inFUNmation - novel approach to information presentation employing a game

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Abstract. We describe our concept of information presentation method alternative to nowadays web presentations and its prototype realization in a system called Aid AutoMagically (A2M). The information is embedded directly in the basic principles and mechanisms of a game and therefore this process is more effective. This concept is used in the prototype realization to motivate users to help others by educating them about others problems. Part of the prototype system is also a concept allowing more people to donate. The prototype system aims at (indirect) solving human problems – which is topic designated by the Imagine Cup competition.

1 Introduction

Current information presentation methods are most commonly static, not responding to user progress or motivating users to learn about the subject they are trying to show them. Specifically in the case of advertisement-like presentations, where the object is to attract attention and spread the information, these features are essential and therefore these classical static or even multimedia methods are less effective. We created a concept of a game containing information embedded directly into its basic principles and in order to play effectively and possibly outperform his own or his friends' previous results – which makes good motivation, user is required to study and understand these principles and the environment of the game, effectively learning new information. His object is even to try to create his own solutions to an in-game situations – this requires thinking about the game environment and therefore means even more effective way to retain the information presented.

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The purpose of this paper is to provide deeper overview of the presenting concept we created and to describe its evaluation as part of system aimed at helping other people. We will firstly discuss current existing means of information presenting and some recent improvements in this field. The next section focuses on more detailed information about the concept and explains it further. In the evaluation we will describe a system we designed in order to evaluate the concept in a prototype of a more complex system. Finally in conclusion we will summarize this paper, pinpoint most interesting or innovative parts of the concept and also mention possible expansion of the concept to different domains.

2 Related work

Currently most used methods for information presentation are static web presentations. While simple to create, these carry various problems resulting from their simplicity. There is very little adaptation to user progress, knowledge or actions. Also, there is very limited attraction and/or motivation in this approach. More multimedia oriented methods are video presentations, which can be embedded directly into web pages nowadays, so it is often complementing "classic" web presentations.

Visualization and navigation. These nowadays web presentations are most commonly taking place in a web browser and user sees only one node at a time and navigates through the nodes via links and various tools, for example backward, forward or home buttons. With some other tools, like sitemap or history trees the navigation can be extended [5]. Navigation via more general graph visualization and traversing is also common [3] and toolkits exist, for example [2]. There are also some other graph based interesting visualizations [4]. Generally problems of graph-based methods are usually little scalability and problems with large number of nodes, although there are approaches for large graphs [6].

Motivation. In order to motivate the user to learn or let the information be presented to him, if he is not seeking it himself, the presentation must entertain him. This can be accomplished as the presentation can in fact be a game, or at least contain game-like elements. The idea of information presentation connected to a game is not new, but the games are usually specifically built for one given purpose or are added to existing information presentations only as complementary, for example only to check user progress.

Attraction. Another way how to entertain and retain the user/player is to make the presentation method visually or otherwise appealing. The visual-based attraction can be easily illustrated on [1]. While the concept of putting picture previews on infinite 3D wall is simple and in functionality the same as thumbnail gallery in browser, it is the 3D visually attractive depiction and user interaction smoothness that gained this concept a lot of attention.

From these considerations we devised following properties for our concept that combine the best of particular ideas and probably would improve some of the identified deficiencies of current information presentation means:

- Visualize information synoptically, probably via graph and allow navigation through it
- Embed the entire concept into a game, but define only basic principles and in such way, that the concept can be greatly reused for various means and applications
- Make the presentation amuse, entertain and motivate the user to learn/see more
- Make the presentation visually and probably also otherwise interesting

3 Information presentation through a game

The concept we created is based on an abstract structure, which is the base element that hosts the entire game, user activity and information. This structure is a mathematics graph. More specifically, the game contains following elements:

1. **Three dimensional graph** – vertices depict information objects, while edges display relations between them. These are the basic information holders in the concept. Furthermore, vertices have various attributes acquiring miscellaneous values.
2. **Tools** – tools manipulate attributes of user-selected vertices at some cost.
3. **Events** – provide mechanism of random occurrences (i.e. changes of other elements) in the game progression and also for informing the user.

