Chapter 20

Human–Machine Trust Interaction: A Technical Overview

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ABSTRACT

Improving user’s trust appropriately could help in designing an intelligent system and make it work effectively, especially with the fast growth of Web-base technology. This chapter introduces the solutions of improving user’s trust in human-machine interaction (HMI), especially for electronic commerce (e-commerce). The author firstly reviews the concept of trust and the main factors that affects the appropriateness of user’s trust in human-machine interaction, such as the properties of machine systems, the properties of human, and context. On the basis of these, the author further discusses the current state, challenges, problems and limitations of establishing and improving the user’s trust in human-machine interaction. Finally, the author summarizes and evaluates the existing solutions for improving the user’s trust appropriately in e-commerce environment.

INTRODUCTION

Trust is familiar to all of us in everyday life. It plays a key role to mediate human-to-human interaction. We often talk about trust that we have in other people (e.g. family members, friends and colleagues), how much we believe what we see or are told, or how confident we are on somebody or something that could work properly. The trust relationships actually shape our social life. With the advent of complex intelligent machine systems, the relationship between human and machine need to be understood. The key factor influencing this relationship could be the human’s trust in the machine. In general, trust is based on past experiences. If the machine has been able to achieve tasks as expectation all the time, you would establish sufficiently strong trust in it.

With the rapid development of modern technology such as digital computing and network technologies, human-machine interaction is becoming prevalent, appearing in all aspects of human life and work. Human-machine interaction is the study of
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interaction between people and machines, while
the interaction between people and machines
occurs at user interfaces. The Association for
Computing Machinery gives the following defini-
tion: “Human-computer interaction is a discipline
concerned with the design, evaluation and imple-
mentation of interactive computing systems for
human use and with the study of major phenomena
surrounding them.” (ACM SIGCHI Curricula for
Human-Computer Interaction) Human-machine
interaction is also sometimes referred to as
human-computer interaction or computer-human
interaction. Human-machine interaction shows
massive potential to improve human performance
and enhance safety. However, it is not uniformly
beneficial to people. If trust is not properly consid-
ered, there are maybe machine-assisted accidents
caused by human-machine interaction. If users
trust the capability of the machine even when it
does not perform the task perfectly, the disaster
could occur. For example the autopilot crashed
the Airbus A320 (Sparaco, 1995). In addition, if
people refute to utilize the machine even when it
could achieve the goal very well, the advanced
benefits of using the machine will be lost.

Such an improper relationship between human
and machine can be described in terms of over-
trusting or under-trusting of machines. These are
illustrated in Figure 1. Over-trusting (too trusting)
and under-trusting (not trusting enough) can lead
to user misusing and disusing the machine (Par-
suraman & Riley, 1997). Reducing over-trusting
and under-trusting in the machine system is a very
important issue in human-machine interaction.
Appropriate trust can improve greatly human-
machine interaction. Ideally, the human should
maintain a correctly calibrated level of trust that
matches the objective capability of the machine
system. How to calibrate the user’s trust to an
appropriate level? It is essential to understand
the factors influencing trust in human-machine
interaction.

This book chapter studies the factors influenc-
ing the user’s trust in human-machine interaction.

We believe understanding this issue is important
for us to develop human’s trust in the machine
system at an appropriate level, neither too high
nor too low. Firstly, the concept of trust and the
factors influencing the user’s trust in human-
machine interaction are introduced. We further
discuss the issues, problems and challenges in this
area that are introduced by e-commerce and web
services, and recommend a number of solutions
in order to improve the trust in human-machine
interaction based on the trust influencing factors.
Finally, we propose future research directions and
conclude the chapter.

BACKGROUND

It is very important to calibrate the user’s trust to
an appropriate level in human-machine interaction.
For this purpose, we have to know what trust is,
which factors influence the user’s trust, and how
trust is influenced. We begin by reviewing the most
common definitions of trust from social science,
psychological science and informational science
perspectives. We then examine the main factors
influencing the user’s trust in human-machine
interaction.

Concept of Human-Machine Trust

Trust, a social psychological concept, is examined
by many researchers from a broad of disciplines,
such as sociology, psychology, economics, infor-
mation science, and so on. Trust has been regarded
as an important research issue in the areas of psy-
chology and sociology since late 1950s. From a
social psychological perspective, trust in another
person has been defined as “the confidence that
one will find what is desired from another per-
son” (Deutsch, 1973); “a generalized expectation
related to the subjective probability an individual
assigns to the occurrence of some set of future
events” (Rempel et al., 1985); “expectations of
persistence of the natural physical order, biologi-
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