Human-Human Interaction: A Neglected Field of Study?

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Abstract. This paper presents an overview of Human-Human Interaction field that would be dedicated to tackling problems that occur while interacting with other people. There are many domains, in which researchers conduct studies regarding interaction between people and electronic devices. However, while doing such research, the problems of human-human interaction tend to be neglected. This type of interaction has only been studied in fields connected to psychology/sociology (human behaviour) and medicine (epidemiology). This article proposes a model of interaction between people based on well-known Human-Computer Interaction models and presents some issues that might occur during the process of communication between people. Furthermore, it presents some possible solutions to improve this interaction effectiveness, by applying various devices and interfaces.

Keywords: Human-Human Interaction · Human Computer-Interaction

1 Introduction

The first time that Human-Computer Interaction (HCI) term has been used was in 1980 [1]. Since then many related fields have been introduced, such as for example Human-Robot Interaction (HRI) [2]. Those fields are dedicated to studying interaction between human and some kind of machine. However, what about Human-Human Interaction? Such term has mostly been studied in the scope of human sciences such as psychology and sociology to describe relations between people as well as by medical sciences, in particular, by the field of epidemiology in the case of studies of propagation of diseases. In the scientific works from the HCI domain, there are only few mentions of such interaction – mostly in the field of HRI, where researchers are attempting to make interaction with robots similar to interacting with other people [3–5]. Because of the rapid technology development, researchers have focused more on the machines, rather than the humans themselves. Only mentions of human-human interaction in the context of interactive information exchange can be found in [6], where authors present an application that stimulates conversation between people, in [7] where authors propose a collaborative design system and in [8], where author discuses the limitations of speech recognition systems and their effect on interaction between people.

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The goal of this paper is to propose a field of study that would be dedicated to caring out research on interaction between people in the context of HCI. The following chapter presents how some well-know interaction models from the field of HCI that can be modified by replacing the machine with another human. Further chapters present some issues that occur during interaction between people and how they can be solved. Last chapter concludes the whole paper.

2 Interaction Models

In 1983 Human Processor Model was introduced by Card [9]. It defines human as a machine that processes information. This machine has sensors (human senses [10]), buffers and cognitive system with memory for processing information (brain), and motor system (legs, hands and head). This way, human is able to communicate (interact) with a machine, that also has input/output and some kind of a processor. This model is the foundation for studying the interaction between human and machine and has been used to present this interaction as a form of a loop where humans send some information to the computer, it processes this information and sends feedback that is received by human and also processed (Fig. 1)

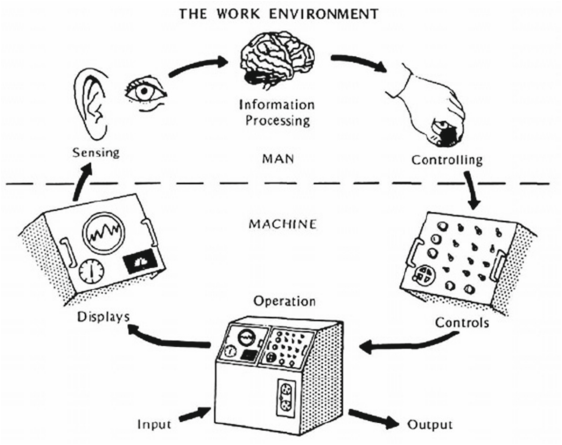

Fig. 1. Model of interaction between human and machine [11]

Such way of presenting interaction has been enhanced by the Association for Computing Machinery (ACM) by adding the context of use and development process (Fig. 2).

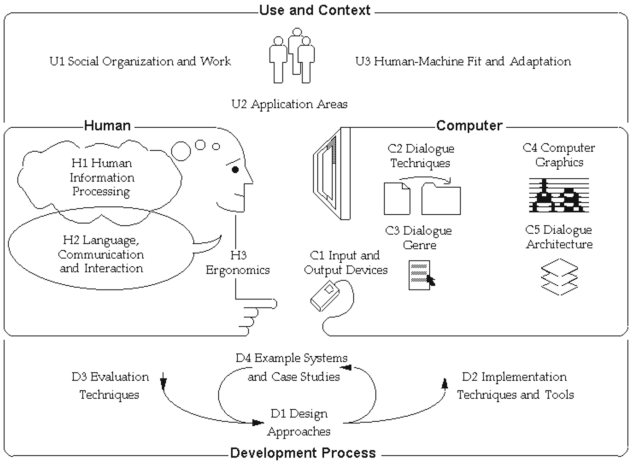

Fig. 2. Human-Computer Interaction model by ACM (https://sigchi.org/)

In the Norman model [12] it is assumed that the main elements of how people do things are: their goals (what they want to happen), the execution (what they do to the world) and the evaluation (comparison of what happened with what was intended to happen). Furthermore, we can divide the execution phase into the following elements: intention to act, sequence of action and execution of the action sequence, and the evaluation phase into: perceiving the state of the world, interpreting the perception and evaluation of interpretations. The Norman seven stage model of interaction is presented in [12]. The modification of the Norman model for compound goals that have to be divided into several sub-goals, where evaluation of interpretations leads to new execution have been presented in the work [13].

