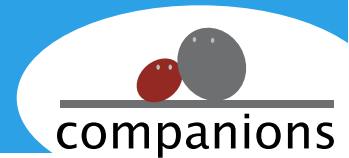


COMPANIONS:

<http://www.companions-project.org/>

Intelligent, Persistent, Personalised Multimodal Interfaces to the Internet



COMPANIONS is a 12.88m Euro interdisciplinary research project which focuses on combining advanced technologies to create personal, persistent 'agents' or 'Companions'. This will be an agent or 'presence' that communicates and develops a relationship with its user primarily by using and understanding speech. The vision is that of a personalised conversational, multimodal interface, one that knows its owner and is implemented on a range of platforms, both static and mobile.

Companions draw upon speech recognition, multimodal human-computer interfaces, intelligent agents, knowledge representation and inference and human language technology — all presented in an intuitive, natural interaction.

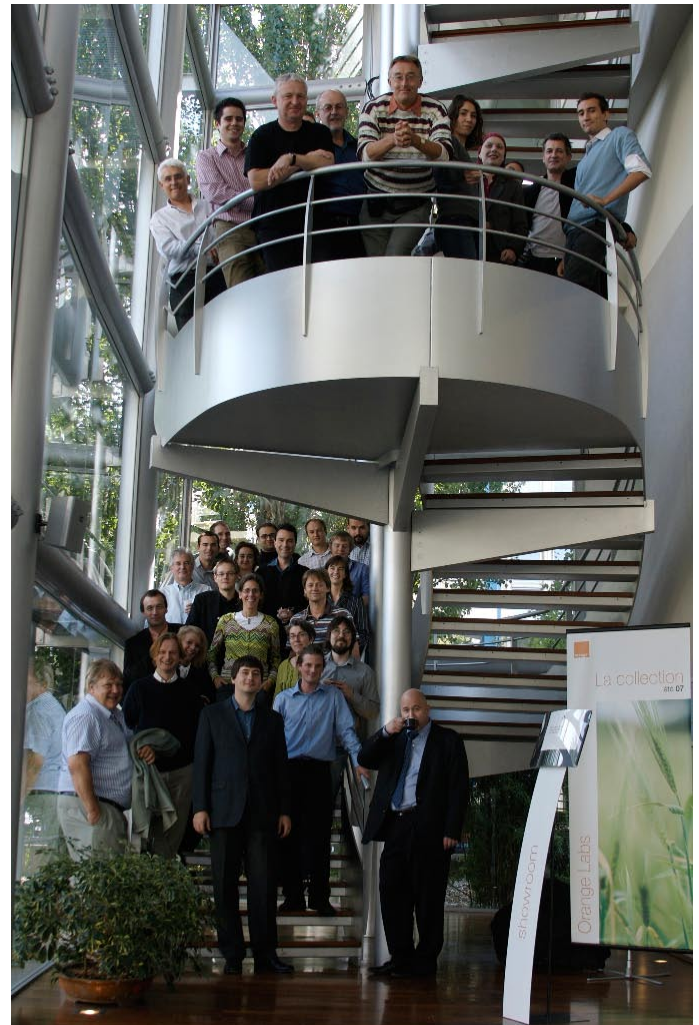
The embodiment of a Companion is relatively unimportant: it could be a screen head, a mobile phone, or some simple object, easy to carry about, like a handbag. **The key thing is talk:** the Companion, whatever its size or shape, will be a conversational entity, interacting with its owner over long periods. It is an ECA (Embodied Conversational Agent) but with an emphasis on the conversation rather than the graphical forms. That is what the project's first trial demonstrators are aiming at.

Research strategy after Year 2: from Prototypes to the Phase II Demonstrator

The Companions project approaches its mid point with its planned shift from Phase I prototypes and research to its Phase II demonstrator. The original motivating idea of the project was to build platforms rapidly with interesting Companion-like functionality: not as final products but as intermediate ones from which we could derive more data and on which we could build research experiments in planning, emotion and machine learning. All this was to be combined during Phase II into a final demonstrator on the basis of the initial evaluations of Phase I prototype performance.

