A New Approach to Architecture of Human-computer Interaction

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Abstract—**Human Computer Interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of the major phenomena surrounding them. There is an extensive literature concerning the human computer interaction. This paper reviews and classifies the existing architectures. Moreover, the paper proposes some new approaches to the architectures of human computer interaction.**

Keywords—human-computer interaction, Post-desktop model HCI, six-model HCI, Meta post desktop HCI.

I. INTRODUCTION

Human-computer interaction is the major challenge in the third era of computing. It is concerned with the joint performance of tasks by humans and machines [1][2]. The human computer interaction can be described as the point of communication between the human user and the computer. The information between the human and computer is defined as the loop of interaction. The loop of interaction has several aspects, including Visual Based [3][4][5], Audio Based [6][7], Task environment [8], Machine environment [9], and Areas of the interface [10].

The human computer interaction is an important aspect of the ubiquitous computing. Ubiquitous computing, is the term given to the third era of modern computing The first era was defined by the mainframe computer, a single large timeshared computer owned by an organization and used by many people at the same time. Second, came the era of the PC, a personal computer primarily owned and used by one person, and dedicated to them [11][12].

According to [13][14], the following statements describes the basis of the human computer interaction:

1) The more human-like the interaction, the better are the users attitudinal responses.
2) The more social intelligence a device has, the more positive the social impact
3) The less telecommunication, the better for the interaction with co-located persons
4) Find balance between useful interruptions and attention for co-located persons

5) The less intrusive the alert and the act of communication, the more socially accepted.

This paper focuses on the human computer interaction problem and classifies the existing architectures. Moreover, we propose some new approaches to the architectures of human computer interaction. The objectives of this paper are

- to classify the existing architectures of human computer interaction
- to describe a meta-post-desktop model of human computer interaction
- to propose a six-senses based model of human computer interaction

II. ARCHITECTURE OF HUMAN COMPUTER INTERACTION

The two main types of HCI are implicit HCI denoted by iHCI and explicit HCI denoted by xHCI [15][16]. In this section we propose some new approaches to the architecture of the iHCI. We classify the possible architectures of human computer interaction into five different types, including desktop model, post-desktop model, creative model, meta-post desktop model, and six-senses based model. In the following sections we explain the property of the mentioned architectures.

A. Desktop Model

Desktop model human computer interaction is the traditional method of interactions. In this method interactions have a low level of transparency. This form of interaction is not quiet secure and reliable. A simple form of desktop model human computer interaction is shown in Fig 1. As the figure shows the human and computer have an explicit form of interaction. The following list indicates some advantages and disadvantages of this kind of human computer interaction:

- Low Cost
- Easy to Implementation
- Low Security
- Low Transparency
- Low Integrity

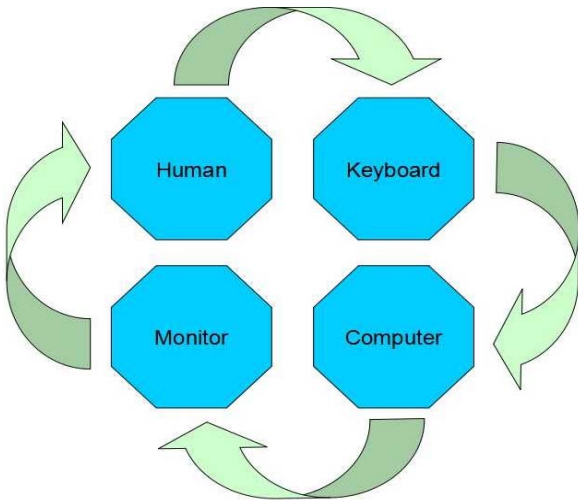- Low Complexity of Computation
- High Complexity of Interaction

Fig. 1. *Desktop base human computer interaction*

An example of this kind of human computer interaction has been shown in Fig 2.

Fig. 2. The user puts an ATM-card in the machine. The ATM machine identifies the user only by using the card.