Player can navigate through the information presented in the graph either directly by jumping to vertices nearby or also by attributes of the vertices and their manipulation with the help of tools provided by the game – and he can also for example isolate a part of the graph and temporarily focus on vertices in the selected segment.

Player's goal is to maintain the highest possible number of vertices in the graph by caring for the needs of individual vertices. The needs of a specific vertex are arising from an unfavourable condition of its attributes. Player tries to satisfy these needs effectively by applying the available tools in a voluminal manner. The usage of tools is priced by the volume (or number of vertices) selected, while applying on more vertices simultaneously naturally leads to discounted pricing compared to single vertex. Player has to rotate the 3D graph and try to find a view, in which he will be able to apply the tool most effectively. Player's score is calculated according to the length of the game (a skill of maintaining the graph for longer time – uncared vertices disappear over time) and also effectiveness of player's steps is considered.

Player is motivated to learn or at least discover the information being presented in various ways. At first, in order to effectively use the tools he has to study and be familiar with the individual vertices and their needs (and attributes therefore) in order to find a groups where the tools will be applied effectively. This "mental" work (looking for suitable configurations by knowing the principles) interleaves with "fun" part – rotating the graph to appropriate position, so player is kept occupied and amused. Secondly, the game evaluates user actions against predefined rules and possible actions alternative to his actual moves and either gives positive feedback or aids by providing hints. Either way, user is motivated to continue playing (to receive

even higher acclaim or to use the tips). And thirdly, by providing overall score compared to other players and other competitive statistics, player is motivated to play again and play better in order to beat others. By playing again player gets to know the information better, but also in order to receive better score, he has to perfectly know all elements in the game and their interaction and consequently also the information embedded – which is the very aim of the information presentation.

3.1 Example – presentation of charity organization work

In order to illustrate this concept further, following is the example of its possible use in a presentation of charity organization and its work and goals. In this example scenario, the organization wants to show to the people what their activities are, but also educate them about problems in other parts of world. Also, the organization wants to show that for example it is better aim at sustainable solutions (build water well) instead of repeatedly solving the problem partially (give away bottled water again and again). Basic elements of the game should be then interpreted as follows:

1. **Graph vertices** – vertices depict people living in bad conditions, for example in the Third World. Their attributes are basic human needs – hunger, health, education, etc. – and the environment in which people live.
2. **Graph edges** – edges show relations between people, either geographical or social. That way disease may spread between vertices close to each other or they may have similar problems arising from similar geographical position – common water source running dry, etc.
3. **Tools** – either direct solutions for given needs (i.e. bring bottled water), but also more permanent, but more costly solutions (build water well).
4. **Events** – events contain information generated by user actions evaluation as noted above, with corresponding acclaim or hints for improving, but also mix of random events – global drought, floods, etc.

Player tries to help the people in the graph by satisfying their human needs. This way, he actually virtually becomes the charity organization, which is presenting to him, and acts and decides as they do in reality. In this example he then should see himself by costs of his actions in a long run and also by his score that the permanent solution is better. This is more effective way of showing him this particular information than if he just opened written report on organization's website.

3.2 User-level presentation creation

As an information presentation concept, it is important not to consider only those, to who is the presentation directed, but also to take into account those, who may have information to be presented. Therefore our concept is highly abstract, allowing mapping it to any field of information. Having game logic and game model abstract allows creating such different mapping by providing mainly presented information oriented data (specifying vertex attribute types and their relations, entering vertices information, designing tools, etc.) and only augmenting game model by specifying rules for evaluation of user actions or scripting random events. Such properties lead to

creation of an editor, which may be used by even less computer skilled persons, probably even with no programming knowledge at all, to create amusing and visually appealing presentations. Also by having only the base concept static, even with easy presentation creation with relatively simple editor each game/presentation may be very different, because of the game logic specified by each individual presentation.

3.3 Visualization

We considered 2D and 3D visualization and finally decided for 3D depiction, which will be more appealing by providing "wow" effect and also should additionally amuse the player. On the other side, it may be more complicated for first-time users or computer less skilled persons to get comfortable with the game, but with adaptability and game-play related aid (resulting from user's actions evaluation as noted above) slightly slower start should be easily overcame. Prototype visualization is shown on Figure 1.