The Phase II demonstrator is now being planned on the basis of the two Phase prototypes described elsewhere in this issue, their evaluations (also described here) — the key unifying idea will be that the same Companion personality will appear in each Companion manifestation, no matter what its physical form: mobile phone, PC screen, or rabbit toy.

The Companion's persistence of personality is shown by voice, attitude, its knowledge of its user's family, and its knowledge of the user's tastes and choices. As well as fusing the functionality and 'personality' we shall use the mid-term evaluations to select the best performing modules from the two prototypes for the Phase II demo.



Honours for Companions Coordinator

On 28 May Professor Yorick Wilks was awarded the 2008 biennial Zampolli Prize for 'Outstanding Contributions to the Advancement of Language Resources and Language Technology Evaluation within Human Language Technologies' by the European Language Development Association. He delivered his prize lecture at LREC-08 in Marrakech. He was also awarded the Association for Computational Linguistics' Lifetime Achievement Award at its 43rd annual meeting in Columbus, Ohio, on 18 June 2008. <http://www.companions-project.org/>

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THE PROJECT is now into its second year, and we have built the first phase demonstrators. There is a Senior Companion (SC) that engages the user in conversations relating to a set of photographs, tells jokes and reads the news. There is a Health and Fitness Companion (HFC), which attempts to promote exercise and a healthy diet in the user. The HFC has a static 'home' part where people talk to a Nabaztag character (a physical plastic rabbit-like artefact that has moving ears and flashing lights and a mobile part where they interact through a mobile phone).

The Nabaztag™ Rabbit as a first embodiment for a Companion

Many challenges have to be addressed in the pursuit of an artificial companion: its appearance and embodiment, the conditions under which it can successfully establish a relationship, its ability to access data and services, to store and process knowledge, to perform elementary reasoning and, a major emphasis of the Companions project, to communicate with its owner. Further, these are not independent dimensions: for instance, there are many difficult issues to address at the intersection of 'communication' and 'relationship', which range from affective dialogue, to the recurrent problem of communication initiative and interruptions.

Our original proposal had investigated different sorts of embodiment for companions, to lay the foundations for a rational selection of a companion design addressing the above dimensions in a way which would support our research. Yet, this careful plan was soon overridden by our previous exposure, as users rather than researchers, to the Nabaztag™ from Paris-based company Violet™, a wireless rabbit designed as a domestic information hub and the first consumer application of pervasive computing that proved a commercial hit.

The simple design and cuteness of the Nabaztag™ had already earned it cult status, and the amount of Web 2.0 user-produced material around it was sufficient evidence of how successful it had been in establishing relationships with its owners. It had even earned academic respectability by appearing in several studies on Pervasive Computing, for instance Tomitsch et al.'s taxonomy of ambient information systems.

From an I/O perspective, the Nabaztag™ provides the basis for Multimodal input (speech and RFID tag reading) and output (Text-To-Speech, patterns of ear movements and lighting patterns). Because the project's emphasis is on dialogue, its lack of mobility (if compared to robotic predecessors such as the Aibo™) is not a limitation either.

All in one, the Nabaztag™ provides embodiment, design, a Multimodal platform, and a wealth of data on its use and acceptance through a large user base. Already incorporated in Telefonica's digital kitchen, it serves as the embodiment of our Health and Fitness Companion. As Violet™, its manufacturer, is about to join the Companions project, this creates a unique opportunity for user studies as well as enhancing our exploitation prospects.

