

Language Resource Management
Descriptors and Mechanisms for Language Resources

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Architecture Standardization – A way towards coherent IT environments

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1 The challenge

IT is on its way to pervade the everyday life. Multimedia appliances, intelligent environments and personal digital assistance are becoming ubiquitous. However, as the man-machine ratio is beginning to drop well below one, the task of maintaining a coherent overall interaction experience is becoming increasingly difficult to manage. The user will obviously not be able, let alone willing, to manually set up and configure devices and net-work connections between devices, whose existence he may even not know about! For future IT enabled devices, the ability to automatically configure themselves and to integrate automatically into an existing web of appliances is becoming a mandatory feature that will decide on the user acceptance and on the effective viability of the technological dream of pervasive, ubiquitous, ambient, or otherwise invisible computing.

Topics that have to be tackled are such very challenging things as:

- Creating a common language for sharing knowledge about user interactions between different devices in order to support distributed multi-modal interaction. (dialogic aspects)
- Creating a common and extensible language for describing the capabilities of devices that allows devices to deliberately make use of each other in order to fulfill a user request. (effectual aspects)
- Creating a common and extensible language for describing the relevant aspects of the surrounding situation within which the user and the device ensemble is located. (situational aspects)

Of course, besides defining these “domains of discourse”, we also need suitable mechanisms for supporting a distributed “knowledge management”. And we need to provide concepts that are scalable enough that not only work stations, PCs, and notebook computers may participate in such a device ensemble, but also smart watches, intelligent clothing, and enlightened lamps – things that can only spend a rather countable number of bytes and processor cycles on knowledge sharing.

2 Towards a common language

The topics that have to be addressed are in order to approach the above challenge are of both technological and organizational nature. Before we can develop systems that inter operate smoothly, we need to have a common understanding of what these things have to talk about between the research and development institutions in this area. The field we have to tackle is multi-disciplinary by nature, spanning ergonomics, user interface technology, knowledge

management and intelligent systems, middleware and networking, up to the level of embedded processors. Our experiences show ¹ that homogenizing the different concepts attached by different specialists to the same notion is already a challenge in itself.

One thing that we need is a *common language* for the researchers in our field, a *reference model* that precisely defines the essential notions and concepts that we need to be able to argue about. Of course, this reference model will have to acknowledge and assess ongoing work in the different specialist fields, and it has to put these fields and their activities into a sound overall structure. In a second step (conceptually second, although possibly temporally in parallel), we have to closer look at the different tiers, columns, levels, or hunks of our domain structure. Here we have to identify areas where we can collect, codify, and standardize existing know-ledge (e.g., for exchanging speech acts) and areas, where we need *new* models, algorithms, and solutions – areas where joint research projects may be the right approach. Among the relevant ongoing work in the different scientific and technical communities are the following activities:

- In the language and speech community, it was seen a necessity to start a standardization initiative within ISO TC37 / SC4, in which standards for language processing are to be established. The main focus is on language resources, but also the components that work on them undergo a certain attention. The question that arises is whether the architecture of distributed multi-modal assistant systems should also be addressed by these activities, in order to allow the researchers in the field to ground their notation about system components on a common language.
- In the middleware community, we have industry-standards such as JINI, UPnP, Salutation or HAVi (And we assume, this experience is shared by many other researchers) . The main focus here is the development of protocols that support dynamic resource discovery based on a syntactical level. These mechanisms form the technical foundation for creating interoperable ad-hoc device ensembles ² (For sake of completeness, it might also be worth considering current work on adaptive middleware).
- In the Web, the activities centred around the “Semantic Web” initiative and the DARPA “Knowledge Sharing Effort” have to be considered, where languages such as DAML/OIL and the ontologies defined on top of these languages are an important instrument for creating coherent systems based on a common domain structure.
- In the area of Multi-modal User Interfaces, meta-models such ARCH, PAC-AMO-DEUS, etc., try to outline the fundamental structure of multi-modal input processing.

These concepts form the architectural link between user interaction processing and application functionality. It should be clear that this list is by no means exhaustive. In a way, it is clear what the role of various system components such as speech recognition, language understanding, dialog management, middleware etcetera is, so why not clarify the role of these components in their interplay. As the field of spoken language dialog system comes together with other fields such as vision, computer graphics, networking and middleware, it is vital to come to a clear common understanding of the notions and terms of the aspects partly independently developed in the different fields.

3 Next steps

What is needed is a broad participation of key players from the multiple fields in this effort,

in order to gain an overall view to assistance systems rather than just a dialog, graphics or middleware centered one.

The prospects for such an initiative would be that first, if the communities see it an important necessity, a common language is established in which different architectures could be talked about, just like what the OSI seven layer reference model is for computer communication. From there, communication aspects between system components could be clarified up to (ultimately) a interoperable exchange, combination, and separation of system components that are scaled to fit the users need, availability of resources, environmental conditions and situational necessities.

In order to assess the necessity to proceed, it is planned to organize a workshop to-wards the end or beginning of next year, where the technical experts should discuss the need, benefits and efforts of a standardization of system architecture aspects in an open and unbiased fashion. The workshop will be organized by the authors in collaboration with Laurent Romary and will be announced in due time. Topics for the workshop, links to rele-vant groups and individuals, or simply the wish to be informed about the activities should be communicated by mail to rapp@sony.de, kirste@rostock.igd.fhg.de or Laurent.Romary@loria.fr.