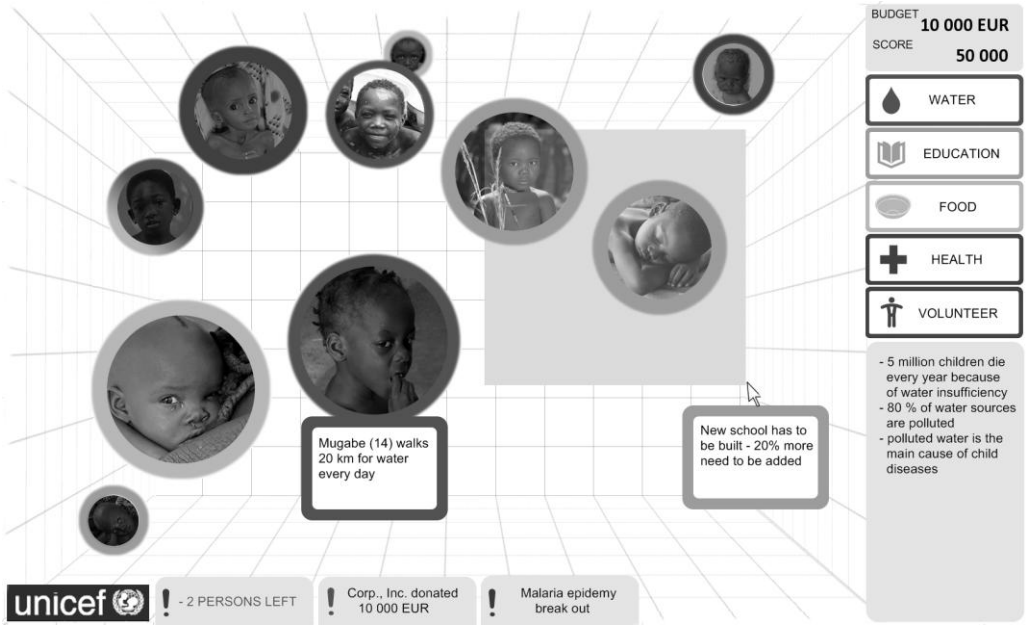

Figure 1. Prototype visualization of the concept.

This visualization shows basic game elements – vertices in 3D space (coloured auras around individual photos depict colour-coded needs of the vertices), tools palette on the right and event queue on the bottom. This figure actually captures a moment when the user is applying a tool on two vertices. Note that in this particular visualization edges are implicit. The texts are very context sensitive and interactive – the information is displayed according to actual tool selected, user actions performed, events happening, etc.

3.4 Further enhancements

This concept can be also expanded further by numerous features. For example, recent public experience proved great potential of social networks. Use of concepts known from these networks should not only greatly improve user experience, but also be beneficial for the presentation because of attracting new users and making existing users stay longer (and possibly learn more). Basic features should include elemental principle of allowing user to add his friends, track their progress and compare to them, but also advanced functionality should be considered – i.e. allowing user to help his friend with complicated situation in his game-play or to give hints. The usage of this concept in a social network environment would also provide an interesting basis for studying and evaluating usage of the game among users and information gathered by them.

Because getting an overview of vertices placed in a 3D space may be challenging, we also included a concept of tracking user's head (face) position in front of the monitor by use of pictures acquired from common webcam and moving virtual camera according to user movement. This would allow user to "look around the corner" by simply moving his head and easily gain orientation in the graph. This feature is also supposed to create an uncommon impression of vertices being placed in a space behind (or inside) the monitor, increasing attractiveness of the concept to the end user.

Also another feature are "game modes", which are action oriented mini-games slightly differing from main game-play and therefore "refreshing" player, but possibly still containing further information presented. These mini-games would take advantage of the graph placed in a 3D space and would consist of finding a specific vertex, interactively defending vertices against some active threat and similar ideas.

4 Evaluation – Aid AutoMagically system

We will evaluate the inFUNmation idea and concept in real environment by using it in a prototype of a more extensive system Aid AutoMagically (A2M).