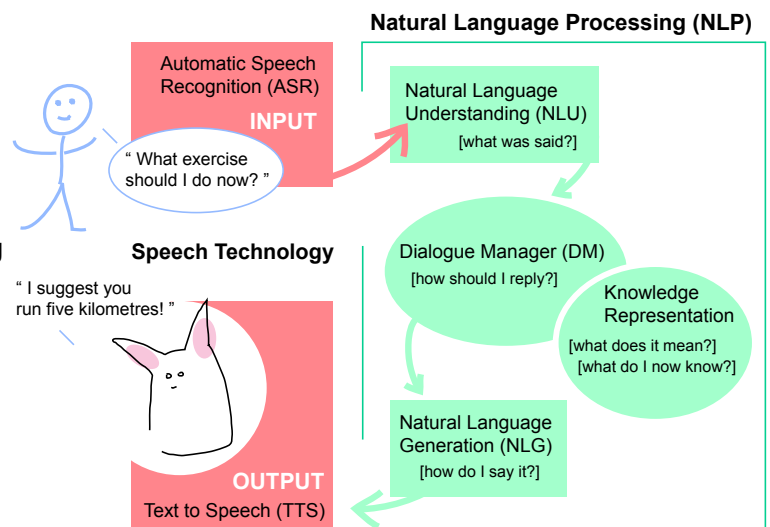
The Dialogue Corpora

The COMPANIONS project is developing a major corpus of material as it progresses. This material comes in the format of dialogue transcripts as well as audio and video recordings, and is available as a valuable resource for the research community.

Since January 2007, over 120 individual sessions have been undertaken with participants talking to a mix of real people and Wizard of Oz systems (people posing as machines), alongside fully functioning embodied conversational agents.

The majority of these dialogues are discussions with participants about their photo collections, focusing on reminiscing about specific images. It is particularly interesting to compare and contrast how people talk about their memories and relationships, as encapsulated by certain images, when they think they are having these discussions with another person and when they think they are talking with a computer system.

Analysis on this data is ongoing and multifaceted. It allows the project to explore the structure of the dialogues on linguistic, semantic, emotional and interaction levels, whilst also informing the project partners working on more technical components such as speech recognition and the effect of different computer generated voices. Naturally this corpora will grow, and hopefully alongside it our understanding of just what it is that makes for natural, informative and pleasurable conversations.



PUBLICATIONS and deliverables are all available on the website. The latest deliverables are: Decision Theory in Dialogue, Models of Domains, Models of Users, An Initial Prototype Companion, and Companions Interaction Design. We now have over fifty publications on the website, including papers and presentations from the Fourth International Workshop on Human-Computer Conversation (Bellagio, 2008).
See: <http://www.companions-project.org/research/>

Evaluating Human-Computer Conversation

In the summer of 2008 we undertook the first interim evaluations. The purpose of the evaluations was as much to refine the evaluation protocol and data gathering method as it was to evaluate the products.

However, some useful base-line data have been gathered. The question this has raised is what makes a good human-companion conversation. Accordingly we undertook a number of evaluations looking at a variety of measures. Some of these seek to evaluate improvement over the state-of-the-art, others seek to evaluate the concepts behind the prototypes, or to measure some specific aspect such as the level of social presence experienced with certain design choices.

Speech metrics were used to calculate the word error rate and concept error rate of the speech recogniser. Dialogue metrics include the duration of the dialogues, distribution of turn taking between prototype and the participant, vocabulary size and utterance lengths.

These are early days in the formation of the Companions concept. One way of looking at Companions is that they are technologies designed so that people form relationships with them. The aim is to move from human-computer interaction to human-technology relationship design. In the case of Companions, conversation is the central part of the interaction, and it is thus primarily through conversation that relationships will be formed. We believe that human-computer dialogues can be evaluated in terms of the quality of speech, the dialogue itself, the tasks, the users and the appropriateness of the dialogue for the context in which it takes place. We will continue to evolve novel methods of evaluation for the novel nature of human-companion conversation.

Images: [left, below] interacting with the Health and Fitness companion (Nabaztag embodiment) and [right] Interacting with the Senior Companion (screen avatar).



Emotion Revisited

Latest research suggests that not only does the Companion need to understand its user's emotions but also that it needs its own emotions to enable it to understand the world and motivate its behaviour.

During the course of a conversation people constantly monitor how they are doing and adapt their strategies to fulfil their current goals. To capture this feature on the Companions project we have to work out how our agents can judge a users emotional state and adjust their own. Humans have a wide range of underlying motivations but for a Companion its goals are always focused on the user: it needs to keep them happy while reconstructing their life narrative. To do this it needs to detect when a user isn't happy and adjust its own behaviour in response, experiencing positive 'emotions' when it succeeds.

Given the challenges in deriving emotion from speech we are taking a multimodal approach, unifying emotional information from both the tone and the content of the users utterances. By maintaining a model of both the users and its own personality our Companion can learn to produce utterances, rich with emotional content, that are specifically designed to reassure and encourage the user. By adapting to the user's personality in this way the Companion develops its own promoting an increasingly natural range of conversations.



