



Activity Report 2018

Team PHOENIX-POST

Programming Language Technology For Communication Services

Inria teams are typically groups of researchers working on the definition of a common project, and objectives, with the goal to arrive at the creation of a project-team. Such project-teams may include other partners (universities or research institutions).

RESEARCH CENTER
Bordeaux - Sud-Ouest

THEME
Distributed programming and Software engineering

Table of contents

1. Team, Visitors, External Collaborators	1
2. Overall Objectives	2
2.1. Context	2
2.2. A Multi-Disciplinary Approach	2
2.3. Overall Objectives	2
3. Research Program	2
3.1. Design-Driven Software Development	2
3.2. Integrating Non-Functional Concerns into Software Design	3
3.3. Human-Driven Software Design	3
4. Application Domains	4
4.1. Assistive computing in the home	4
4.2. Assistive computing on-the-go	5
4.3. Life Plan	5
5. New Software and Platforms	6
6. New Results	7
6.1. Towards context-aware assistive applications for aging in place via real-life-proof activity detection	7
6.2. Are visual cues helpful for virtual spatial navigation and spatial memory in patients with mild cognitive impairment or Alzheimer’s disease?	7
6.3. Early detection of mild cognitive impairment with in-home monitoring technologies using functional measures: A systematic review	8
6.4. A Language for Online State Processing of Binary Sensors, Applied to Ambient Assisted Living	8
6.5. Implementing a semi-causal domain-specific language for context detection over binary sensors	9
6.6. Towards Truly Accessible MOOCs for Persons with Cognitive Disabilities: Design and Field Assessment	9
6.7. Assistive Computing: a Human-Centered Approach to Developing Computing Support for Cognition	9
7. Partnerships and Cooperations	10
8. Dissemination	10
8.1. Promoting Scientific Activities	10
8.1.1. Scientific Events Organisation	10
8.1.2. Scientific Events Selection	10
8.1.3. Journal	10
8.1.4. Scientific Expertise	10
8.1.5. Research Administration	10
8.2. Teaching - Supervision - Juries	11
8.2.1. Teaching	11
8.2.2. Supervision	11
8.2.3. Juries	11
8.3. Popularization	12
8.3.1. Articles and contents	12
8.3.2. Interventions	12
9. Bibliography	12

Team PHOENIX-POST

Creation of the Team: 2018 January 01

Keywords:

Computer Science and Digital Science:

- A1.2.5. - Internet of things
- A1.4. - Ubiquitous Systems
- A2.1. - Programming Languages
- A2.4.2. - Model-checking
- A2.5. - Software engineering
- A2.6.2. - Middleware
- A5.1. - Human-Computer Interaction
- A5.11. - Smart spaces

Other Research Topics and Application Domains:

- B1.2.2. - Cognitive science
- B2.1. - Well being
- B2.5.2. - Cognitive disabilities
- B2.5.3. - Assistance for elderly
- B4.5. - Energy consumption
- B8. - Smart Cities and Territories

1. Team, Visitors, External Collaborators

Research Scientists

Bernard Serpette [Inria, Researcher, from Mar 2017]
Eugène Volanschi [Inria, Advanced Research Position]

Faculty Members

Charles Consel [Team leader, Institut National Polytechnique de Bordeaux, Professor, HDR]
Hélène Sauz on [Univ de Bordeaux, Professor, HDR]

Post-Doctoral Fellow

St phanie Giraud [Inria, until June 2018]

PhD Students

Audrey Landuran [Univ de Bordeaux]
Rafik Belloum [Inria]
C cile Mazon [Inria]

Technical staff

Amandine Desrozier [Inria, Research technician, until June 2018]
Flora Gallet [Inria, Research technician, until Sept 2018]

Intern

Benjamin Hate [Inria, from June 2017 until Sept 2017]

External Collaborator

Bernard N'Kaoua [Univ de Bordeaux]

2. Overall Objectives

2.1. Context

A host of networked entities (devices and services) are populating smart spaces that become prevalent (*e.g.*, building management, personal assistance, avionics) and large scale (*e.g.*, train station, city, highway network). These smart spaces are becoming intimately intertwined with our daily life and professional activities, raising scientific challenges that go beyond the boundaries of single field of expertise.

2.2. A Multi-Disciplinary Approach

We focus our attention on the domain of applications that orchestrate networked objects, whether populating smart spaces or worn by individuals on-the-go. Because such applications are intimately intertwined with the users' daily life and professional activities, they can improve users' efficiency in performing tasks or compensate for the users' deficiencies and disabilities, promoting autonomy. However, this emerging domain of *assistive computing* raises scientific challenges that go beyond the boundaries of Computer Science. To address these challenges, the Phoenix group has been conducting interdisciplinary research that combines

- Cognitive Science to study user needs and make a rigorous assessment of the services provided to users;
- Sensing and actuating expertise to support users, based on accurate and rich interactions with their environment;
- Design-driven software engineering to support and guide all the development process of the services provided to users.

2.3. Overall Objectives

The activities of the Phoenix group revolve around three main avenues of research.

Design-driven software development. We further the study of design-driven software development, exploring the integration of both functional and non-functional concerns in the design phase, as well as the human-computer interaction dimension. We also expand the scope of our approach by scaling it up to the orchestration of masses of sensors and actuators. This line of work is mainly concretized in a design-based development tool suite called DiaSuite.

Assistive computing in the home. This line of work leverages DiaSuite to develop an assisted living platform, named HomeAssist, which exploits the capabilities of smart spaces to provide services that compensate or remediate cognitive difficulties of users, drawn from needs analyses. This work is validated in the context of two research projects: HomeAssist for older adults, and ANDDI for adults with Intellectual Disabilities (ID). This platform is currently deployed in the homes of older adults where a variety of applications assist them with their daily activities.

Assistive computing on-the-go. We develop mobile assistive computing support based on tablets. In particular, we have developed a cognitive assistive technology for the inclusion of children with Autism in mainstreamed environments, named School+.

