
How to import the concept of conviviality to web communities

Patrice Caire

Department of Computer Science and Communications,
University of Luxembourg,
6 Rue Richard Coudenhove-Kalergi,
L-1359 Luxembourg City, Luxembourg
Fax: 352 46 66 44 5 500
E-mail: Patrice.caire@uni.lu

Abstract: While conviviality has simultaneously been defined in the literature as individual freedom realised in personal interdependence, rational and cooperative behaviour and normative instrument, no model has yet been proposed for computer science. In this article, we raise the question of how to import the concept of conviviality to web communities. Firstly, we analyse the concept of conviviality for social science, multi-agent systems and intelligent interface; we show the distinction among various kinds of use of conviviality, the positive outcomes such as social cohesion, trust and participation but also the negative aspects that emerged when conviviality becomes an instrument of power relations. Secondly, we look at the challenges conviviality raises for computer science, starting with a discussion on the misconceptions about conviviality. We then discuss the role of conviviality in multi-agent systems, for example, as a useful high-level modelling concept for organisations and communities. Thirdly, we consider conviviality for computer science environments and discuss the role of awareness, also pointed out by mixed-initiative interaction design; furthermore, we discuss the importance of guidelines to address privacy challenges raised by new technologies. Fourthly, we look at the normative aspect of conviviality as described in the literature, and find that social norms for conviviality parallel legal and institutional norms for digital cities. Finally, we introduce the idea of conviviality measures based on agents' interdependencies.

Keywords: conviviality; multi-agent systems; MAS; normative systems; social computing; digital cities; web-based communities.

Reference to this paper should be made as follows: Caire, P. (2010) 'How to import the concept of conviviality to web communities', *Int. J. Web Based Communities*, Vol. 6, No. 1, pp.99–113.

Biographical notes: Patrice Caire is a PhD candidate under Prof. Leon van der Torre and a Teaching Assistant in the Computer Sciences Department of Luxembourg University. Her research interests are related to normative multi-agent systems, social computing, conviviality and digital cities. She received her Master of Science in Computer Science from the New York University Media Lab. under Prof. Jack Schwartz with research topics related to non-verbal communication over the internet. She has six years industrial experience at Stanford Research Institute, Scient, Netscape and AOL. She is a member of IEEE, ACM, SIGCHI and has published research papers at national and international conference proceedings.

1 Introduction

The concept of conviviality often comes up in the context of web communities to describe both sociable relations between members, and user-friendly software and hardware. However, the concept of conviviality also arises in institutional contexts to denote values usually attached to concepts such as eDemocracy.

Generally speaking, a convivial place or group is one in which individuals are welcome and feel at ease (Ackermann, 2005; Sipitakiat, 2001; Schechter, 2004), but definitions in literature spread from individual freedom realised in personal interdependence (Illich, 1974) to rational and cooperative behaviour (Sadek et al., 1997) to normative instrument when in the hands of power at play (Taylor, 2004). In 1998, the European Community developed a research theme called *Societe de l'Information Conviviale* (Weyrich, 1999), translated by User-Friendly Information Society, as part of its Fifth Framework research program to promote shared social values. The terms user-friendly and convivial are often used as synonymous, particularly in the area of human computer interaction (HCI). However, the distinction between user-friendliness and conviviality increases when such factors as, the user's emotional experience and the user's state of enjoyment, are taken into consideration. Today, user-friendly refers more specifically to a human-machine relation and to qualities, such as ease-of-use, compliance to ergonomics standards and usability heuristics.

In contrast, conviviality relates to social interaction and following Illich's definition, to 'individual freedom realised in personal interdependence'. Moreover, the concept of conviviality is finding new meaning in developing fields, such as adaptive systems, augmented cognition, and ambient intelligence. We therefore think that a thorough analysis of the concept of conviviality is useful and timely.

The European Community directives to incorporate conviviality into the information society of tomorrow drew attention to the relevance of conviviality for the online communities, such as digital cities; it also ensured that conviviality would be part of the specification and design of digital cities. This echoed Sadek et al.'s (1997) claim, that conviviality is the essential and global characteristic that emerges from the intelligence of a system rather than from a set of local characteristics that vary depending upon the application contexts and the types of users. The authors further add that a list of criteria will by itself not suffice to express conviviality, because in fact, the critical factor is the relations that bind these criteria together and the way these relations are perceived by individuals.

In this article, we raise the following question: How to bring the concept of conviviality to web communities? The literature shows that there is a challenge and our main question is that, assuming we use conviviality, what are the challenges in the computer science environment. Our main question breaks down into the following research questions: first, what is distinct in computer science? Second, what are the challenges with bringing the concept of conviviality to the field of computer science? Third, how can we define conviviality for computer science environments? And finally, can we use the social norm concept and measures? The methodology we follow for this article is a literature review in the areas of semiotics, philosophy, sociology, computer science, agent theory and human computer interaction. We then proceed with critical discussions. The layout of this article is as follows. In Section 2, we present a survey on the concept of conviviality in social science highlighting the challenges in literature; in

Section 3, we look at what is distinct in computer science. In Section 4, we discuss how we can define conviviality for computer science environments and in Section 5, we discuss the use of the social norm concept, normative systems and measures.