Companions Winter School 2008: Prague

The Companions Winter School was organized by the Vilem Mathesius Centre at the Institute of Formal and Applied Linguistics, Charles University in Prague. The topic this year is 'Dialogue, Speech and Language': in line with the research issues tackled by the Companions project.

Speakers included leading researchers in the project - Markku Turunen (core dialogue architecture), Bjorn Gambäck (knowledge bases and reasoning), Fred Jelinek (speech recognition), Jan Hajic (natural language understanding and generation), Enrico Zovato (text to speech synthesis) and Roger Moore (emotion).

The audience was PhD students and postdocs working on the Companions projects, students of the Czech Universities involved in the project and their partners, and students from Central and Eastern European countries (thanks to additional funding from the Open Society Foundation).

Students from the NSF program 'Partnership for Research and Education' involved in cooperation with the Charles University will also be present.

<http://www.companions-project.org/events/>

Companions Workshop: Bellagio 2008

In October 2008, the Companions Project hosted the Fourth Workshop on Human-Computer Conversation at the Grand Hotel Villa Serbelloni in Bellagio, Italy. The Companions Coordinator, Yorick Wilks, started this series in 1997 with David Levy after they won the Loebner Computer Conversation Prize in New York that year.

The emphasis was on presenting practical, demonstrable, systems as opposed to theoretical ones, and to bring out for discussion both industrial and academic work, little of which was published in those days if not theoretically posed.

In 2008, when multimodal dialogue research is widely supported by the Commission and other agencies worldwide, the role of this workshop was to encourage discussion between on-going multimodal projects taking different approaches to emotion, on-the-fly knowledge representation, ECAs, machine learning, language and speech processing.

Distinguished invited speakers included: James Allen (Univ. of West Florida), Ricardo Baeza-Yates (Yahoo! Research), Jeff Bilmes (Univ. of Washington), Harry Bunt (Univ. of Tilburg), Marc Cavazza (Univ. of Teesside), Oliver Lemon (Univ. of Edinburgh), and Tim Paek (Microsoft Research, Redmond). Many related European projects were represented, including HUMAINE, CALLAS, SEMAINE, AMIDA NIMITEK, INDIGO, LIREC, PETICON, AMI and TALK, and there was a special concertation session on how to move forward together on matters of common interest between COMPANIONS and the CALLAS project.

Papers and presentations from the workshop are all available on the Companions website:

<http://www.companions-project.org/events/>

Companions Seminar: Artificial Companions in Society: economic, psychological and philosophical perspectives

The Oxford Internet Institute last November hosted a one day seminar on 'Artificial Companions in Society' to explore the effect on social life future Companions will have when they begin to contact each other. We asked: How will they change our relations with each other? How important will they be in the emotional and practical lives of their owners? The major featured speaker was Professor Sherry Turkle, who is Abby Rockefeller Mauzé Professor of the Social Studies of Science and Technology in the Program in Science, Technology, and Society at MIT and the founder (2001) and current director of the MIT Initiative on Technology and Self, a center of research and reflection on the evolving connections between people and artefacts.

The contributors assumed that some form of long-term computer Companions are now a certainty in the coming years, and that it is a good moment to consider their personal and social consequences from a set of wide interdisciplinary perspectives. Other well known contributors to the seminar included Professor Maggie Boden of Sussex University, and Dr David Levy, author of the recent book 'Love, Sex and Robots' (2008). It is expected the proceedings will be published as a book.



Turkle Seminar, Reception

Companions Consortium

University of Sheffield, University of Oxford, University of Teesside, Charles University, Swedish Institute of Computer Science, Napier University, As An Angel, Loquendo, University of Tampere, University of West Bohemia, University of Washington, Telefonica Group, France Telecom, TeliaSonera, University at Albany, Polar Rose

Scientific Governing Council

Members: James Allen (University of Rochester), Ricardo Baeza-Yates (Yahoo! Research Labs Europe), Riza Berka (CEO Hakia), Harry C. Bunt (University of Tilburg, Netherlands), Greg Grefenstette (Exalead), David Levy (Intelligent Systems), Rafi Haladjian (Nabaztag)