3. Research Program

3.1. Design-Driven Software Development

Raising the level of abstraction beyond programming is a very active research topic involving a range of areas, including software engineering, programming languages and formal verification. The challenge is to allow design dimensions of a software system, both functional and non-functional, to be expressed in a high-level way, instead of being encoded with a programming language. Such design dimensions can then be leveraged to verify conformance properties and to generate programming support.

Our research on this topic is to take up this challenge with an approach inspired by programming languages, introducing a full-fledged language for designing software systems and processing design descriptions both for verification and code generation purposes. Our approach is also DSL-inspired in that it defines a conceptual framework to guide software development. Lastly, to make our approach practical to software developers, we introduce a methodology and a suite of tools covering the development life-cycle.

To raise the level of abstraction beyond programming, the key approaches are model-driven engineering and architecture description languages. A number of *architecture description languages* have been proposed; they are either (1) coupled with a programming language (e.g., [35]), providing some level of abstraction above programming, or (2) integrated into a programming language (e.g., [31], [36]), mixing levels of abstraction. Furthermore, these approaches poorly leverage architecture descriptions to support programming, they are crudely integrated into existing development environments, or they are solely used for verification purposes. *Model-driven software development* is another actively researched area. This approach often lacks code generation and verification support. Finally, most (if not all) approaches related to our research goal are *general purpose*; their universal nature provides little, if any, guidance to design a software system. This situation is a major impediment to both reasoning about a design artifact and generating programming support.

3.2. Integrating Non-Functional Concerns into Software Design

Most existing design approaches do not address non-functional concerns. When they do, they do not provide an approach to non-functional concerns that covers the entire development life-cycle. Furthermore, they usually are general purpose, impeding the use of non-functional declarations for verification and code generation. For example, the Architecture Analysis & Design Language (AADL) is a standard dedicated to real-time embedded systems [32]. AADL provides language constructs for the specification of software systems (e.g., component, port) and their deployment on execution platforms (e.g., thread, process, memory). Using AADL, designers specify non-functional aspects by adding properties on language constructs (e.g., the period of a thread) or using language extensions such as the Error Model Annex.¹ The software design concepts of AADL are still rather general purpose and give little guidance to the designer.

Beyond offering a conceptual framework, our language-based approach provides an ideal setting to address non-functional properties (e.g., performance, reliability, security, ...). Specifically, a design language can be enriched with non-functional declarations to pursue three goals: (1) expanding further the type of conformance that can be checked between the design of a software system and its implementation or execution infrastructure, (2) enabling additional programming support and guidance, and (3) leveraging the design declarations to optimize the generated implementation.

We are investigating this idea by extending our design language with non-functional declarations. For example, we have addressed error handling [10], access conflicts to resources [34], quality of service constraints [33], and more recently, data delivery models and parallel computation models for masses of sensors [9].

Following our approach to paradigm-oriented software development, non-functional declarations are verified at design time, they generate support that guides and constrains programming, they produce a runtime system that preserves invariants and performs efficiently.

3.3. Human-Driven Software Design

Knowledge of the human characteristics (individual, social and organizational) allow the design of complex system and artifacts for increasing their efficacy. In our approach of assistive computing, a main challenge is the integration of facets of Human Factors in order to design technology support adapted to user needs in term of ergonomic properties (acceptability, usability, utility etc) and delivered functionalities (oriented task under user abilities constraints).

¹The Error Model Annex is a standardized AADL extension for the description of errors [37].

We adapt this approach to improve the independent living and self-determination of users with cognitive impairments by developing a variety of orchestration scenarios of networked objects (hardware/software) to provide a pervasive support to their activities. Human factors methodologies are adopted in our approach with as direct purpose the reliability and efficiency of the performance of digital support systems in respect of objectives of health and well-being of the person (monitoring, evaluation, and rehabilitation).

Precisely, our methodologies are based on a closed iterative loop, as described in the figure below :

- Identifying the person needs in a natural situation (*i.e.*, desired but problematic activities) according to Human Factors Models of activity (*i.e.*, environmental constraints; social support networks - caregivers and family; person's abilities)
- Designing environmental support that will assist the users to bypass their cognitive impairment (according to environmental models of cognitive compensatory mechanisms); and then implement this support in terms of technological solutions (scenarios of networked objects, hardware interface, software interface, interaction style, *etc*)
- Empirically evaluating the assistive solution based on human experimentations that includes ergonomic assessments (acceptability, usability, usefulness, *etc*) as well as longitudinal evaluations of use's efficacy in terms of activities performed by the individual, of satisfaction and well-being provided to the individual but also to his/her entourage (family and caregivers).

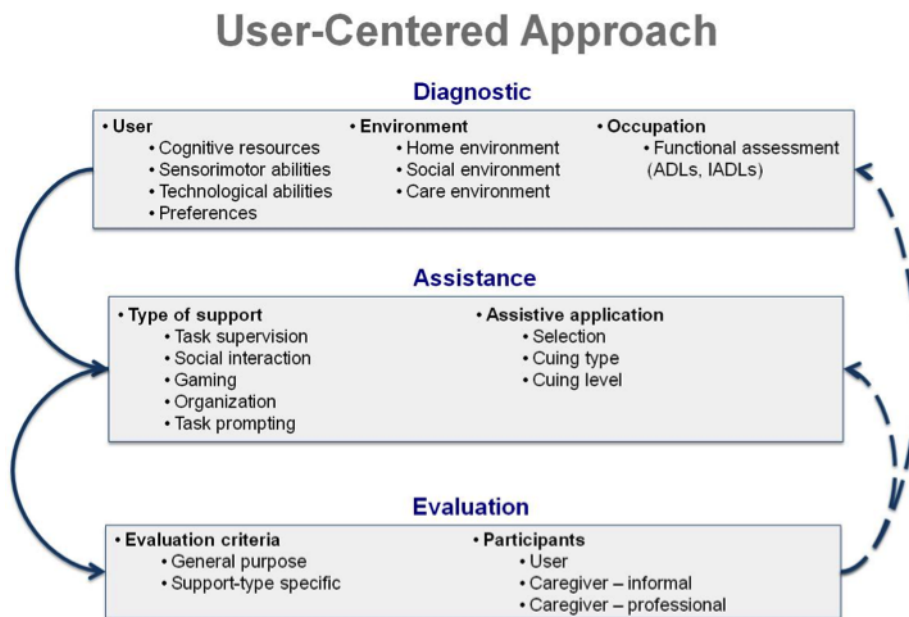


Figure 1. User-Centered Approach

4. Application Domains

4.1. Assistive computing in the home

Participants: Rafik Belloum, Audrey Landuran, Stéphanie Giraud, Flora Gallet, Amandine Desrozier, Charles Consel, Bernard Serpette, Eugène Volanschki.