2 Conviviality

First, we note that the many definitions of conviviality remain vague and not technical (Table 1). We further note that the concept can be related to other non-technical socio-cognitive concepts, such as trust and power, that have acquired more technical interpretation in multi-agent systems (MAS) for example.

Table 1 Definitions of conviviality

<i>Etymological and domain specific definitions</i>
15th century ‘convivial’, from Latin, <i>convivere</i> ‘to live together with, to eat together with’ <i>French Academy Dictionary (Dictionnaire de l’Academie Francaise, 2000)</i>
Adj. convivial: (of an atmosphere, society, relations or event) friendly and lively, (of a person) cheerfully sociable (<i>Oxford English Dictionary, 2007</i>)
Technology: quality pertaining to a software or hardware easy and pleasant to use and understand even for a beginner. User friendly, usability by extension also reliable and efficient (<i>Le Grand Dictionnaire Terminologique, 2007</i>)
Sociology: set of positive relations between the people and the groups that form a society, with an emphasis on community life and equality rather than hierarchical functions (<i>Le Grand Dictionnaire Terminologique, 2007</i>)

2.1 Individuals vs. groups

First used in a scientific and philosophical context (Polanyi, 1974), in 1964, as synonymous with *empathy*, conviviality allows individuals to identify with each other thereby experiencing each other’s feelings, thoughts and attitudes. By extension, a community is convivial when it aims at sharing knowledge: Members trust each other, share commitments and interests and make mutual efforts to build conviviality and preserve it. A convivial learning experience is based on role swapping (Illich, 1971), teacher role alternating with learner role, emphasising the concept of reciprocity as key component and creating concepts such as learning webs, skill exchange networks and peer-matching communication, later expanded by Papert and the Constructionists with concepts such as *learning-by-making* (Papert and Harel, 1991).

Conviviality is then described as a social form of human interaction, a way to reinforce group cohesion through the recognition of common values. The sharing of habits and customs, for example the sharing of certain types of food or drinks, create and reinforce a community through a ‘positive feeling of togetherness’; individuals become part of the community which in turn, reinforces the community’s awareness of its identity. The physical experience of conviviality is transformed into knowledge sharing experience: ‘to know is to understand in a certain manner that can be shared by others who form with you a community of understanding’ (Schechter, 2004).

2.2 *From groups to institutions*

Illich (1974) further develop the concept of conviviality with his notion of ‘individual freedom realised in personal interdependence’. Conviviality should then be the foundation for a new society, one that gives its members the means, referred to as tools, for achieving their personal goals: ‘a convivial society would be the result of social arrangements that guarantee for each member the most ample and free access to the tools of the community and limit this freedom only in favour of another member’s equal freedom’. Conviviality is then seen by Putnam as an enhancement to social capital, a condition for the civil society where communities are characterised by political equality, civic engagement, solidarity, trust, tolerance and strong associative life (Putnam, 2000), therefore tightly linking the performance of political institutions to the character of civil life (Putnam, 1988). These ideas are further developed by Lamizet (2004) who characterises conviviality as both ‘institutional structures that facilitate social relations and technological processes that are easy to control and pleasurable to use’. An important use for conviviality today is for digital cities as a mechanism to reinforce social cohesion and as a tool to reduce miscoordinations between individuals (Caire and van der Torre, 2009a; Caire, 2009; Caire, 2008).

2.3 *The darker side of conviviality*

However, a negative side of conviviality emerges when it is instrumentalised, one group being favoured at the expense of another. Ashby argues that

“truth realities about minorities are built from the perspective of the majority via template token instances in which conflict is highlighted and resolution is achieved through minority assimilation to majority norms [...] Conviviality is achieved for the majority, but only through a process by which non-conviviality is reinforced for the minority.” (Ashby, 2004)

Taylor further added to this negative side the idea that conviviality can be used to mask the power relationships and social structures that govern communities. Taylor asks the question

“whether it is possible for convivial institutions to exist, other than by simply creating another set of power relationships and social orders that, during the moment of involvement, appear to allow free rein to individual expression [...]. Community members may experience a sense of conviviality which is deceptive and which disappears as soon as the members return to the alienation of their fragmented lives.” (Taylor, 2004)

2.4 *Summary*

We summarised, from different sources, positive and negative aspects of conviviality and present, as examples, some excerpts (Table 2): The emphasis is on sharing of common grounds and inclusiveness for positive side, on division and coercive behaviours for negative side.

Table 2 Different aspects of conviviality

<i>Positive aspects (enabler)</i>	<i>Grey aspects (ignorance)</i>	<i>Negative aspects (threat)</i>
Share knowledge and skills	Ignore cultural diversity	Crush outsiders
Deal with conflict	Hide conflict	Fragmentation
Feeling of ‘togetherness’	Promote homogenisation	Totalitarianism
Equality	Political correctness	Reductionism
Trust	Non-transparent systematic controls	Deception

3 Challenges

After looking at the multiple and broad range definitions and uses of conviviality in social sciences and noting the number and depth of ethical issues discussed in social science regarding the concept of conviviality, we recognise that conviviality raises a challenge for computer science. Which issues are relevant in computer science? How can the positive aspects of conviviality be used in computer science environment? What is distinct in computer science? How should the negative aspects of conviviality be taken into account?

