Knowledge Based Communication Interface

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ABSTRACT

Communication between the user and the mathematical model is a vital element for decision support. Without well-done interface, there is no effective decision process. Individual decision maker must communicate with a Decision Support Systems and need data, information and knowledge from this system.
Communication between the model and the user should find an environment that is based on standard, often used, communication instruments. It should include also communication instruments that are typical for model making. Mathematical models should be an invisible part of the decision making, mathematical models in a user preferred form, and this is because of the quality of cognition for user, not for his/her comfort.

Keywords: model communication, intuitive interface, information and communication technology, knowledge systems

1. INTRODUCTION

The interface is a basic filter. A man can communicate with his surroundings through this filter. The quality of man's understanding/cognition is determined on the quality of that filter. Some filters are biological, and some other we acquire during our studies, life and so on. As human development changes, so does the interface. Some of these changes are small, but we try tend to improve our interfaces. Some time ago some interfaces were abusive to individual's barrier seeking for information resources, knowledge of science no matter of the quality of the individual.
People make more complex decisions in their work. The increase in decision-making complexity increases the need for professional Decision Support Systems (DSS). These systems often contain mathematical models inside. Today's level of the model vs. user communication is not very high. Non-professional users do not know how to use the model, in spite of this it can help him a lot (because the non-professional user is a professional in his job). We can do everything with technologies, but there are limits to our knowledge. That is why we have to find the limits of the need and utility. The goal is not a perfect illusion of a model, but it is a perfect communication too, between a man and cognition of the model (model use).
There is demand for building models. The user has to be able to communicate with the model or generally with every instrument. The complexity of systems is rising too. So the user has to know these systems, especially know how to use them and how to read results of computation at the end. So it is necessary to further communication between the user and the model so it can be user friendly as possible. Also so a non-professional user would understand it.

2. COMMUNICATION SUPPORT

Communication between the user and the model is a vital element for decision support. Without well-done interface, there is no effective decision process. Individual decision maker must communicate with a DSS (and of course with colleagues, experts, government agencies, customers, vendors, business partners, and so on) and need data, information and knowledge from this system.
Communication between the model and the user should find an environment that is based on standard, often used, communication instruments. It should include also communication instruments that are typical for model making. Mathematical models should be an invisible part of the decision making, mathematical models in a user preferred form, and this is because of the quality of cognition for user, not for his/her comfort.
In todays level of communication between the user and the model description there is a tendency to have an interface (communication) developed. There is a look of characteristics of interface such as user friendly interfaces and interfaces that have an information tunnel between the user and the model (view of world), not only a filter. User should operate the interface in intuitive way.
The user should have the possibility to change the model, stop, and finish running the process, and to know what is happening in it. The interface should divide the solving process into cases/points.
Modern information technologies provide inexpensive, fast, capable, reliable means of supporting communications. Information and communication technology (ICT) is a new possibility for the interface.

Words, movements, pictures, and texts can be used there.
Technology or better cyberspace is ideal. Where there are no differences between reality and models, models can be transformed into a virtual reality, because it is only just another form to display reality.

3. INTUITIVE INTERFACE

3.1. Interface definition

An interface can be understood by many ways, but in definitions, some identical moments can be found:

- An interface is what you see when you look at your monitor: the collection of words, pictures, buttons, menus, and other stuff that lets you do things. The interface is also sometimes referred to as the graphic user interface, which is shortened to GUI and pronounced "gooey". [4]
- The on-screen appearance of a computer application or program; the connection between the user and the program. With reference to hardware, interface also means the point of connection between communicating devices, for example, a parallel port and printer cables. [14]

- The boundary between a computer and a drive it communicates with. [9]
- A shared boundary. A physical point of demarcation between two devices where the electrical signals, connectors, timing and handshaking are defined. [8]
- A boundary across which two systems communicate. [5]

- In hardware, an interface is a connector used to link devices. In software, it allows communication between two software systems or between people and systems. In the automation field, interface refers to the method by which users can access the automated library system. [9]
- A connection (through a hardware device or through a software program) between different components of a computer system (usually performing some kind of translation between protocols internal to the components); used especially in the contexts of network communication, or communication between computer systems and their users. [4]

