examined [9 10 and 21]. There are many research efforts have focused on how to transform business process data to shapes whereas decision makers face the challenge of understanding what underlying finding and how they can draw sensible conclusions. Thus a visualized interface should support and improve the entire problem-solving phases, not only data transformation. Most of existing decision support systems, and simulation systems, have built-in functionalities but cannot expose spot environment changing or provide possibilities for negotiation.

Many of Intelligent Decision Support Systems (IDSS) such as Expert Systems (ES), Group Decision Support Systems (GDSS), Online Analytical Processing (OLAP), and Business Intelligence (BI) rely on different types of information visualization techniques. These techniques are more interested in investigating a problem through the use of the static Graphical User Interface GUI manner [1] without considering the visual presentation of information effectively as a steering-set of a decision maker on the front. Static graphs of visualized information would have less affect on a decision maker interaction.

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Information overloads burden, with an increasing pressure to perform tasks more quickly and in better manner create a muzzy decision taker. Accordingly interactive visualized information is being worth during decision making activities subject to other limitations in time and cost. Hence, one may address 2D Interactive Information Visualization IIV for this concern. Compared to using traditional data representations such as two-dimensional data set, a decision maker who uses visualizations should perform better during the entire problem-solving process. In fact, this must be the ultimate goal of developing visualizations for better decision-making[20]. A user's satisfaction with the decision outcomes is a very important factor in predicting preference and attitude for different decision support systems.

Information visualization (IV) is an emerging trend that relies on the human's perception and cognitive abilities to visualize data [11]. Incorporating IV techniques to a decision support system is the potential solution to improve system's effectiveness and to provide decision makers with better insights about the data that they are analyzing. In the human-computer-interaction (HCI) and IV literature, the existed differences among individual are always emphasized, whereas a decision-style, which is recognized as one of the key individual cognitive differences that affects system success, has received a little attention in these areas. Decision style reflects the way by which a person thinks and reacts with facts about specific situation. In decision support system (DSS) literature, decision style has been acknowledged to affect decision making performance and one's preferences for human machine-interface [10][4]. Unfortunately, it has been frequently overlooked and rarely been given priority in the DSS design [2] [6].

This research tackles some of these limitations and trying to overcome such DSS shortcomings. Architecting an Intelligent Visualized Decision Toolbox (IVDT) is the most concern of this research. It mainly originates from focusing on user-specific needs. Therefore, the first aspect of the toolbox is the provision of visualizations in a well understandable way for muzzy decision maker.

This paper is approaching options to explorative analysis, its focusing is to advance interactive graph visualizing rather than upon looking at a hard graph generated from the answered queries. Such a featured IVDT issues to be proper to adaptability and applicability for a wide range of problems, and may be customized for many business as a workable version.

The rest of this paper is organized as follows. Section 2 discusses visualized elements issues in a related work. Section 3 discusses how this research tackle IVDT problem. Section 4 briefly describes the proposed toolbox and presents IVTD prototype. Section 6 concludes the paper.

2. Visualizwd elements: Related Work Review

There are numerous visualization software tools that are being developed and enhanced gradually for data preparation, data visualization, and data mining. The graphical and fact finding capabilities of software tools vary from package to package, as demonstrated in this limited investigated domain, four core packages i.e Microsoft (MS) Excel, SGI MineSet, SPSS and Oracle have static nature since the data is a read once give a hard displays.

For instance, MS Excel toolbox includes core data visualization types such as column, bar, pie, line, scatter, and radar graphs. These traditional graphs are common to most visualization tool suites. MS Excel chart, as shown in figure 1, is used in exploratory data analysis to illustrate the major features of the distribution of the data in a convenient form [8]. However, spotting trends and predicting outcomes by looking at static bar charts or line charts is not always effective due to the limited amount of information that can be displayed, this is particularly true when patterns exist in more than a few dimensions.

The user cannot easily interact with the visualization. Interactive visualizations IV should allow users to get free hand to amend a visualized displays as similar as displayed data.