3.1 Misconceptions

First, the various definitions of the notion of conviviality are notoriously vague. The definition of the *Grand Dictionnaire Terminologique* requires that various other vague concepts are made more precise, such as ‘positive relations’, ‘community life’ and ‘equality’. Second, the concept of conviviality is not technical and therefore not applicable for agent technology. Third, it is unclear how the concept of conviviality can be used for MAS. Before we present our case why we believe the concept of conviviality should play a role in MAS, we like to present some counterarguments.

First, we believe that the ambiguity and vagueness of conviviality is not a valid reason to discard it together with its associated social science literature, because this ambiguity and vagueness holds for most other social-cognitive concepts studied in MAS. Moreover, the existence of various definitions makes it possible to choose one which fits best the interests on the MAS community and, as we show in this paper, it is possible to make the vague definitions much more precise.

Second, the concept of conviviality and the associated social science literature is not technical. However, the concept can be related to other non-technical concepts used in MAS, which have a more technical interpretation. For example, the concept of conviviality was popularised by a book of Illich in 1973 called *Tools for Conviviality*, in which he defines conviviality as follows:

“Conviviality means individual freedom realised in personal interdependence.”

Dependencies have been related to goals of agents and the abilities of other agents to see to these goals, in particular due to reference to values like individual freedom, privacy, empathy and collective identity. However, we show in this paper how conviviality can be

mapped to agent concepts and that there also exist more pragmatic definitions of conviviality. Individual freedom, referred to by Illich, relates to the notion of agent autonomy, which is central in most definitions of agency. Moreover, there is also a more pragmatic conception of conviviality, which we adopt in this paper, which is not concerned with some of the more prosaic discussions in conviviality.

Third, the aim of social scientists is not to define the concept, but to create conviviality by creating the desired conditions for social interaction. This coincides with the aim of designers of MAS applications in ambient intelligence, digital cities or virtual communities. For example, Illich defines a convivial learning experience in which the teacher and the student switch roles, such that the teacher becomes the student and the student becomes the teacher. This role swapping emphasises reciprocity as a key component for conviviality. Such role swapping scenarios can directly be used in MAS and it has been emphasised here that conviviality is based on reciprocity (Gomes et al., 2004).

Example: The system proposed by Gomes et al. (2004) provides a recommendation service of student tutors for computational learning environments. ‘Each agent pupil represents a pupil logged onto the system. One of the functions of the system is to be the client for an instant message service. Through its agent pupil, any pupil can communicate with other pupils in the system. Another function of the agent pupil is to pass information on the affective states of the pupil. This information can be inferred by the agent or be adjusted by the pupil itself.’

The authors’ claim that ‘convivial social relationships are based on mutual acceptance through interaction’ hence on reciprocity and in this case students helping each other. A utility function takes as input a student’s social profile and computes the student’s affective states indicating if the student needs help; if she/he does then the system recommends a tutor. Remaining challenges are with defining utility function inputs to compute recommendations, presently a set of random values and to automate inferences of students requiring help. This exposes the urgent need for further research in evaluation methods and measures for concepts such as mood, sociability and conviviality.

However, these critical challenges of a technical nature, pointed out so far, are pale in comparison with the ethical issues raised by the possible development of such a system: preserving pupils’ privacy, securing the information gathered to create their social profiles, deterring possible misuse of pupils’ affective states and system errors concerning the data. In fact, it is imperative that designers of such systems use, for example, guidelines.

3.2 Role of conviviality

There are several reasons to add conviviality as a social-cognitive concept to computer science, for example, to MAS models and theories.

First, requirements for MAS expressed by politicians and managers say that systems must be convivial, whereas MAS researchers and developers use other concepts. As an analogy, consider a manager requiring of her system developers to have a convivial attitude during a meeting, in order, for example, to make it more efficient. Conviviality during the meeting is used as a tool to achieve the goals of the meeting and when the employees leave the meeting room, they go back to their conflicted relations with each other. The developers, however, may not understand the notion of a ‘convivial attitude’.

To model the requirement, the developers may interpret the conviviality requirement as being autonomous to make suggestions, being reactive to react the discussion in the meeting to reach their goals, being pro-active to take the initiative and being goal-directed and most importantly being social by interact with others to reach their goals.

Second, the use of conviviality as an agent concept ensures that considerations on the user-friendliness of MAS get the same importance and considerations on the functionality of the system. For example, our experience with the development of a digital city in Europe is that computer engineers are focussed on filling in forms and developing menu structures and other interface issues and do not take into account that a digital city should be a meeting place for human and artificial agents. In other words, they forget the metaphor of a real city which should be underlying the digital city. In particular, using conviviality in MAS models ensures that user friendliness is incorporated in the specification and design of MAS. There is a widespread belief that user friendliness is something, which can be added to a MAS once it has been developed. However, it is much more difficult to turn a non-convivial system into a convivial one, than developing a convivial system from scratch. Thus conviviality should be incorporated from the first design of the system.

