3D INTERNET FOR COGNITIVE INFOCOMMUNICATION

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SUMMARY

The paper presents new research directions both for 3D internet and cognitive info-communication. It reviews basic concepts and definitions and gives some “historical” view that helps to understand current international trends and projects. Some examples of our experimental results are also presented.

INTRODUCTION

Our daily activities are more and more linked to the "digital social behavior". Investors in industry are highly aware of these trends and allocate more financial means to develop personal-fit products to reach the level when these products – besides remain functional – become indispensable partners for their owners and - as it can be clearly marked in the case of new generation mobiles – express even their cultural and social affiliation. The more complicated it is to use a device, the less it can be used in everyday life since we are not willing to learn all functions. Therefore the demand of the users that they would like to „discuss” compound needs with their personal informatics in an easy, user friendly way is fully understandable [1]. Man live in a 3D world. All our knowledge is in 3D and we use 3D in our non- and para-verbal communication. No wonder that it is a natural need from the customers that they would like to communicate with their personal informatics in the very same way; in 3D. That is why – among others – internet, the appearance of all allocated and collective knowledge of man, should also be in 3D.

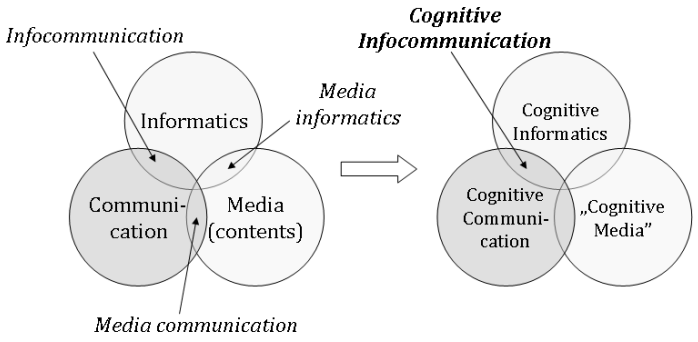
THE BASIC DEFINITIONS FOR THE COGNITIVE INFOCOMMUNICATION AND FOR THE 3D INTERNET

The classic information-technology is composed of 3 pillars (see Figure 1. a).

(A) **The media** is to create and manipulate the information content.

(B) The communication function is to transmit the information.

(C) The informatics task is to process the information.



1.a The three pillars of traditional information-technology

1.b The location of cognitive info communication

Figure 1.
Divisions of the traditional and cognitive information-technology

Today, the boundaries between the three pillars are becoming increasingly blurred. That is called the convergence theorem in the IT literature. Thus the intermediate areas are becoming in the focus of attention.

(A) **The media communication** is responsible to deliver the information to the broad masses.

(B) **The media informatics** uses the strength of the informatics to build up the interactive media.

(C) **The infocommunication** handles the communication both between the people and the information-technology tools and the communication between the information-technology tools.

Cognitive infocommunication

The information-technology triplet can be found in every corner of the cognitive research field. **Cognitive science**, or in other words **acquaintance science**, was developed in the fifties as a branch of the interdisciplinary sciences, trying to understand how the human sensing works and examining the sensing connection with brain activities and human intelligence. This paper focuses on the cognitive infocommunication whose place is shown in Figure 1b. The previous definitions can be supplemented by the following interdisciplinary sciences:

(A) **The cognitive communication** is closer to cognitive sciences and its task is to analyze how information is sent through the transmission channels. These channels include cognitive linguistics and other non- and paraverbal channels introduced by other cognitive sciences, including the cases, when our senses are not used in the usual way, for example, when the visually disabled use their hands to see.

(B) **The cognitive informatics** should belong to the informatics branch. It investigates the internal information processing mechanisms of the human brain and their engineering applications in computing.

(C) **The cognitive infocommunication** handles the communication channels between people and information-technology tools and also the communications which are based on cognitive informatics processes.

The definition of cognitive infocommunication is used in greater extent. In Figure 2. an example is shown for cognitive infocommunication. There is machine communication between the low level controller and a robot or intelligent tool. The link between a robot and the high level intelligent control is realized at the infocommunication level. When the operator gives direct order to the robot that is also called infocommunication. The cognitive infocommunication level is only reached if the entire communication process – from the natural intelligence, generated by the human brain to the controlled task - is examined as a whole.

3D Internet

"**3D Internet**" is such content service, which is taking advantage of the opportunities of the Internet to give the user a stereoscopic 3-dimensional viewing experience, or attached multimedia (interactive) content.