The model introduces also two main interaction issues: The Gulf of Execution and the Gulf of Interpretation. The Gulf of Execution is defined as the difference between intensions and the allowable actions [12]. This gulf is measured by the lack of difficulty to perform the intended actions. From the other hand the Gulf of the Evaluation 'reflects the amount of effort that the person must expert to evaluate the physical state of the system and to determine how well the expectations and intensions have been met' [12]. The size of this gulf is small when the appropriate information about the state of the system is delivered in such a way that is easy to interpret by the person.

These gulfs are present in a great many of devices and systems, also the degree to which they can be observed is significant. The present life requires from people interaction with a great many of differentiated devices, from highly computerized cars, sophisticated microwave ovens to air-conditioning control panel. These devices are not only differing from their functionality but as they are coming from variety of producers are using differentiated interaction styles. These causes a great many of usability problems, which in many cases are not manifested by the users, because they tend to blame themselves or they 'are incapable of operating the pesky devices' [12].

3 Human-Human Interaction

If the machine in the models presented in the previous section would be replaced, so there are two humans instead, the model of interaction could be presented this way (Fig. 3):

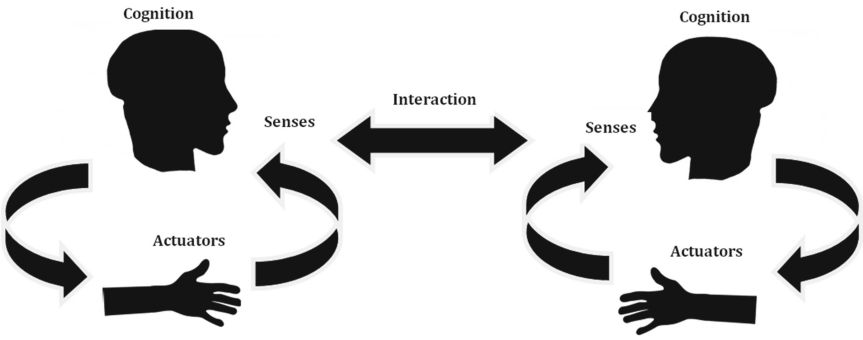

Fig. 3. Human-Human Interaction model

Interaction between people would have the same components - actuators and senses serve as input and output devices and brain is used to process information.

Presenting the interaction between people in such a way entails similar interaction problems as in the field of HCI. Those identified by Don Norman [12] can be easily transformed to provide some typical interaction problems between people themselves. For the gulf of execution, an example situation would be asking a person about something that we assume they know and getting a response that they do not know the answer to that question, as for the gulf of evaluation, sample situation might be similar, but instead of no response we would get unrecognisable or partial answer. Since in both cases this interaction is done with human it is hard to distinguish those two types. Furthermore, communication between humans is not only limited to speech, there are also gestures, body language and face expressions, that all could be misinterpreted. This might indicate that interaction problems identified by Don Norman should be revised and expanded in terms of interaction between people.

Furthermore, looking into sources related to interaction between people in social context [14, 15], it is easy to find that there are many obvious interaction problems, related not only to demographic differences between people but also to their personal characteristics, which include interpersonal communication skills, relationship, personality, attitude, emotions and knowledge.

However, the two core elements of communication between people described in [16] are intersubjectivity (striving to understand others and being understood) and impact (extend in which a message brings about change in thoughts, feelings or behaviour).

Intersubjectivity is rather similar to previously mentioned gulfs of execution and evaluation, whereas impact is a form of User Experience (UX) [17] from interacting with another person.

To sum up, there are many factors that could undermine the interaction between humans, related to the use of their senses, knowledge and cognitive processing, their personal characteristics and also demographic factors.

The proposed field of Human-Human Interaction (HHI) could tackle such interaction problems and find solutions to improve the communication between people. Example ways, how this interaction can be enhanced are presented in the following section.

4 Applications of Human-Human Interaction

With the current state of technology, there are some solutions that can be used to improve the interaction between people. In order to improve the intersubjectivity of communication, various devices that enhance our senses and expand our knowledge can be used:

- Wearable technology – small devices that could provide us with additional information about various things
- Augmented Reality applications – used to expand our knowledge about surrounding world
- Mobile devices applications – apps that allow language translations and other ways to improve communication
- Interactive avatars – as mentioned in the paper [6], they could help to communicate by translating and stimulating conversations
- Other, future devices that could be introduced – e.g. voice modulator that allows to speak in different languages, ear plugs that enhance the reception of speech, contact lenses that present information about other people, and many others

Above mentioned devices could be used to improve elements of interaction between people such as understanding and therefore make this experience more efficient and satisfying. On the other hand, impact of interaction with another person can also be researched, using well-known methods and devices for biometric and behavioural data acquisition, such as eye trackers, EEG devices and many more [18]. After recognition that particular elements of such interaction cause some negative impact, they can be eliminated or improved, in order to make the whole experience more pleasant.

5 Summary and Future Work

While doing research on interaction with various devices, scientists have forgotten the issue of interaction between people, and how newly developed technologies can enhance this interaction. This article discusses the necessity to create a field that would tackle such problem, and focus besides on computers and robots also on humans themselves. In today's world, where globalisation effect causes mixing of people from different cultures, religions and languages it is necessary to conduct some research on how new technologies are able to help people to break these potential barriers. HHI could also help people with disabilities that generally have problems with communicating with other people. Human-Human Interaction is a neglected field of study that surely deserves more attention.

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