Third, it is a useful high level modelling concept for organisations and communities, emphasising the social side of them rather than the legal side. Erickson and Kellogg (2000) say:

“In socially translucent systems, we believe it will be easier for users to carry on coherent discussions; to observe and imitate others’ actions; to engage in peer pressure; to create, notice and conform to social conventions. We see social translucence as a fundamental requirement for supporting all types of communication and collaboration.”

Taylor studies conviviality in British pantomime and observes that: ‘conviviality masks the power relationships and social structures that govern societies’.

This social perspective gives new way to look at normative systems. Norms are not just for static bureaucratic systems, but can also be used for dynamic systems. Social norms versus legal norms.

Example: Reputation is defined as ‘the overall quality or character as seen or judged by people in general and the recognition by other people of some characteristic or ability’ (Incorporated Merriam-Webster, 2006). When Casare and Sichman (2005) state that ‘reputation is an indispensable condition for the social conviviality in human societies’, they emphasise that reputation provides transparency quality of the information provided with reputation, throughout the group about its member, this transparency insures the conviviality of the group, as all group members receive the same information about their peers. The authors’ system insures that everyone is aware of anyone’s behaviour, that is anyone’s compliance or not to the rules of the group. Casare and Sichman define a functional ontology of reputation for MAS whereby ‘roles are played by entities involved in reputative processes such as reputation evaluation and reputation propagation’.

The authors’ claim that ‘concepts of the legal world can be used to model the social world, through the extension of the concept of legal rule to social norm and the internalisation of social mechanisms in the agent’s mind, so far externalised in legal institutions’. In their system, the agents actual behaviours are compared to the social norms observed in their world. The process, however, presupposes an initial reputation

profile of users that agents can then update in real-time. Reputation acts as a communication tool, ensuring complete social transparency throughout the system. The strict application of norms to reputation however may be difficult and suffer from rigidity. Of course, the same holds for conviviality.

‘Besides the obvious risk of accidental leaks of information, profiles also threaten universal equality, a concept central to many constitutions, basic laws and human rights, where ‘all men are created equal’ (Bohn et al., 2005). Indeed, extremely customised intelligent systems are very promising for users as they only get the information that is relevant to their profile, however, the fact that at the same time a large amount of information might be deliberately withheld from me because they are not considered a valued recipient of such information, would constitute a severe violation of privacy for many people and would create very non convivial environments.

Fourth, when developing user-friendly MAS, it is crucial to understand the inherent threads of conviviality. Whereas conviviality was put forward by Illich as a positive concept, also negative aspects were discussed. Agents are often not rational and cooperative to achieve conviviality (Sadek et al., 1997) and unity through diversity (Hofkirchner, 2004) may lead to suppression of minorities. Taylor explores the contradiction that conviviality cannot exist outside institutions: i.e., the question ‘whether it is possible that convivial institutions to exist other than by simply creating another set of power relationships and social orders that, during the moment of involvement, appear to allow free rein to individual expression. Community members may experience a sense of conviviality, which is deceptive and which disappears as soon as the members return to the alienation of their fragmented lives’.

Example: To fulfil his goal that ‘all service offerings must integrate conviviality to the interaction between user and system as an essential preoccupation’ (Sadek et al., 1997), Sadek et al. define a convivial agent as rational and cooperative. An interaction is defined as convivial ‘if the agent presents, jointly and at all times, one or all of the following characteristics: capacity for negotiation, contextual interpretation, flexibility of the entry language, flexibility of interaction, production of cooperative reactions and finally of adequate response forms’. These communicative capacities and social intelligence based on emotional intelligence are crucial to enhance agents’ ability to interact with users in a convivial way.

Furthermore, building on this work, Ochs et al. (2005) distinguish felt emotions from expressed emotions noting that ‘a person may decide to express an emotion different from the one she actually felt because she has to follow some socio-cultural norms’. We believe this direction to be very relevant to the evaluation of conviviality as it dissociates personal feeling from social expression.

4 Conviviality for computer science environments

According to Lamizet (2004), conviviality was elaborated to describe both ‘institutional structures that facilitate social relations and technological processes that are easy to control and pleasurable to use’. On one hand, conviviality allows individual expression facilitated by personalised interface and customised content while on the other hand, it contributes to the standardisation of media and the uniformisation of representation systems. In her study of animated toys, Ackermann (2005), looking at the relational

qualities of playthings notes that beyond humanoid traits, it is an AniMate's manners of interaction that matter: 'beyond smarts, it is its conviviality. Beyond obedience or bossiness, it is an AniMate's relative autonomy and ability to share control'. Building on Illich's (1974) notion of conviviality based on individual freedom and role swapping, Ackermann explores partial and shared control as critical quality of conviviality.

Moreover, in the context of spontaneous interactions, traditional security, with authorisations, is difficult to apply and innovative approaches, based on more dynamic notions such as conviviality, have to be investigated.