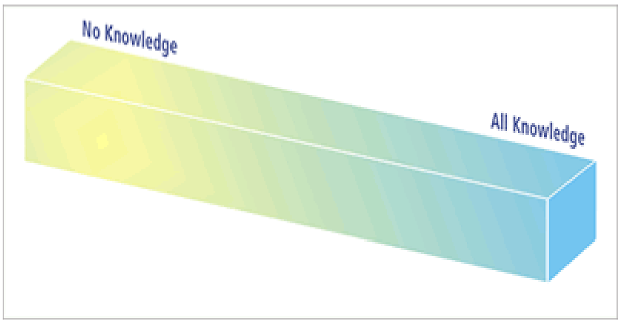
- The procedures, codes and protocols that enable two entities to interact for a meaningful exchange of information. [2]
- In relation to human communication with a computer, the appearance of the screen via which the interaction occurs. Also: the boundary between two devices or programs in a transmission path. At an interface, the circuitry and/or software routine is standardized so as to allow information to pass from one device to the other. The interfaces themselves must be compatible for standardization to occur. [14]
- A linkage, usually between a computer and a user, or among computer programs. An interface between a computer and user refers to the elements of the computer and software that the user interacts with the screens, icons, menus, and dialogues. An interface among computer programs involves using agreed upon commands and statements that let one computer program exchanged information with the other in a way that the first program can integrate the second's. [1]
- The specific communication methods through which you communicate with a system. The graphical user interface provides a set of graphical elements that you use to effectively communicate your intentions to the underlying system. [5]
- This is any type of point where two different things come together. Most often, the term is used to describe the programs between you and your computer. What you see on the screen is the interface between you and what your computer is doing. [4]

Mostly the term “interface” is used in computer science, physics, and chemistry. General definition, based on previous definition, can be concluding as follows.

“Interface is some filter, boundary between two participants of communication, who communicate through that filter. Interface transmits data/information/ knowledge.”

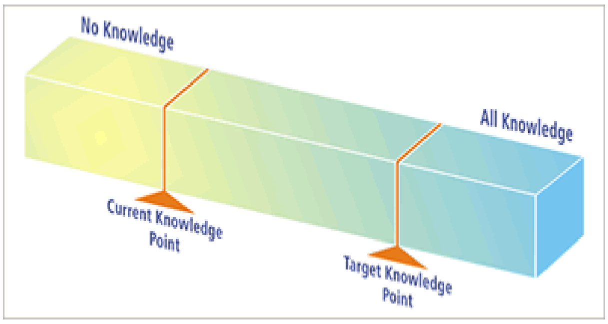
3.2. Current and Target Knowledge Points

All users can be divided into several groups. In the first group, there are the users, who know absolutely nothing about how to use the interface. (Maybe they don’t even know how to use a mouse.) The second ones are the users, who know everything there is to know about the interface design. (That may only be the designers.) Of course, most of the users are between these two boundary points.
An interface’s knowledge space is a continuum, which goes from knowing nothing about the interface and to knowing everything someone could possibly know. See Picture 1.



Picture 1 An interface's knowledge space continuum

The distance from the left represents how much any given user knows about the interface design. For each user, it can be called this the current knowledge point. That's the amount of knowledge they have when they approach the interface.
There's another point that's of interest: the target knowledge point. This point represents how much knowledge the user needs to know to accomplish their objective. Every time a specific user tries to complete a specific task, the current knowledge and target knowledge points become very important. For a given user trying to complete a given task with an interface, there are two points in the knowledge space that are to most interesting. *Current Knowledge* represents the knowledge the user has when they first approach the interface to complete the task. *Target Knowledge* is the knowledge the user needs to accomplish the task. See Picture 2.

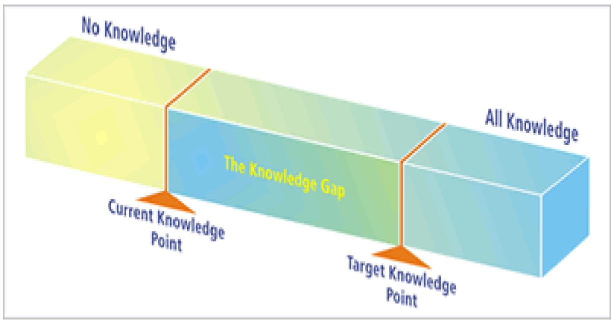


Picture 2 Current Knowledge point and Target Knowledge point

Every user will have a different current knowledge point and that point changes as they get more experience. By plotting out different users, it often occurs very clear clusters — bunches of users that share extremely similar current knowledge.
Working with users in the middle of several of the most important clusters gives a good place to start. Using these clusters can help interface designers determine which personas to focus on.