In this avenue of research, we have been developing a systemic approach to introducing an assisted living platform for the home of older adults. To do so, we formed an interdisciplinary team that allows (1) to identify the user needs from a gerontological and psychological viewpoint; (2) to propose assistive applications designed by human factors and HCI experts, in collaboration with caregivers and users; (3) to develop and test applications designed and developed by software engineers; (4) to conduct a field study to assess the benefits of the platform and assistive applications, in collaboration with caregivers, by deploying the system at the actual homes.

Our research activities for assistive computing in the home are conducted under the *HomeAssist* project. This work takes the form of a platform offering an online catalog of assistive applications that orchestrate an open-ended set of networked objects. Our platform leverages DiaSuite to quickly and safely develop applications at a high level.

Our scientific achievements include the design principles of our platform, its key features to effectively assist individuals in their home, field studies to validate HomeAssist, the expansion of HomeAssist to serve individuals with ID, and the technology transfer of HomeAssist. Note that a complete presentation of this work, from a Cognitive Science perspective, is given in the doctoral thesis of Lucile Dupuy published recently (2016).

4.1.1. Project-team positioning

There is a range of platforms for assisted living aimed at older adults that have been developed for more than a decade. Most of these platforms are used in a setting where participants come to a research apartment to perform certain tasks. This setting makes it difficult to assess user acceptance and satisfaction of the proposed approaches because the user does not interact with the technology on a daily basis, over a period of time. Furthermore, older adults adopt routines to optimize their daily functioning at home. This situation calls for field studies in a naturalistic setting to strengthen the evaluation of assisted living platforms.

HomeAssist innovates in that it supports independent living across the activities of daily living and is validated by field studies in naturalistic setting.

4.2. Assistive computing on-the-go

Participants: Cécile Mazon, Benjamin Hate, Hélène Sauzéon, Charles Consel.

We conduct research on assistive computing supported by mobile devices such as smart phones and tablets. Both research projects presented in this section are supported by tablets and leverage their functionalities to guide users with cognitive challenges performing activities and tasks, whether in mainstream schools to support inclusion or in residential settings to support their autonomy. The mobile nature of tablets allows to envision such devices as supporting users with cognitive challenges across a range of environments.

Many research projects bring cognitive-support applications to users based on tablets and smartphones. However, few projects equip users with such devices in actual mainstream environments, including stakeholders in the design process and targeting an autonomous usage of assistive applications. An additional originality of our approach is our interdisciplinary approach that allows us to integrate key psychological dimensions in our design, such as self-determination.

4.3. Life Plan

Participants: Audrey Landuran, Bernard N'Kaoua.

Elaboration of life plan is a major stage in the developmental trajectory of people with intellectual deficiency and is based on several capabilities : make choices, express them, be aware of their consequences, etc. However, these various capabilities can raise problems for people with Down syndrome. The aim of this project has been to design and validate a digital assistant that allows to help the individuals to make choices, to plan for the future and to define their life plan. The user centered methodology employed has allowed to involve the people with Down syndrome, their families and their caregivers in all stages of design. Different validations achieved attest for the accessible, friendly, funny character of the assistant and its ability to promote the expression of the life plan in accordance with individuals' choices, wishes and desires.

The digital assistant is now available online at : <http://www.monprojetdevie.trisomie21-france.org/>.



Figure 2. Sample screenshots from the Life Plan website.

5. New Software and Platforms

5.1. Allen

The Allen DSL for online context detection over binary sensors

KEYWORDS: DSL - Contextual service - Iot - Sensors - Data stream

SCIENTIFIC DESCRIPTION: There is a large variety of binary sensors in use today, and useful context-aware services can be defined using such binary sensors. However, the currently available approaches for programming context-aware services do not conveniently support binary sensors. Indeed, no existing approach simultaneously supports a notion of state, central to binary sensors, offers a complete set of operators to compose states, allows to define reusable abstractions by means of such compositions, and implements efficient online processing of these operators.

The Allen language proposes a new approach for event processing specifically targeted to binary sensors. The central contributions of this language are a native notion of state and semi-causal operators for temporal state composition including: Allen logic's interval relations generalized for handling multiple intervals, and temporal filters for handling delays. Compared to other approaches such as CEP (complex event processing), our language provides less discontinued information, allows less restricted compositions, and supports reusable abstractions. We implemented a compiler for our language and applied it to successfully rewrite a full set of real Ambient Assisted Living services. The performance of our prototype interpreter has been shown to compete well with a commercial CEP engine when expressing the same services.

FUNCTIONAL DESCRIPTION: Main concepts and features: * Signal: formalized as a boolean function of (discrete) time. A signal models either the current state of a physical sensor or a higher-level context depending on such sensors. The "states" of a signal are the time intervals where the signal is 1. * Precise semantics of an Allen program: based on the above model. Allows checking domain properties. * Operators: allow to combine signals for deriving more complex signals. Each operator takes a given number of signals and produces a signal. For instance, the logic operators "and", "or", "not" have their usual meaning, at each time point, unary operators up(s) and down(s) produces the starting/ending events of signal s. Binary operator during(p,q) produces a signal containing the states of p entirely contained in some state of q. * Parameterized operators: take, besides a given number of signals, a given number of scalar (numeric) parameters, such as temporal delays. For instance, the unary operators gt[T](s) and lt[T](s) produces signals containing only the states of s which are longer/shorter than some delay T. * Language constructs for defining new operators. For instance, "def up(s) = gt[1](s)" allows defining operator "up" above, based on the more primitive operator "gt". This feature enables the construction of user-defined abstractions, and thus creating layers of reusable pieces of context logic. * Online context detection: the computation in real time of contexts based on incoming streams of events produces by sensors.