4.1 Awareness

With the increasing number of services and growing capacity of mobile devices such as PDAs and smart phones interacting with web applications, users rely more strongly on technology to keep their personal data while at the same time becoming less aware of the privacy risks they are exposed to, current solutions to protect users' privacy offer them little choice and control over the release of their data.

Example 1: Mobile Ubiquitous Privacy Protection for Electronic Transactions (MUPPET) (Cheng et al., 2007), proposes a privacy-aware information brokerage framework to address this issue: It introduces a purpose-based access control model that supports flexible and fine-grain policies using typed operation labels. Furthermore, the system allows reward-driven information exchange that provides a protocol for explicit communication. In other words, users must provide justifications as to why they want to contact you. Rewards are given to users who behave according to your privacy policies, which are tuned based on ongoing evaluation of the information exchange. Finally, the system includes a purpose detection engine with an intuitive user interface for purpose management. It also supports explicit as well as implicit purpose activations based on users' contexts or on users' authorisations.

Such a system provides ways to differentiate between the goals of the agents contacting the user and therefore provides added information for the user to be aware of the communication and to decide whether or not to accept it, providing a tool for a more convivial environment, in which the user can have more confidence. Tunable privacy policies, with more granular evaluation of the exchange, certainly add to obtain a closer match between the resulting policies and the communication exchanges. However, as it is based on a constant evaluation of the user communication, the question to clarify is regarding the evaluation methods and the inference engine that elaborates the policies. Moreover, an error from the purpose detection engine about the type of context the user is in could be very damageable for the user and make the systems rather non-convivial.

Example 2: In a rather new area of research called mixed-initiative interaction 'people and computers take initiatives to contribute to solving a problem, achieving a goal or coming to a joint understanding' (Horvitz et al., 2004). A critical element is how users focus their attention: 'attentional cues are central in decisions about when to initiate or to make an effective contribution to a conversation or project' (Horvitz et al., 2003). Mixed-initiative research aims at developing software that filters appropriately incoming information to shield users from incoming disturbances such as e-mails and phone calls. The filtering of incoming information is achieved through measuring user's keystrokes and scrolling activities, recording the number of opened windows, analysing content, checking events in calendars, location and time of day and also on psychological insights.

This allows for more convivial relations where users' need to concentrate on their goals, if they choose to, is being respected, while at the same time allowing other users to contact them if they want to without feeling set aside.

4.2 Guidelines

In a convivial environment, users feel their needs are taken care of, including their need to privacy and to security. To address the privacy challenges raised by new technologies, two levels of guidelines can be discerned. The easiest guidelines to implement, given the proper protocols, are to prevent unwanted surveillance by creating simple behaviours and to provide some base-line anonymity by devising communication protocols that use temporary, random identification.

Guidelines more difficult to implement are, for example, given a specific scenario:

- as certain parts of a system may have different security requirements, to find adequate security settings
- to create simple mechanisms for pseudonymity-based identity management
- to fulfil needed trust requirements by implementing digital signatures with corresponding public-key infrastructure and back-end systems with privacy aware databases and access technologies.

To elaborate guidelines for privacy-respecting infrastructures, laws and codes of practices together with social and technological realities should be taken into account. We may have accepted that personal data collection everyday erodes our privacy, however, a number of important threats need to be addressed: 'the improved means of subtly exerting influence and control through the large amounts of personal data that might be collected, not covertly, but as part of freely chosen services such as loyalty programmes, recommender systems, or payment schemes; the increased risk for identity theft and credit fraud through poorly implemented RFID authentication systems' (Langheinrich, 2005).

Example: In interactive systems, traditionally, a human user communicates and interacts explicitly with the system by using a variety of modality, however, intelligent systems create the need for new forms of HCI, transparent and decentralised. The concept of implicit human computer interaction (iHCI) proposes to take the users' context into account when creating new user interface for intelligent systems.

The basic idea of implicit input is that the system can perceive the interaction of the user with the physical environment and the overall situations in which the actions take place. The system anticipates the user's goal to provide appropriate support (Riva et al., 2005).

Issues being raised here are for example, how to find and analyse the situations relevant for the system? How to abstract from situation to context? How to link context to behaviour? The central questions reside in how to keep users in charge of their interaction and how to achieve a balance between stability and dynamics and these are the questions that conviviality can address with notions such of balanced equilibrium and dynamic personal interdependence.

Hence, the importance of clearly stating what kind of privacy we need and which level of privacy we need, to develop tools that address ethical issues, such as identity

theft and surveillance. These issues are raised by an increasing number of services and applications that can help contribute or prevent to import conviviality to virtual communities.

5 Norms and measures

The role of norms is increasingly getting attention specifically in MAS where the most common view is that ‘norms are constraints on behaviour via social laws’ (Boella et al., 2006b). In their introduction to normative MAS, Boella et al. (2006b) give the following definition: ‘a normative MAS is a MAS together with normative systems in which agents, on the one hand, can decide whether to follow the explicitly represented norms and on the other the normative systems specify how and in which extent the agents can modify the norms’. Agents therefore decide how to interact with each other, following conviviality conventions or not, they can, also, modify these conventions and thereby contribute to their evolution.