B. Post-Desktop Model

In this form of human computer interaction we use advanced device for communicating. The information can be captured by using a set of sensors. The captured data must be analyzed and compiled to raw data. For this purpose we use intelligent computation methods. There is a short conversation between user and machine. The conversation also must be translated to raw data. The raw data will be processed by soft-wares and hard wares. For this purposes we use the intelligent computation and algorithms. The following list indicates some advantages and disadvantages of this kind of human computer Interaction:

- High Complexity of Computation
- High Security
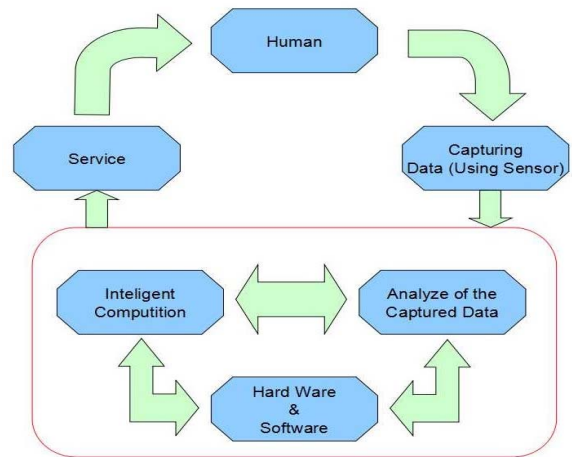- High Transparency
- High Integrity
- Low Complexity of Interaction

Fig. 3. *Post-Desktop model human computer interaction.*

As an example we assume that the user wants to take money from ATM. In this case the user does not need to input a card to the ATM. The ATM captures information related to the user by sensors. There is a short conversion between the user and ATM-machine. The conversion will get translated to the low level information. A simple form of post-desktop human computer interaction is shown in Fig 4.
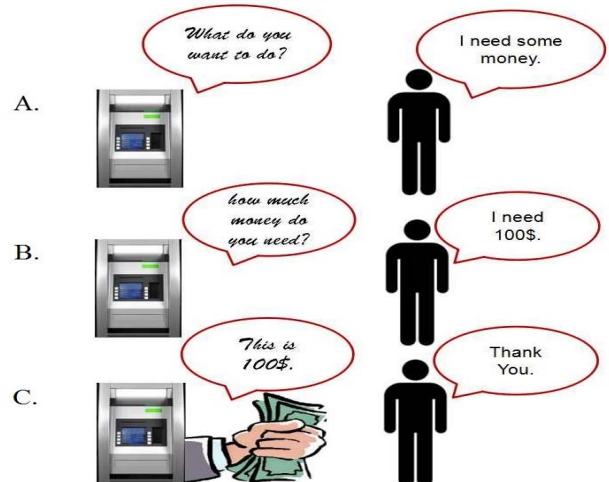

Fig. 4. *A simple form of post-desktop human computer interaction.*

C. Creative Model

Similar to the previous model, in this form of human computer interaction, the machine and user have a conversation too. This conversation usually is very long and complicated. The machine helps to the user to make a decision n order to provide the service that the user needs. For this purpose the cognation based algorithms will be very useful.

Fig 5 indicates a simple example of a creative model of human computer interaction. In this example the person wants to take some money from ATM. We assume that the user does not know how much money he needs. He only tells his plan to machine and the machine will give the enough money to buy what he needs.

D. Meta-Post-Desktop Model

In this form of human computer interaction we use advanced sensors for communicating. It can be implemented similar to a brain interface model [17][18][19][20]. The query can be captured from human brain directly. For this purposes a set of intelligent sensors would be used. In this case the interactions have a high level of transparency. The captured information will be analyzed and translated to the raw data. The raw data will be processed by low level soft-wares and hard wares. After that the low level software and hard-wares provide responses. The provided response will be translated to a higher level response. For this purposes a set of middle wares is required. Finally, the high level responses will be considered as a feedback of captured queries. Fig 6 indicates a general architecture for meta post desktop model human computer interaction.
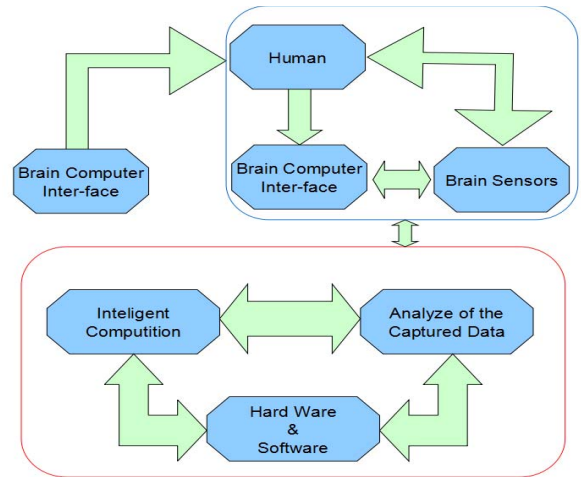