RELEASE FUNCTIONAL DESCRIPTION: First public version.

- Author: Eugène Volanschi
- Contact: Eugène Volanschi
- URL: <https://github.com/NicVolanschi/Allen>

6. New Results

6.1. Towards context-aware assistive applications for aging in place via real-life-proof activity detection

Assisted living applications can support aging in place efficiently when their context-awareness is based on a real-life-proof approach to activity detection. Recently, Caroux et al. proposed a new approach to monitoring activities dedicated to older adults, named "activity verification". This approach uses a knowledge-driven framework that draws from the literature on older adults. The purpose of the present study is to address the limitations of this approach by scaling it up and by demonstrating that it is applicable to context-aware assistive applications for aging in place. First, an experimental study was conducted in which this approach was used to monitor a large range of daily activities, for a long period (8 weeks of experimentation) and involving several participants (7 participants). Second, this approach was used to validate two examples of context-aware assisted living applications, via simulation, based on real-life sensor log data. Results showed that the applicability of the "activity verification" approach scales up to a large range of daily activities by extending this approach (with accuracy values ranging between 0.82 and 1.00 depending on the activity of interest). Its inter-participant and intra-participant consistencies were demonstrated. Its limitations were addressed and the applicability to context-aware assistive applications for aging in place running on a dedicated platform was demonstrated.

6.2. Are visual cues helpful for virtual spatial navigation and spatial memory in patients with mild cognitive impairment or Alzheimer's disease?

Objective: To evaluate whether visual cues are helpful for virtual spatial navigation and memory in Alzheimer's disease (AD) and patients with mild cognitive impairment (MCI). Method: 20 patients with AD, 18 patients with MCI and 20 age-matched healthy controls (HC) were included. Participants had to actively reproduce a path that included 5 intersections with one landmark at each intersection that they had seen previously during a learning phase. Three cueing conditions for navigation were offered: salient landmarks, directional arrows and a map. A path without additional visual stimuli served as control condition. Navigation

time and number of trajectory mistakes were recorded. Results: With the presence of directional arrows, no significant difference was found between groups concerning the number of trajectory mistakes and navigation time. The number of trajectory mistakes did not differ significantly between patients with AD and patients with MCI on the path with arrows, the path with salient landmarks and the path with a map. There were significant correlations between the number of trajectory mistakes under the arrow condition and executive tests, and between the number of trajectory mistakes under the salient landmark condition and memory tests. Conclusion: Visual cueing such as directional arrows and salient landmarks appears helpful for spatial navigation and memory tasks in patients with AD and patients with MCI. This study opens new research avenues for neuro-rehabilitation, such as the use of augmented reality in real-life settings to support the navigational capabilities of patients with MCI and patients with AD.

6.3. Early detection of mild cognitive impairment with in-home monitoring technologies using functional measures: A systematic review

Introduction: The aging of the world population is accompanied by a substantial increase in neurodegenerative disorders such as dementia. Early detection of dementia, i.e. at the mild cognitive impairment (MCI) stage, could be an essential condition for slowing down the loss of autonomy and quality of life caused by the disease, as it would provide a critical window for the implementation of early pharmacological and non-pharmacological interventions. However, the current assessments for MCI have several limitations. In this context, approaches involving smart home technologies offer many attractive advantages, including the continuous measurement of functional abilities in ecological environments. Objective: This systematic review aims to investigate the current state of knowledge on the effectiveness of smart home technologies for the early detection of MCI through the monitoring of everyday life activities. Methods: A systematic search of publications in Medline, EMBASE, CINAHL was conducted. Results: Sixteen studies were included in this review. Twelve studies were based on real-life monitoring, with several sensors installed in participants' actual homes, and four studies included scenario-based evaluations in which the participants had to complete various tasks in a research lab apartment. In real-life monitoring, the most used indicators of MCI were walking speed and activity/motion in the house. In scenario-based evaluation, time of completion, quality of activity completion, number of errors, amount of assistance needed, and task-irrelevant behaviors during the performance of everyday activities predicted MCI in participants. Discussion: Despite technological limitations and the novelty of the field, smart home technologies represent a promising potential for the early screening of MCI and could support clinicians in geriatric care.

6.4. A Language for Online State Processing of Binary Sensors, Applied to Ambient Assisted Living

There is a large variety of binary sensors in use today, and useful context-aware services can be defined using such binary sensors. However, the currently available approaches for programming context-aware services do not conveniently support binary sensors. Indeed, no existing approach simultaneously supports a notion of state, central to binary sensors, offers a complete set of operators to compose states, allows to define reusable abstractions by means of such compositions, and implements efficient online processing of these operators. This paper proposes a new language for event processing specifically targeted to binary sensors. The central contributions of this language are a native notion of state and semi-causal operators for temporal state composition including: Allen's interval relations generalized for handling multiple intervals, and temporal filters for handling delays. Compared to other approaches such as CEP (complex event processing), our language provides less discontinued information, allows less restricted compositions, and supports reusable abstractions. We implemented an interpreter for our language and applied it to successfully rewrite a full set of real Ambient Assisted Living services. The performance of our prototype interpreter is shown to compete well with a commercial CEP engine when expressing the same services.