5.1 Kinds of norms

Several kinds of norms are usually distinguished in normative systems. Within the structure of normative MAS Boella and van der Torre (2004) distinguish ‘between regulative norms that describe obligations, prohibitions and permissions and constitutive norms that regulate the creation of institutional facts as well as the modification of the normative system itself’. A third kind of norms, procedural norms, can also be distinguished. Procedural norms ‘are not concerned with the content of any decision except one which alters decision-making procedures’ (Lawrence, 1976).

Boella et al. further describe action models where ‘agents are goal directed and try to maximise their choice of means to obtain a goal’. It is assumed that an agent belongs to a group and must follow the norms like all members of that group. In such a system, conviviality maximises benefits for a group, for instance, by standardising the conventions of the groups’ communications, conviviality contributes to the efficiency of processes and the achievement of the group’s common goals, it therefore contributes to reducing conflicts between members and allows efficient interaction and cooperation.

The role of norms for conviviality is that it reinforces social cohesion by reflecting the group’s core values internally as well as externally. By making the rules explicit, the role of norms for conviviality contributes to the elaboration of guidelines for conduct such as privacy protection guidelines; these guidelines are crucial for the development of intelligent systems applications and coordination systems. Finally, the social warranty and protection mechanisms of conviviality are achieved through the expression of the group members toward each other: rewards, praise and encouragements for members who abide by the rules; ostracism, anger and blame for the ones who do not. Such behaviour coordination and regulation mechanisms are the very ones that underlie web societies and they are addressed by explicit conviviality specifications.

5.2 Measures

In this section, we raise the question of how to measure conviviality. We first note that the degree of conviviality is not independent from other research in MAS such as

coalitions and reciprocity. For example, conviviality increases reciprocity, in the sense that in a convivial environment, agents cooperate more with each other. Additionally, reciprocity contributes to the emergence of conviviality, that is, the amount of inter-agent dependencies is a measure for conviviality. Furthermore, the number and the structure of these inter-agent dependencies is a measure for the level of conviviality of the environment and an indication of the possible emergence of coalitions between the agents.

6 Related research

Castelfranchi (2003) introduces concepts like groups and collectives from social theory in agent theory, both to enrich agent theory and to develop experimental, conceptual and theoretical new instruments for the social sciences. In Boella et al. (2007), the concept of social importance is analysed from a social power perspective. As an example of related concepts, a review of trust and reputation can be found in Sabater and Sierra (2005).

A large body of work on the design of agent societies has been produced, for example, the engineering of multi-agent systems as electronic institutions (Sierra et al., 2004), the organisation of MAS (Vazquez-Salceda et al., 2005; Ferber et al., 2003), the Gaia methodology (Zambonelli et al., 2003) and Tropos methodology (Bresciani et al., 2004).

An example of social structure, norms and ontologies for agent organisations can be found in Dignum et al. (2005), whilst an example of social laws for artificial agent societies in Shoham and Tennenholtz (1995).

Dependence networks are analysed in Sichman (1998) and Sichman and Conte (2002), and social networks analysis presented in Breiger (2004). In Sauro (2005), criteria for admissibility in agent coalition formation are proposed and in Boella et al. (2006a), strengthened.

7 Conclusions

Conviviality is usually considered a positive concept related to sociability. However, as it becomes an instrument of power relations, a darker side emerges. In fact, conviviality definitions, in the literature, range from ‘individual freedom realised in personal interdependence’ to ‘rational and cooperative behaviour’ to ‘a normative instrument’ hinting at the challenge. In this article, we raise the question of how to import the concept of conviviality to web communities. Firstly, we analyse the concept of conviviality for social science, MAS and intelligent interface. We show the distinction between various kinds of use of conviviality, on the one hand, the positive outcomes, such as social cohesion, trust and participation, and on the other hand, the negative side related to lack of diversity, privacy and ethical issues. Secondly, starting with a discussion on the misconceptions about conviviality, we look at the challenges conviviality raises for computer science. We then discuss the role of conviviality in MAS, for example as a useful high-level modelling concept for organisations and communities. Thirdly, we consider conviviality for computer science environments and discuss the role of awareness, also pointed out by mixed-initiative interaction design. Furthermore, we discuss the importance of guidelines to address privacy challenges raised by new

technologies. Fourthly, we look at the normative aspect of conviviality as described in the literature, and find that social norms for conviviality parallel legal and institutional norms for digital cities. Finally, we introduce the idea of conviviality measures based on agents' interdependencies.

In ongoing work, such as 'designing convivial digital cities' (Caire, 2009), we raise the question whether social intelligence design could be used to designing convivial digital cities. We look at digital cities from a social intelligence point of view, and, as an initial step towards obtaining measures for conviviality, present a case study describing interactions between users and agents using dependence graphs. Then, in 'convivial ambient technologies: requirement, ontology and design' (Caire and van der Torre, 2009a), we further develop the vision of conviviality as a key concept necessary to web communities by raising the question of, how to use the social concept of conviviality to develop user-friendly ambient intelligence applications? We present an analysis of conviviality requirements, propose a conviviality ontology, a dependence networks formalism and a design analysis based on coalition formation.