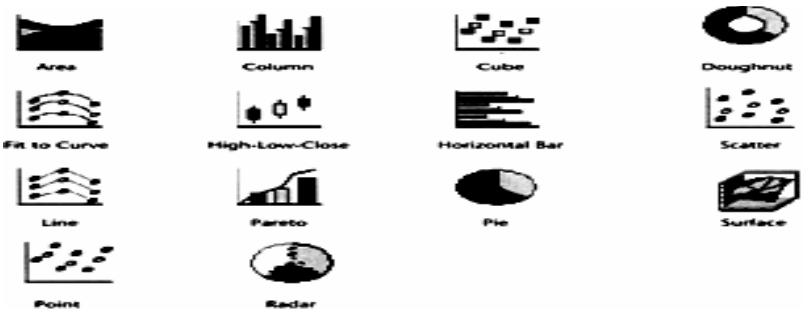


Figure 1 visualized elements in ready made package

3. IVDT Problem

Although the evolution in information visualization is presenting many technological challenges, but the greatest challenge may be retaining an intimate involvement and understanding by end-users. This challenge is a great issue since IV enables decision makers to fast analyze large quantities of information (hundreds of entities), aiding quick understanding of data distributions and rapid detection of patterns. IVDT would help users make quicker, and better-informing decision by spotting on business issues and opportunities in a short time and in understandable manner..

Both information Overload (IO) problem, and the vague of inarticulable decision processes that cannot be repeated, are driving reasons of IVDT problem.

Information visualization provides powerful trend to communicate and navigate through outcomes from intelligent visualization processes. There are three important roles for information visualization in the IDSS [20]:

1- Mission identification i.e. discovering a problem or finding out an opportunity and at which data domain

2- Offering decision making backend services.

3- Interactively managing visual outcomes on iterative modes.

This IVDT work is an extension to the IV-IDSS [20], in order to enable decision makers to: (a) monitor business performance, (b) identify critical data relationships, and (c) apply what-if scenarios to understand potential performance in a busy mode conditions.

4. Intelligent Visualized Decision Toolbox (IVDT) Field study

This section show how Intelligent Visualized Toolbox Components for muzzy decision maker are identified. Section 4.1 contains field Study summary, section 4.2 presents building blocks architecture and the functionality of the proposed IVDT services.

4.1. Field Study Summary

For identifying decision-involvers needs, Joint Application Development (JAD) methodology and a focused group are used to answer what is really decision-involvers need. The acquired information help very must in architecting IVDT prototype. The interrogated focused group is 23 of respondents out of 60 acquired users. Table (1) gives the summative results of this filed study. Decision takers' styles became more close to the fact represented in figure 2.

Table (1) IVDT Summative Focused-group

Involvers		Most Data source	Needed response of IVDT	Decision style	How do they see IVTD look like
Mgt levels	#				
High	5	Database (DB)	Slow Monitoring	Heuristic	Simple indicator
Tactical	11	Data Warehouse	Slow Interactive	Analytical	Interactive GUI
Operational	7	Direct injecting DB	Fast reaction	Model-base	Smart Auto-reaction

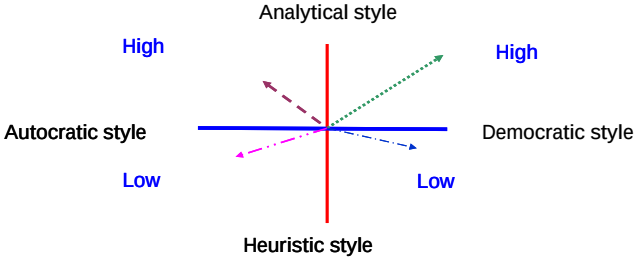
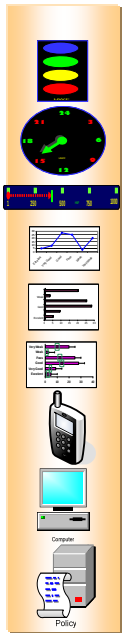


Figure (2) Decision Style

This field analysis thoroughly conducted the next process of architecting IVDT as given in figure 3 next.