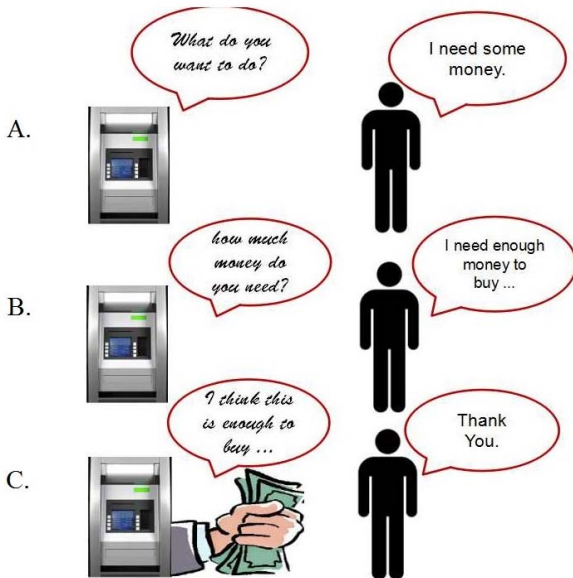Fig. 6. Meta-Post-Desktop model human computer interaction.

Fig. 5. A simple example of a creative model of human computer interaction.

Fig 7 indicates a simple example of a meta-post-desktop model of human computer interaction. In this case we assume that the user wants to take money from an ATM too. He has to go in front of the ATM. Then the ATM automatically captures the user request and gives money to the user. The person does not do anything. In fact the person does not input any data.
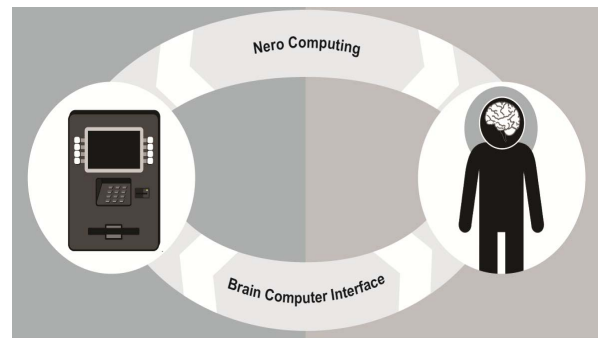

Fig. 7. A simple example of a meta-post-desktop model of human computer interaction.

E. Six-senses Based Model

In this form of human computer interaction we assume that that the computers are able to predict natural phenomena. Then by using the predicted information the computers will be able to match the natural phenomena with the human requests. We also assume a brain computer interface model in order to captured the requests of the users. Fig 8 indicates a general architecture for six-senses based model human computer interaction. The following list indicates some advantages and disadvantages of the six-senses based model human computer interaction

- High Cost
- Difficulty of Implementation
- Risk-able Security
- Very High Transparency
- Complexity of Computation
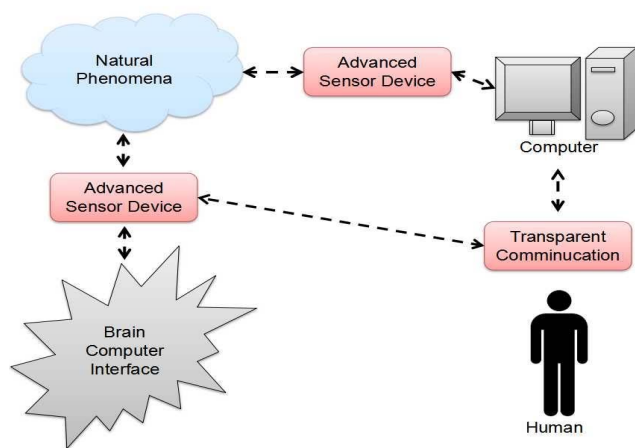- Legality Problems
- Very Flexible

Fig. 8. The architecture of 6th sense based human computer interaction

III. CONCLUSION

The human computer interaction can be described as the point of communication between the human user and the computer. This paper classified the human computer interaction into five main categories. The paper also provided a general architecture for each mentioned type of human computer interaction. We also proposed some new architectures for the implicit human computer interaction.

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