6.5. Implementing a semi-causal domain-specific language for context detection over binary sensors

In spite of the fact that many sensors in use today are binary (i.e. produce only values of 0 and 1), and that useful context-aware applications are built exclusively on top of them, there is currently no development approach specifically targeted to binary sensors. Dealing with notions of state and state combinators, central to binary sensors, is tedious and error-prone in current approaches. For instance, developing such applications in a general programming language requires writing code to process events, maintain state and perform state transitions on events, manage timers and/or event histories. In another paper, we introduced a domain specific language (DSL) called Allen, specifically targeted to binary sensors. Allen natively expresses states and state combinations, and detects contexts on line, on incoming streams of binary events. Expressing state combinations in Allen is natural and intuitive due to a key ingredient: semi-causal operators. That paper focused on the concept of the language and its main operators, but did not address its implementation challenges. Indeed, online evaluation of expressions containing semi-causal operators is difficult, because semi-causal sub-expressions may block waiting for future events, thus generating unknown values, besides 0 and 1. These unknown values may or may not propagate to the containing expressions, depending on the current value of the other arguments. This paper presents a compiler and runtime for the Allen language, and shows how they implement its state combining operators, based on reducing complex expressions to a core subset of operators, which are implemented natively. We define several assisted living applications both in Allen and in a general scripting language. We show that the former are much more concise in Allen, achieve more effective code reuse, and ease the checking of some domain properties.

6.6. Towards Truly Accessible MOOCs for Persons with Cognitive Disabilities: Design and Field Assessment

MOOCs are playing an increasingly important role in education systems. Unfortunately, MOOCs are not fully accessible. In this paper, we propose design principles to enhance the accessibility of MOOC players, especially for persons with cognitive disabilities. These principles result from a participatory design process gathering 7 persons with disabilities and 13 expert professionals. They are also inspired by various design approaches (Universal Design for Learning, Instructional Design, Environmental Support). We also detail the creation of a MOOC player offering a set of accessibility features that users can alter according to their needs and capabilities. We used it to teach a MOOC on digital accessibility. Finally, we conducted a field study to assess learning and usability outcomes for persons with cognitive and non-cognitive impairments. Results support the effectiveness of our player for increasing accessibility.

6.7. Assistive Computing: a Human-Centered Approach to Developing Computing Support for Cognition

The growing population of cognitively impaired individuals calls for the emergence of a research area dedicated to developing computing systems that address their needs. The nature of this research area requires to bridge the many disciplines needed to develop human-centered, assistive computing systems. Such bridging may seem unattainable considering the conceptual and practical gaps between the related disciplines and the challenges of propagating human-related concerns throughout the many stages of the development process of assistive technologies. As a consequence, existing assistive technologies lack a proper needs analysis; their development is often driven by technology concerns, resulting in ill-designed and stereotype-biased systems; and, most of them are not tested for their effectiveness in assisting users. In this paper, we propose a systematic exploration of this vast challenge. First, we decline Assistive Computing as a research area and propose key principles to drive its study. Then, we introduce a tool-based methodology dedicated to developing assistive computing support, integrating a range of disciplines from human-related sciences to computer science. This methodology is purposefully pragmatic in that it leverages, aggregates and revisits numerous research results, concretizing it with a range of examples. More generally, our goal is i) to provide a framework to conduct research in the area of Assistive Computing and ii) to identify the necessary bridges between disciplines to account for all the dimensions of such systems.

7. Partnerships and Cooperations

7.1. International Initiatives

- Idex cooperation programme UB-UUW-Canada — Category B - Emerging Cooperation (2017-2018), managed by M. Fernandes and H. Sauzéon.
- Idex cooperation programme UB-UUW-Canada — Category A - Research projects - Priority topics (Aging) – (2017-2018), managed by M. Fernandes and H. Sauzéon.

8. Dissemination

8.1. Promoting Scientific Activities

8.1.1. Scientific Events Organisation

8.1.1.1. Member of the Organizing Committees

Hélène Sauzéon participated in organizing the residence seminar “Human and technology”, framed by the Institute of advanced studies of the Bordeaux University, held on Jun 5-6, 2018, at Cadillac, France.

Hélène Sauzéon organized the scientific workshop “Innovation technologique et maladies neurodégénératives” of the Excellence center BIND, on Nov 23, 2018.

8.1.2. Scientific Events Selection

8.1.2.1. Reviewer

Hélène Sauzéon and Stéphanie Giraud performed reviews for the ACM-CHI conference.

8.1.3. Journal

8.1.3.1. Reviewer - Reviewing Activities

Hélène Sauzéon performed reviews for the following journals: Psychonomic Bulletin and Review; Gerontology; PlosOne, Memory and Cognition, Aging, Neuropsychology and Cognition, International Journal of Environmental Research and Public Health.

8.1.4. Scientific Expertise

Hélène Sauzéon is a member for the evaluation committee CES 19 (TECSAN) - ANR, since 2017.

8.1.5. Research Administration

Hélène Sauzéon held the following responsibilities:

- Vice-Director of the Lab “Activité, handicap, cognition et système nerveux” (EA 4136), leader of the axis “Handicap cognitif”, since 2015.
- Member of the “Young researchers” committee within Inria Bordeaux, since 2015.
- Member of the Committee launching a new institute of advanced studies at the University of Bordeaux since 2016. In this context she participated at the design of this institute, leveraging her expertise in cognitive sciences and interdisciplinary research at Inria Bordeaux. Indeed, the aim of the institute is fostering interdisciplinary research, innovation, and creativity, by providing adequate financial support, educative and participative resources to researchers on the Bordeaux campus.
- Member of the International Relations Committee — IFR Handicap-INSERM, since 2017.
- Leader of the Innovations and Transfer committee of the excellence center BIND in Bordeaux, since 2018.