Control Shape	Control Description
	Blue, Green, Yellow, and Red *ON/OFF* lights. They contain light and light degree due to decision maker request (fuzzy light)
	Two-direction O'clock indicator
	Scaled ***x-y*** Progress indicator
	Simulated Curve
	Simulated Bar
	Simulated time-line
	Do-mobile Action
	Do-remote computer action
	Do-remoter Deriver Action

Figure(3) Muzzy Decision maker Toolbox

4.2. IVDT Architecture and Functionality

IVRD is composed of three comments:

1- On-the-spot component: it is a set of indicators that can instantaneously show the status of the underlying database, its functionality is to monitor the decision variables comes from database. They are presented figure 4, this set is composed of three programmable controls: (1) Blue, Green, yellow, and Red, each color would associate with strength of light value(fuzzy light),(2) two-direction counter that can represent the flow volume of a specific attribute, and (3) Progress of ***x-y*** Scale to alert the user at cross border boundaries

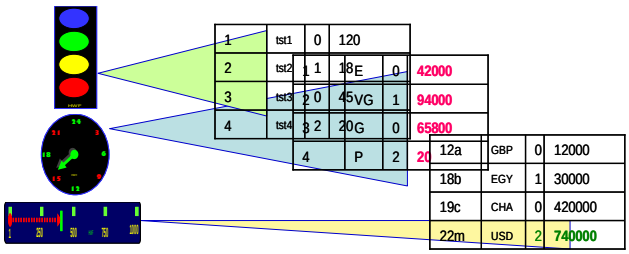


Figure (4) On-The-Spot Monitoring set

2- Simulated Shapes: Simulated Shapes component: it is a set of simulated shapes that can interactively simulate the underlying data warehouse (cube), its functionality is to guide what-if scenario based on decision variables comes from data cube. They are presented figure 5, this set is composed of three programmable controls: (1) line, Bar, and time-line

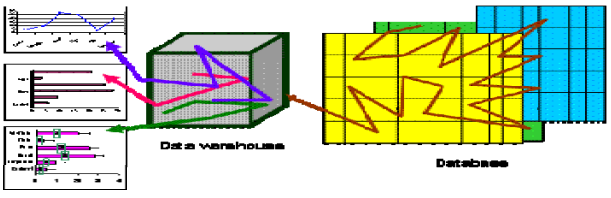


Figure (5) Simulated Shapes

3- Action-Decision shapes component: it is a set of controls that can trigger a certain action depending of cause-action attribute value of the underlying direct-database, its functionality is to smartly react as user-agent with other environment smart-drivers. This set is presented figure 6, this set is composed of four programmable controls: (1) tuner to offset or adjust a database value, e.g. do account transfer, close a dormant account, etc. (2) Send-to-mobile control, e.g. send massage, (3) manage a remote-computer-resources control, e.g. shut-downa compute and (4) trigger an order to another business, e.g. reorder point, stop a stolen credit card etc.

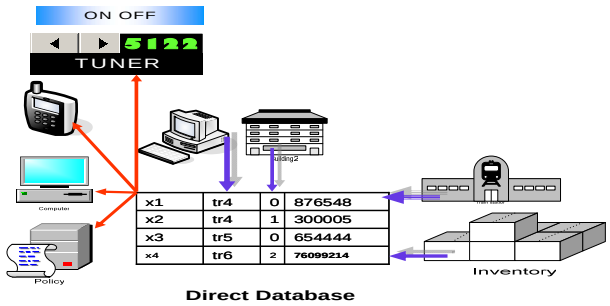


Figure (6) Action-Decision shapes

5. Conclusion

In this research an Intelligent Visualized Decision Toolbox (IVDT) is introduced for Muzzy Decision Maker. IVDT requirements assessment is based on both JAD methodology and focused group to answer what is really decision involvers need. The acquired information help very must in architecting IVDT prototype. The introduced IVDT is reviewed and highly accepted. IVDT implementation would greatly exploit the new capabilities in object oriented programming rather than click-and-drop static graphs, it is very easily extendable, and can be basically integrated by extending the tools menu of the main window. IVDT may cope with the progression in both: users' cognitive needs and the modern visualization computing power. It considers a continuous beak time of decision makers by incorporating inference logic along with associate option-base visualization and can interactivity enhance a decision process.

However this research is a direct responsiveness to decision making style and user satisfaction, it is a step forward to improve IVDT effectiveness implementation and popularity.

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