4.1 Aid AutoMagically principle and motivation

The idea of Aid AutoMagically and its prototype realization are both taking part in the Imagine Cup 2009 international project competition focused on inventing a new ways of technology to help solving various human problems, mostly motivated by the eight United Nations Millennium Goals (including fighting poverty, achieving universal education, improving maternal and child health, etc.). The system therefore aims at helping and aiding others, but not directly. While putting technology at work in the least developed parts of the world should help locally and partially, only great systematic changes could make prolonged and sustainable improvement. And people are behind everything, so in order to make such a change, thinking of people who can help has to be changed. The A2M system does so by motivating people to learn about others problems, educating them about these problems and also provides them with a mean to help, at least financially for now.

4.2 inFUNmation in use – motivate and educate

Our inFUNmation concept of information presentation ideally covers one base part of the A2M system – the motivation and education. The information presented in the A2M system consists of information about human problems in order to let people know about the problems, show them that the problems exists and motivate them to think about it, but it also contains information about work of charity organizations in order to show them that this is one way of helping solving the problems mentioned and possibly motivating them to contribute. In the prototype we will focus on UNICEF, a humanitarian organization closely related to the Millennium Goals. Close cooperation with this organization would allow depicting real world problems and solutions in the game described sooner in this paper.

For this prototype implementation of the inFUNmation concept we have chosen the Windows Presentation Foundation technology from Microsoft .NET Framework 3.5, because it is specifically suited for information presentation and it also provides easy-to-use mechanisms for 3D displaying, however at the cost of the range of supported features being not as wide as in lower-level 3D APIs. However, for this concept the 3D functions provided by WPF should suffice and other advantages of WPF compensate for this. This technology also provides a mean to run the application in the web browser window via XAML Browser Application (XBAP) technology, while still maintaining hardware accelerated 3D display.

4.3 The "Rounder" – the real-life test

People now educated with the use of inFUNmation concept may want to help, most commonly by financial donation. We identified some problems with already available methods of donating, therefore we created a concept of modified POS terminal (point-of-sale electronic device processing credit and debit card payments), which will allow to round the amount being paid (in progressive steps) and the added extra funds would be forwarded for a purpose chosen by the user. It is important that the user interface should be as simple as possible; probably the main element will be only one big button for incrementally rounding the amount. Main advantages of this concept include simplifying of the donating and therefore also the process of helping or making it more available due to widespread deployment of the terminals.

The use of inFUNmation plays important role together with this donation option. Users are not only motivated to make the donation and help others, they also know why it is important and for what are the funds used, breaking the psychological barriers. By covering more charity organizations and human problems topics, it also helps them to consider the options and choose the purpose they deem most appropriate.

The output from the "Rounder" part of the A2M system is very well measurable and various statistics could be made about the usage and the options being chosen. Also there is a correlation between educating or influencing the user with information presentation and what he does afterwards – e.g. whether he would use the option to help by donating more often or what purposes he would prefer. This means that the inFUNmation concept can be easily evaluated and tested for its proposed effectiveness and innovation by tracking the usage of the "Rounder"-enabled POS terminals. Also,

more classical approaches like differential test against nowadays presentation methods and/or polls are to be carried out too.

5 Conclusions

In this paper we described our inFUNmation concept for information presentation and its use in Aid AutoMagically (A2M) system, which is aimed at helping with human problems. However, being a general information presentation concept, it can be also used in almost any other domain, probably with very little or no modification at all. These domains include for example applications in e-learning environment, e-shops presentations or even commercial advertisements.

The concept showed in this paper should improve the information presentation in the computer and especially web environment. Its use of the game in information presenting context is unique in the way in which is the information embedded and used. Also this concept is scalable and is expected to handle larger amounts of vertices; therefore it improves areas in which classical forms of information visualizations mostly fail. The main contribution of the concept consists of making receiving information presented through it more fun and easier, but it also makes presenting easier for those who want to present. Because it is still only a concept, evaluating its properties in real use is still needed. For this purpose the A2M system described sooner is currently being implemented and hopefully evaluation data will be available soon.

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