8.2. Teaching - Supervision - Juries

8.2.1. Teaching

- Master (M2) : Charles Consel, “Advanced topics — Technology surveys”, 17h, Bordeaux INP, France
- Licence: H  l  ne Sauz  on, “Psychologie Cognitive G  n  rale”, 30h, University of Bordeaux, France.
- Master: H  l  ne Sauz  on, “Sciences cognitives du langage”, 30h, University of Bordeaux, France.
- Master: H  l  ne Sauz  on, “Neuropsychologie cognitive (Vieillesse normale et pathologique)”, 30h, University of Bordeaux, France.
- Master: H  l  ne Sauz  on, “Technologies du Handicap cognitif”, 30h, University of Bordeaux, France.
- Master: H  l  ne Sauz  on, “Facteurs Humains et IHM”, 9h, University of Bordeaux, France.
- Licence (L3) : Eug  ne Volanschi, “Introduction to imperative programming”, 24h, Bordeaux INP, France
- Licence (L3) : Eug  ne Volanschi, “Object-oriented programming”, 24h, IUT Informatique, Bordeaux, France
- Licence (L2) : Bernard Serpette, “Functional Programming”, 35h, Universit   de Bordeaux, France.
- Licence (L2): C  cile Mazon, “Fonctions ex  cutives”, 22h, MIASHS, Universit   de Bordeaux, France
- Licence (L2) : C  cile Mazon, “Introduction    la psychologie cognitive”, 22h, MIASHS, Universit   de Bordeaux, France
- Licence (L2): C  cile Mazon, “Applications d’assistance sur tablettes”, 7h, MIASHS, Universit   de Bordeaux, France
- Master : C  cile Mazon, “Pr  paration et   valuation en inspection ergonomique des interfaces”, 7h, Universit   de Bordeaux, France

8.2.2. Supervision

- PhD: Audrey Landuran, “Design, adaptation and validation of digital tools for people with intellectual disabilities”, defended on Nov 26, 2018, directed by Bernard N’Kaoua.
- PhD: A. Delmas, “Conception et validation d’un serious game pour l’  ducation th  rapeutique d’enfants asthmatiques”, defended on Sept 12, 2018, co-directed by H  l  ne Sauz  on and Pierre-Yves Oudeyer.
- PhD in progress : C  cile Mazon, “Personalization and evaluation of a digital assistant for school inclusion of college students with autism and/or intellectual disability”, University of Bordeaux, started in September 2016, co-directed by H  l  ne Sauz  on and Charles Consel.
- PhD in progress: P.A. Cinquin, “Conception et validation d’un lecteur accessible aux personnes avec troubles cognitifs pour un syst  me d’enseignement num  rique”, started in 2016, co-directed by H  l  ne Sauz  on and Pascal Guitton.
- PhD in progress: A. Zamudio Rodriguez, “Suivi longitudinal de l’impact    12 et 24 mois de la solution DomAssist aupr  s de personnes   g  es pr  -fragiles et fragiles”, started in Octobre 2017, co-directed by H  l  ne Sauz  on and K. P  r  s.
- PhD in progress: Rafik Belloum, “A methodology for developing assistive services”, started in 2016, directed by Charles Consel.

8.2.3. Juries

H  l  ne Sauz  on participated in the following juries:

- President of the PhD thesis jury for S. T. Popescu (PhD in Cognitive Sciences, supervised by M. Wexler and J. Sackure), 2018, École des Hautes Études en Sciences Sociales, Paris.
- President of the PhD thesis jury for I. Chraïbi Kaadoud (PhD in Computer Science, supervised by F. Alexandre and J.N. Rougier), 2018, Université de Bordeaux.
- Reviewer in the PhD thesis jury for L. Quillion-Dupré (PhD in Cognitive Sciences, Psychology and Neurocognition, supervised by V. Rialle and E. Monfort), 2018, Université de Grenoble.
- Examiner in the PhD jury for B. Clement (PhD in Computer Science, supervised by P.Y. Oudeyer and M. Lopez), 2018, Université de Bordeaux.

8.3. Popularization

8.3.1. Articles and contents

- Mazon, C., Fage, C. et Sauzéon, H. (2017). "Impacts des technologies numériques pour favoriser l'inclusion scolaire d'élèves avec Trouble du Spectre Autistique". In *Les Cahiers de l'Actif* (a journal for professionals working in caregiving and assistance).

8.3.2. Interventions

- Bernard Serpette, Mar 12, 2018: participating to the Week of math at the primary school St-Genes in Bordeaux: initiating 1st and 2nd grade pupils to computational thinking via problem-solving games
- Cécile Mazon, Sept 27, 2018: participating to the Open days at Inria Bordeaux: presenting to the general public the scientific projects about technology assistance for young persons with ASD.
- Cécile Mazon, Jan 18-19, 2018: Poster for the symposium UB-CNRS - "Sensibilisation et regards croisés autour du handicap", Pôle juridique, Université de Bordeaux, France
- Cécile Mazon, Jan 15-19, 2018: managing the internship of a high-school pupil (Roxane Allouche) at Inria Bordeaux

9. Bibliography

Major publications by the team in recent years

- [1] E. BALLAND, C. CONSEL, H. SAUZÉON, B. N'KAOUA. *A Case for Human-Driven Software Development*, in "ICSE'13: Proceedings of the 35th International Conference on Software Engineering (NIER track)", San Francisco, United States, May 2013, <http://hal.inria.fr/hal-00814296>
- [2] B. BERTRAN, J. BRUNEAU, D. CASSOU, N. LORIENT, E. BALLAND, C. CONSEL. *DiaSuite: a Tool Suite To Develop Sense/Compute/Control Applications*, in "Science of Computer Programming, Fourth special issue on Experimental Software and Toolkits", January 2014, vol. 79 [DOI : 10.1016/J.SCICO.2012.04.001], <https://hal.inria.fr/hal-00702909>
- [3] D. CASSOU, E. BALLAND, C. CONSEL, J. LAWALL. *Leveraging Software Architectures to Guide and Verify the Development of Sense/Compute/Control Applications*, in "ICSE'11: Proceedings of the 33rd International Conference on Software Engineering", Honolulu, United States, ACM, 2011, pp. 431-440, <http://hal.inria.fr/inria-00537789/en>
- [4] D. CASSOU, J. BRUNEAU, C. CONSEL, E. BALLAND. *Towards a Tool-based Development Methodology for Pervasive Computing Applications*, in "IEEE TSE: Transactions on Software Engineering", 2012, vol. 38, n° 6, pp. 1445-1463, <http://hal.inria.fr/hal-00683210>