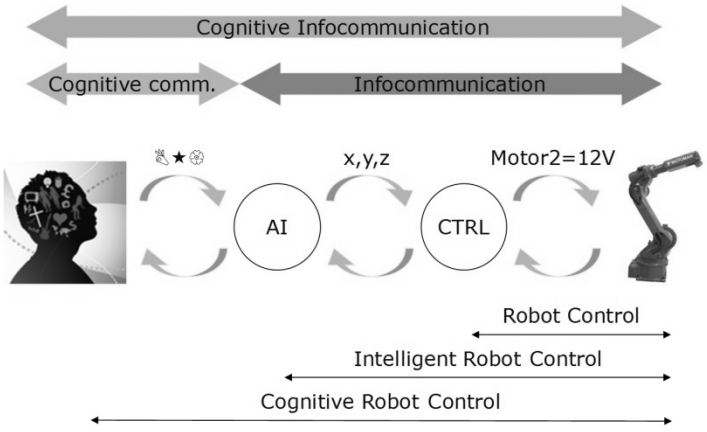


Figure 2.
The cognitive info-communication

At the currently held SIGGRAPH Computer Graphics conference Mozilla, Google and Opera have announced the WebGL, which can be used to build in 3D graphics into a homepage without any separate external plug-in. The standard is based on the OpenGL and the first version will be available within a few months. To be able to carry out this, basically new input and display hardware and software tools are needed. From these the key element is the stereoscopic visualization. These can be grouped in a number of different ways. To give a detailed description of these technologies would go beyond the limits of this article.

It is important to emphasize here that compared to the many conventional display devices significantly different new technologies are developed in this field (one promising domestic example is holographic TV). In home usage the most widely used technology is anaglyph technique because it only requires a simple screen and even a home-made anaglyph (colour filter) glasses is sufficient. This technology also appeared on YouTube. On the file sharing portals many films can be found whose stereo has been made by anaglyph technique. The first stereo cinemas used polar-filter technology, so this tradition has a history of several decades but presently modern cinemas have switched to stereo infitec technology. In both cases an appropriate optical filter is placed in front of the projector, which makes this technology too complicated to use in the case of monitors. On the other hand for just only about a little bit over than 100 000 HUF you can buy a 120-Hz monitor, which is capable to display images with 60-60 Hz alternating frequency, projecting the stereo image separately for the right and left eye. The monitor comes with an accessory, active shutter glasses, which is synchronized with the monitor and able to split the images for the left and right eye. Although it is likely that future of 3D screens would work without glasses. Such displays have appeared already on the market but their prices are over twice as much as the ones which use glasses.

Telemanipulation and monitoring based on the 3D Internet

When a cognitive infocommunication instrument is used to give an online command through the 3D Internet to a robot to perform a task, then we came to the 3D Internet-based telemanipulation. This also includes monitoring. The 3D visualization of the monitored information content of the human cognitive processes, perceptual abilities and as well as the speed and the importance of the information, is a separate science.

Intelligent space, as the forerunner of the 3D Internet based cognitive infocommunications

The “Intelligent Space" is an extension of the 3D virtual reality equipped with intelligence. In this sense it goes beyond the boundaries of 3D Internet but in current case it can be viewed as the preliminary version of it and it is considered to be an important field of application, because it has determinative role in the intelligent space concept, where distributed intelligent devices are connected through the Internet.

A defined area (e.g. a room) can be considered as an intelligent space, if it is equipped with distributed actuators, sensors and robots who jointly “understand” and monitor the actions taken place in the virtual space and thus able to influence the events or help the humans staying in the virtual space.

The “Intelligent Space" is the first definition and is the trademark of the first implemented system called iSpace, which burst into the public awareness in the nineties as the result of Hideki Hashimoto, professor of Tokyo University, work [6], [7]. The tools for the 3D Internet and cognitive infocommunication are ideal for iSpace-s.

It is necessary to distinguish two cases. In one people are communicating between each other (at both ends of the communication channels are humans). In this case the task of the cognitive information device is to deliver non- and para-verbal information in the best possible way.

It is a completely different situation, when we communicate with a machine or with an artificial intelligence. Not long ago the programming language of machinery was completely abstract and only a few professional had the privilege to understand it. Today not only a small group of professionals are forced to communicate with machines, thus there is a strong demand to develop cognitive information channels. Here we have to emphasize the customization of personal tools for informatics to fit for personal needs. For users the personal tools for informatics are almost like "partners", with whom the communication should be carried out in the same way as with another human being.

The most important condition of this is that we should be able to talk to our device; moreover the para- and non-verbal channels should preferably work in both directions and in 3D because

that is our natural environment. With this the real challenge is when the artificial intelligent device communicates with a human because the “feelings” of the artificial system, - voltage, current, torque, angular momentum, consumption, etc. - are completely different from those of the humans. All these feelings have be transformed to human senses in such a way that either the sensory organs with the appropriate resolutions and speeds are attached together or their combinations, since in many cases we can’t even break down which senses determined our action. For example, a racing driver autopilot manoeuvres according to the engine torque, speed and many other parameters that are hardly understandable for people while humans drive according to the shifting of the landscape, the sound of the engine and many divergent acceleration measurement sensors in our body. When we drive a car in a virtual space and control an autopilot, the “senses” of the autopilot have to be transformed to human senses using cognitive infocommunication tools.

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