In future work, we propose to deepen our work on conviviality requirements using the agent-oriented software methodology Tropos. Moreover, we further develop our model from the formalisation we introduced using dependence networks in Caire and van der Torre (2009b) and Caire et al. (2008). Moreover, we are further developing our conviviality measures based on the coalitions identified in the networks.

Acknowledgements

The authors would like to thank the City of Luxembourg for their financial support.

References

- Ackermann, E.K. (2005) 'Playthings that do things: a young kid's 'incredibles'!', in *IDC '05: Proceeding of the 2005 Conference on Interaction Design and Children*, pp.1–8, ACM Press, New York, New York, USA.
- Ashby, W. (2004) 'Unmasking narrative: a semiotic perspective on the conviviality/non-conviviality dichotomy in storytelling about the German other', *Trans, Internet Journal for Cultural Sciences*, Vol. 1, No. 15.
- Boella, G. and van der Torre, L.W.N. (2004) 'Regulative and constitutive norms in normative multiagent systems', in Dubois, D., Welty, C.A. and Williams, M-A. (Eds.): *Knowledge Representation*, pp.255–266, AAAI Press.
- Boella, G., Sauro, L. and van der Torre, L. (2006) 'Strengthening admissible coalitions', in *ECAI 2006*, pp.195–199.
- Boella, G., Sauro, L. and van der Torre, L. (2007) 'From social power to social importance', *Web Intelligence and Agent Systems*, pp.393–404.
- Boella, G., van der Torre, L. and Verhagen, H. (2006) 'Introduction to normative multiagent systems', *Computational & Mathematical Organization Theory*, Vol. 12, Nos. 2–3, pp.71–79, October.
- Bohn, J., Coroama, V., Langheinrich, M., Mattern, F. and Rohs, M. (2005) 'Social, economic and ethical implications of ambient intelligence and ubiquitous computing', in Weber, W., Rabaey, J. and Aarts, E. (Eds.): *Ambient Intelligence*, pp.5–29, Springer-Verlag.
- Breiger, R.L. (2004) 'The analysis of social networks', *Handbook of Data Analysis*, pp.505–526.

- Bresciani, P., Perini, A., Giorgini, P., Giunchiglia, F. and Mylopoulos, J. (2004) 'Tropos: an agent-oriented software development methodology', *Autonomous Agents and Multi-Agent Systems Journal*, Vol. 8, pp.203–236.
- Caire, P. (2008) 'A normative multi-agent systems approach to the use of conviviality for digital cities', in J. Ossowski, S. Noriega, P. Sichman and J.S. Padget (Eds.): *Coordination, Organizations, Institutions, and Norms in Agent Systems III. COIN 2007 International Workshops COIN@AAMAS 2007, Honolulu, HI, USA, May 2007 COIN@MALLOW 2007, Durham, UK, September 2007 Revised Selected Papers*, Vol. LNCS 4870, pp.245–260.
- Caire, P. (2009) *Designing Convivial Digital Cities: A Social Design Intelligence Approach*, AI & Society.
- Caire, P. and van der Torre, L. (2009a) 'Convivial ambient technologies: requirements, ontology, and design', *The Computer Journal*.
- Caire, P. and van der Torre, L. (2009b) 'Temporal dependence networks for the design of convivial multiagent systems (short paper)', in *Proc. of 8th Int. Conf. on Autonomous Agents and Multiagent Systems (AA-MAS 2009)*.
- Caire, P., Villata, S., van der Torre, L. and Boella, G. (2008) 'Conviviality masks in role-based institutions: multi-agent teleconferencing in virtual worlds', in to be published, editor, *Proceedings of The Seventh International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*.
- Casare, S. and Sichman, J. (2005) 'Towards a functional ontology of reputation', in *AAMAS '05: Proceedings of the Fourth International Joint Conference on Autonomous Agents and Multiagent Systems*, pp.505–511, ACM Press, New York, New York, USA.
- Castelfranchi, C. (2003) 'The micro-macro constitution of power', *Protosociology*, Vol. 18, pp.208–269.
- Cheng, W., Li, J., Moore, K. and Karp, A.H. (2007) 'Muppet: mobile ubiquitous privacy protection for electronic transactions', *Information Society Technologies Report*, Hewlett Packard Laboratory, 03 April 2007.
- Dictionnaire de l'Academie Francaise* (2000) Neuvieme edition, Version informatisee.
- Dignum, V., Vazquez-Salceda, J. and Dignum, F. (2005) 'Omni: introducing social structure, norms and ontologies into agent organizations', in *ProMAS'04*, pp.181–198.
- Erickson, T. and Kellogg, W.A. (2000) 'Social translucence: an approach to designing systems that support social processes', *ACM Trans. Comput.-Hum. Interact.*, Vol. 7, No. 1, pp.59–83.
- Ferber, J., Gutknecht, O. and Michel, F. (2003) 'From agents to organizations: an organizational view of multi-agent systems', in *AOSE '03*, pp.214–230.
- Gomes, E.R., Boff, E. and Vicari, R.M. (2004) 'Social, affective and pedagogical agents for the recommendation of student tutors', in *Proceedings of Intelligent Tutoring Systems*.
- Hofkirchner, W. (2004) 'Unity through diversity dialectics – systems thinking – semiotics', *Trans, Internet Journal for Cultural Sciences*, Vol. 1, No. 15.
- Horvitz, E., Kadie, C.M., Paek, T. and Hovel, D. (2003) 'Models of attention in computing and communication: from principles to applications', *Commun. ACM*, Vol. 46, No. 3, pp.52–59.
- Horvitz, E., Koch, P. and Apacible, J. (2004) 'Busybody: creating and fielding personalized models of the cost of interruption', in Herbsleb, J.D. and Olson, G.M. (Eds.): *Computer Supported Cooperative Work*, pp.507–510, ACM.
- Illich, I. (1971) *Deschooling Society*, Marion Boyars Publishers, Ltd.
- Illich, I. (1974) *Tools for Conviviality*, Marion Boyars Publishers, August.
- Incorporated Merriam-Webster (2006) *Merriam Webster Online Dictionary*, Merriam-Webster.
- Lamizet, B. (2004) 'Culture – commonness of the common?', *Trans, Internet Journal for Cultural Sciences*, Vol. 1, No. 15.
- Langheinrich, M. (2005) 'Personal privacy in ubiquitous computing – tools and system support', PhD thesis, ETH Zurich, Zurich, Switzerland, May.