- [5] C. CONSEL, L. DUPUY, H. SAUZÉON. *A Unifying Notification System To Scale Up Assistive Services*, in "ASSETS - The 17th International ACM SIGACCESS Conference on Computers and Accessibility", Lisbon, Portugal, October 2015, <https://hal.inria.fr/hal-01225637>
- [6] L. DUPUY, C. CONSEL, H. SAUZÉON. *Self Determination-Based Design To Achieve Acceptance of Assisted Living Technologies For Older Adults*, in "Computers in Human Behavior", September 2016, vol. 65, Accepted for publication in the journal Computers In Human Behavior [DOI : 10.1016/j.chb.2016.07.042], <https://hal.inria.fr/hal-01351332>
- [7] C. FAGE, L. POMMEREAU, C. CONSEL, E. BALLAND, H. SAUZÉON. *Tablet-Based Activity Schedule in Mainstream Environment for Children with Autism and Children with ID*, in "ACM Transactions on Accessible Computing ", March 2016, vol. 8, n^o 3 [DOI : 10.1145/2854156], <https://hal.archives-ouvertes.fr/hal-01330442>
- [8] M. KABÁČ, C. CONSEL. *Designing Parallel Data Processing for Large-Scale Sensor Orchestration*, in "13th IEEE International Conference on Ubiquitous Intelligence and Computing (UIC 2016)", Toulouse, France, July 2016, Best Paper Award, <https://hal.inria.fr/hal-01319730>
- [9] M. KABÁČ, C. CONSEL, N. VOLANSCHI. *Designing Parallel Data Processing for Enabling Large-Scale Sensor Applications*, in "Personal and Ubiquitous Computing", 2017 [DOI : 10.1007/s00779-017-1009-1], <https://hal.inria.fr/hal-01470281>
- [10] J. MERCADAL, Q. ENARD, C. CONSEL, N. LORIAN. *A Domain-Specific Approach to Architecturing Error Handling in Pervasive Computing*, in "OOPSLA'10: Proceedings of the 25th Annual ACM SIGPLAN Conference on Object Oriented Programming Systems Languages and Applications", États-Unis Reno, October 2010
- [11] M. TAILLADE, H. SAUZÉON, P. ARVIND PALA, M. DÉJOS, F. LARRUE, C. GROSS, B. N'KAOUA. *Age-related wayfinding differences in real large-scale environments: detrimental motor control effects during spatial learning are mediated by executive decline?*, in "PLoS ONE", 2013, vol. 8, n^o 7 [DOI : 10.1371/JOURNAL.PONE.0067193], <http://hal.inria.fr/hal-00906837>
- [12] P. VAN DER WALT, C. CONSEL, E. BALLAND. *Frameworks compiled from declarations: a language-independent approach*, in "Software: Practice and Experience", May 2016 [DOI : 10.1002/SPE.2417], <https://hal.inria.fr/hal-01236352>

Publications of the year

Articles in International Peer-Reviewed Journals

- [13] B. BÉCHADERGUE, L. CHASSAGNE, H. GUAN. *Vehicle-to-Vehicle Visible Light Phase-Shift Rangefinder Based on the Automotive Lighting*, in "IEEE Sensors Journal", 2018, pp. 5334 - 5342 [DOI : 10.1109/JSEN.2018.2839673], <https://hal.archives-ouvertes.fr/hal-01800369>
- [14] L. CAROUX, C. CONSEL, L. DUPUY, H. SAUZÉON. *Towards context-aware assistive applications for aging in place via real-life-proof activity detection*, in "Journal of ambient intelligence and smart environments", November 2018, vol. 10, n^o 6, pp. 445 - 459 [DOI : 10.3233/AIS-180505], <https://hal.inria.fr/hal-01921226>
- [15] M. COGNÉ, S. AURIACOMBE, L. VASA, F. TISON, E. KLINGER, H. SAUZÉON, P.-A. JOSEPH, B. N'KAOUA. *Are visual cues helpful for virtual spatial navigation and spatial memory in patients with mild*

- cognitive impairment or Alzheimer's disease?*, in "Neuropsychology", May 2018, vol. 32, n^o 4, pp. 385 - 400 [DOI : 10.1037/NEU0000435], <https://hal.inria.fr/hal-01803917>
- [16] L. DUPUY, H. SAUZÉON. *Ambient assisted living platforms for aging in place: lessons learned from a field study*, in "Gerontechnology", April 2018, vol. 17, n^o s, 109s p. [DOI : 10.4017/GT.2018.17.s.106.00], <https://hal.inria.fr/hal-01803882>
- [17] C. FAGE, C. CONSEL, E. BALLAND, K. ETCHEGOYHEN, A. AMESTOY, M. BOUVARD, H. SAUZÉON. *Tablet Apps to Support First School Inclusion of Children With Autism Spectrum Disorders (ASD) in Mainstream Classrooms: A Pilot Study*, in "Frontiers in Psychology", October 2018, vol. 9 [DOI : 10.3389/FPSYG.2018.02020], <https://hal.inria.fr/hal-01904791>
- [18] C. FAGE, C. MAZON, H. SAUZÉON. *School Inclusion of Children with ASD and Technology-based interventions : a review* , in "Enfance- Paris-", February 2018, vol. 1, pp. 103-130, <https://hal.inria.fr/hal-01804536>
- [19] M. LUSSIER, M. LAVOIE, S. GIROUX, C. CONSEL, M. GUAY, J. MACOIR, C. HUDON, D. LORRAIN, L. TALBOT, F. LANGLOIS, H. PIGOT, N. BIER. *Early detection of mild cognitive impairment with in-home monitoring technologies using functional measures: A systematic review*, in "IEEE Journal of Biomedical and Health Informatics", May 2018, pp. 1-11 [DOI : 10.1109/JBHI.2018.2834317], <https://hal.inria.fr/hal-01857758>
- [20] C. MAZON, C. FAGE, H. SAUZÉON. *Effectiveness and usability of technology-based interventions for children and adolescents with ASD: A systematic review of reliability, consistency, generalization and durability related to the effects of intervention*, in "Computers in Human Behavior", December 2018, <https://hal.inria.fr/hal-01950078>
- [21] N. VOLANSCHI, B. SERPETTE, A. CARTERON, C. CONSEL. *A Language for Online State Processing of Binary Sensors, Applied to Ambient Assisted Living*, in "Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies", 2018, vol. 2, n^o 4, 26 p. [DOI : 10.1145/3287070], <https://hal.inria.fr/hal-01947742>