3.3. The Knowledge Gap

The distance between current knowledge and target knowledge has a technical name: "The Gap".
The Knowledge Gap is where interface happens. It is not necessary to create interface to the left of current knowledge point, because it's all stuff the user already knows. Similarly it is not necessary to create interface to the right of the target knowledge point, since the user won't be need that information for this task, at least. It is needed to design the interface for the space in between current knowledge and target knowledge.
The space between the Current Knowledge and Target Knowledge points is called The Knowledge Gap. This is the portion of the knowledge space, where designing interfaces is most concerned. See Picture 3.



Picture 3 The Knowledge Gap

Users can complete their objective when current knowledge equals target knowledge. There are two ways this can happen:

1. train the user, thereby increasing their current knowledge, until they know everything they need to know.
2. reduce the knowledge necessary, by making the interface easier, until target knowledge only requires the information the user already has.

In fact, most good design involves both: users are trained (through explanatory text and other devices) while the designer reduces complexity, reducing the gap distance from both directions.

3.4. Two Conditions of Intuitiveness

There are two conditions where users will tell an interface seems 'intuitive' to them. It only takes meeting one of the two conditions to get the user to tell the interface design is intuitive. When neither condition is met, the same user will likely complain that the interface feels "unintuitive":

1. Both the current knowledge point and the target knowledge point are identical. When the user walks up

to the design, they know everything they need to operate it and complete their objective.

2. The current knowledge point and the target knowledge point are separate, but the user is completely unaware the interface design is helping them bridge the gap. The user is being trained, but in a way that seems natural.

The biggest challenge in making a design seem intuitive to users is learning where the current and target knowledge points are. What do users already know and what do they need to know? To build intuitive interfaces, answering these two questions is critical.

For identifying the user's current knowledge, is good to use field studies. Watching potential users, in their own environments, working with their normal set of tools, and facing their daily challenges, gives us tremendous insight in what knowledge they will have and where the upper bounds are.
Usability testing for identifying necessary target knowledge for important tasks can be used. When users sit in front of a design, the knowledge gap becomes instantly visible.

Unfortunately, making an interface intuitive often increases development costs dramatically. Reducing target knowledge, particularly for large knowledge gaps, can be a very expensive process, particularly if it has to be building complex tools, such as wizards and data auditors. [13]

But intuitive interface can bring to the owner, except the costs, some kind of profit. [17] E. g. users have much more difficulty finding a phone number to call customer service center on the web site. Provider maybe doesn't want a lot of phone calls from users. They aren't set up to handle the volume of calls and building a complete customer service call center could render their entire operation unprofitable. While it's inconvenient to the user, they'd rather handle the problems through email, which is far more cost effective.
The interface designers can deliberately make the process of calling them very unintuitive to encourage customers to find another way to resolve their problems.
How "intuitive" works - what makes someone perceive a design to be intuitive - it becomes easier to make the decision as to whether an intuitive design is worth the extra effort. The knowledge users have when they arrive at the design (current knowledge), what knowledge they'll need to complete their tasks (target knowledge), and what the interface design needs to do to help them complete the task (the gap) are the key ingredients for making an interface that seems 'intuitive' to users.

4. CONCLUSION

The interface becomes invisible and produces a perceptual illusion of nonmediation:

1. the interface should provide rich verbal and nonverbal information for social interaction (presence as social richness);
2. objects and entities in such an interface should appear perceptually and socially vivid and real (presence as realism);
3. any border between "this side" and "the other side" of the interface should be removed, so users can perceive that they have moved to the other side, or that they and other users are sharing a real or artificial environment (presence as transportation);
4. the interface should be directly manipulated and involve multiple senses (presence as immersion);
5. if there is no possibility of true social interaction with people and entities in the environment, users should be encouraged to respond to social cues they provide just as we would in nonmediated communication (presence as social actor within medium).
6. when the interface or environment themselves present the user with social cues normally reserved for human-human interaction, the user should perceive it not as an interface or environment but as an independent social entity, a transformed medium (presence as medium as social actor).

Interfaces can be referred as Natural User Interfaces (NUIs). The expected success of this approach lies in its ability to build on fundamental human skills: namely to interact with real world subjects and objects. NUIs are multimodal (i. e., they integrate different forms of interaction) and therefore allows the users to choose the appropriate and/or individually preferred interaction style for every (inter)action.

In order to achieve the effective interface, it should consider the following points.

- The interface should be convenient for users. If users need a lot of complex processes to interact with others, they cannot concentrate on their work.
- Not only contents in the windows, but also their sizes or the locations should be transformed dynamically. Meaningful information needs to be added, unnecessary information should be removed, and all information needs to be balanced.

The interface becomes invisible or transparent, functioning as would a large open window, with the user and the content (objects and entities) sharing the same environment; or it is transformed into something other than an interface, a social entity.

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