- Lawrence, D.G. (1976) 'Procedural norms and tolerance: a reassessment', *The American Political Science Review*.
- Le Grand Dictionnaire Terminologique* (2007) Office Quebecois de la Langue Francaise.
- Ochs, M., Niewiadomski, R., Pelachaud, C. and Sadek, D. (2005) 'Intelligent expressions of emotions', in Tao, J., Tan, T. and Picard, R.W. (Eds.): *Affective Computing and Intelligent Interaction*, Vol. 3784, pp.707–714, *Lecture Notes in Computer Science*, Springer.
- Oxford English Dictionary* (2007) Oxford University Press.
- Papert, S. and Harel, I. (1991) *Constructionism*, Chapter 1, MIT Press, Cambridge, Massachusetts.
- Polanyi, M. (1974) *Personal Knowledge: Towards a Post-Critical Philosophy*, University of Chicago Press, August.
- Putnam, R.D. (1988) 'Diplomacy and domestic politics: the logic of two-level games', *International Organization*, Vol. 42, No. 3, pp.427–460.
- Putnam, R.D. (2000) 'Bowling alone: the collapse and revival of American community', in *Computer Supported Cooperative Work*, p.357.
- Riva, G., Vatalaro, F., Davide, F. and Alcaniz, M. (2005) *Ambient Intelligence*, IOS Press.
- Sabater, J. and Sierra, C. (2005) 'Review on computational trust and reputation models', *Artif. Intell. Rev.*, Vol. 24, No. 1, pp.33–60.
- Sadek, M.D., Bretier, P. and Panaget, E. (1997) 'ARTIMIS: natural dialogue meets rational agency', in *International Joint Conferences on Artificial Intelligence*, No. 2, pp.1030–1035.
- Sauro, L. (2005) 'Formalizing admissibility criteria in coalition formation among goal directed agents', PhD thesis, University of Turin.
- Schechter, M. (2004) 'Conviviality, gender and love stories: Plato's symposium and Isak Dinesen's (k. Blixen's) Babette's feast', *Trans, Internet Journal for Cultural Sciences*, Vol. 1, No. 15.
- Shoham, Y. and Tennenholtz, M. (1995) 'On social laws for artificial agent societies: off-line design', *Artificial Intelligence*, pp.231–252.
- Sichman, J.S. (1998) 'Depint: dependence-based coalition formation in an open multi-agent scenario', *Artificial Societies and Social Simulation*, Vol. 1, No. 2.
- Sichman, J.S. and Conte, R. (2002) 'Multi-agent dependence by dependence graphs', in *AAMAS'02*, pp.483–490.
- Sierra, C., Rodriguez-Aguilar, J.A., Noriega, P., Arcos, J.L. and Esteva, M. (2004) 'Engineering multi-agent systems as electronic institutions', *European Journal for the Informatics Professional*.
- Sipitakiat, A. (2001) 'Digital technology for conviviality: making the most of students' energy and imagination in learning environments', Master's thesis, MIT, Cambridge, Massachusetts, USA.
- Taylor, M. (2004) 'Oh no it isn't: audience participation and community identity', *Trans, Internet Journal for Cultural Sciences*, Vol. 1, No. 15.
- Vazquez-Salceda, J., Dignum, V. and Dignum, F. (2005) 'Organizing multi-agent systems', *Journal of Autonomous Agents and Multi-Agent Systems*, Vol. 11, No. 3, pp.307–360.
- Weyrich, C. (1999) 'Orientations for work programme 2000 and beyond', *Information Society Technologies Report*, Information Society Technologies Advisory Group, 17 September 1999.
- Zambonelli, F., Jennings, N. and Wooldridge, M. (2003) 'Developing multiagent systems: the Gaia methodology', *IEEE Transactions of Software Engineering and Methodology*, Vol. 12, pp.317–370.