International Conferences with Proceedings

- [22] P.-A. CINQUIN, P. GUITTON, H. SAUZÉON. *Towards Truly Accessible MOOCs for Persons with Cognitive Disabilities: Design and Field Assessment*, in "ICCHP 2018 - 16th International Conference on Computers Helping People with Special Needs", Linz, Austria, July 2018, <https://hal.inria.fr/hal-01761462>
- [23] C. CONSEL. *Assistive Computing: a Human-Centered Approach to Developing Computing Support for Cognition*, in "the 40th International Conference Software Engineering (ICSE)", Gothenburg, France, ACM Press, May 2018, vol. 18 [DOI : 10.1145/3183428.3183431], <https://hal.inria.fr/hal-01857736>
- [24] C. MAZON, C. FAGE, A. AMESTOY, I. HESLING, M. BOUVARD, K. ETCHEGOYHEN, H. SAUZÉON. *Cognitive mediators of school-related socio-adaptive behaviors in children and adolescents with ASD: A pilot study*, in "4th International Congress of Clinical and Health Psychology on Children and Adolescents", Palma de Mallorca, Spain, Book of Abstracts of the 4th International Congress of Clinical and Health Psychology on Children and Adolescents, Aitana Investigación, November 2018, <https://hal.inria.fr/hal-01939740>
- [25] L. PILLETTE, C. JEUNET, R. N'KAMBOU, B. N'KAOUA, F. LOTTE. *Towards Artificial Learning Companions for Mental Imagery-based Brain-Computer Interfaces*, in "WACAI 2018 - Workshop sur les "Affects,

Compagnons Artificiels et Interactions™", Ile de Porquerolles, France, June 2018, pp. 1-8, <https://hal.inria.fr/hal-01762612>

- [26] N. VOLANSCHI, A. CARTERON, C. CONSEL. *A Domain-Specific Approach To Unifying The Many Dimensions of Context-Aware Home Service Development*, in "The 15th IEEE International Conference on Ubiquitous Intelligence and Computing (UIC 2018)", Guangzhou, China, October 2018, The complete proceedings are available at <http://www.smart-world.org/2018/uic/conferenceProceedings.php>, <https://hal.inria.fr/hal-01956193>
- [27] N. VOLANSCHI, B. SERPETTE, C. CONSEL. *Implementing a semi-causal domain-specific language for context detection over binary sensors*, in "17th International Conference on Generative Programming: Concepts and Experiences (GPCE 2018)", Boston, Massachusetts, United States, Proceedings of the 17th ACM SIGPLAN International Conference on Generative Programming: Concepts and Experiences, ACM SIGPLAN, November 2018, pp. 66-78 [DOI: 10.1145/3278122.3278134], <https://hal.inria.fr/hal-01956179>
- [28] N. VOLANSCHI. *Stereo: editing clones refactored as code generators*, in "ICSME 2018 - 34th IEEE International Conference on Software Maintenance and Evolution", Madrid, Spain, September 2018, <https://hal.inria.fr/hal-01882545>

Scientific Books (or Scientific Book chapters)

- [29] F. LOTTE, C. JEUNET, J. MLADENOVIC, B. N'KAOUA, L. PILLETTE. *A BCI challenge for the signal processing community: considering the user in the loop*, in "Signal Processing and Machine Learning for Brain-Machine Interfaces", IET, 2018, pp. 1-33, Chapter 8, <https://hal.inria.fr/hal-01762573>

Other Publications

- [30] C. MAZON, C. FAGE, H. SAUZÉON. *Effectiveness and Usability of Technology-based Interventions with children and adolescents with ASD: a systematic review*, July 2018, EuroScience Open Forum (ESOF 2018), Poster, <https://hal.inria.fr/hal-01939765>

References in notes

- [31] J. ALDRICH, V. KOSTADINOV, C. CHAMBERS. *Alias Annotations for Program Understanding*, in "OOP-SLA'02: Proceedings of the 17th International Conference on Object-Oriented Programming, Systems, Languages, and Applications", New York, NY, USA, ACM, 2002, vol. 37(11), pp. 311–330
- [32] P. FEILER. *The Architecture Analysis & Design Language (AADL): An Introduction*, DTIC Document, 2006
- [33] S. GATTI, E. BALLAND, C. CONSEL. *A Step-wise Approach for Integrating QoS throughout Software Development*, in "FASE'11: Proceedings of the 14th European Conference on Fundamental Approaches to Software Engineering", Sarrebruck, Germany, Lecture Notes in Computer Science, Springer, March 2011, vol. 6603, pp. 217-231, <http://hal.inria.fr/inria-00561619>
- [34] H. JAKOB, C. CONSEL, N. LORIAN. *Architecturing Conflict Handling of Pervasive Computing Resources*, in "11th IFIP International Conference on Distributed Applications and Interoperable Systems (DAIS'11)", Reykjavik, Iceland, June 2011, <http://hal.inria.fr/inria-00581604>
- [35] R. N. TAYLOR, N. MEDVIDOVIC, E. M. DASHOFY. *Software Architecture: Foundations, Theory, and Practice*, Wiley, 2009

- [36] N. UBAYASHI, J. NOMURA, T. TAMAI. *Archface: A Contract Place Where Architectural Design and Code Meet Together*, in "ICSE'10: Proceedings of the 32nd International Conference on Software Engineering", New York, NY, USA, ACM, 2010, pp. 75–84
- [37] S. VESTAL. *An Overview of the Architecture Analysis & Design Language (AADL) Error Model Annex*, in "AADL Workshop", 2005