LetUs Assist: An Architecture for Coordinating Community-Based Collaborative Personal Assistant Intelligent Agents
(Extended Abstract)

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Abstract
Personal Assistants working within a common interest social community have special characteristics stemming from the common profile that is usually inherent in the community. Personal assistants should consult their own preference profile, the community common profile and the profiles of other peers of the community. In this research, we propose an architecture for an environment to handle such unique coordination.

Personal Assistants
Personal assistants are intelligent agents that can represent individuals on the Web [1]. They help users in their day-to-day activities, especially those involving information retrieval, negotiation, or coordination. A personal assistant might schedule a meeting, handle emails, sort and file correspondents, negotiate, or find information of interest to the individual. A personal assistant differs from a personalized search program or email filter in that it is inherently network-based, interactive and adaptive. For instance, in addition to managing personal calendars, personal assistants communicate with other personal assistants to schedule conferences and meetings. They can also consult other assistants to find preferred service providers, such as travel agents and dentists. This means that the preferences and experiences of one individual can benefit other individuals. In doing so, assistant agents don’t only manage and maintain the profiles and preferences of their owner individuals but also coordinate with the assistants of other individuals tobenefit from their expertise.

Figure 1: A Network of Coordinating Assistant Agents in a Single Social Community.
Figure 1 depicts a network of coordinating assistant agents each of which having its own preference profile that governs its response to requests. In its simplest form, when no rules found in the personal profile that supports a certain request, the agent interacts with its owner individual for an action. However, in a network of cooperative individual assistants, the assistant agent can first consult its peer assistants for how a response should be from their perspective before it validates the action from its owner individual. This way, individuals can share their expertise and opinions whilst agents can learn and hence update their profile.

**Assistant Agents Work in Communities**

Individuals, and hence their assistant agents, are not living and behaving in isolation, but rather they are socializing through communities that are sharing common interests. More interestingly, an individual usually subscribes to several social communities each of which is satisfying one of his interests (see Figure 2). Moreover, an individual may have different roles at different communities; therefore, his profile and behavior in the context of one social community might differ, and even sometimes contradicts with his behavior in another context. This research proposes an architecture that organizes assistant agents to serve in multi-contexts of several social communities where each individual has its own profile that fits with the general profiles and governing rules of the communities at large that he is a member of.

![Figure 2: An Assistant Agent is Involved in Several Social Communities](image)

**An Architecture of Coordinating Assistant Agents Within a Community**

The proposed architecture (Figure 3) organizes assistant agents in a network of coordinating agents. Unlike most environment architectures for collaborative agents [2], the assumption in this proposed design is that all those agents belong to the same community and hence, are all having a common general profile while each individual assistant agent has its own specific profile. Each assistant agent is composed of two main active agents. One is acting on the local Individual Personalized Profile (IPP) while the other is a socializing agent that collaborates with other peer assistant agents of the same community group. On the other hand, the community is managed by what we called it a “Community Governing Agent” (CGA) that is responsible for:

- Collaborating with all individual assistant agents of the community to revile knowledge about the community profile.
Managing the reconciliation process of newly learned knowledge.

Figure 3: Architecture of Coordinating Assistant Agents within Same Community

In response to a request, an agent seeks knowledge from three collaborating sources as in Figure 4. These sources are the Individual Personalized Profile (IPP), the Community Cultural Governing Profile (CCGP) and the Individual Personalized Profile of other community agents, respectively.

1. If $\exists r \in (IPP), r \text{ fits Request Q } \Rightarrow \text{Apply}(r)$.
2. If not $\exists r \in (IPP), r \text{ fits Q } \Rightarrow \text{Consult}(CCGP)$.
3. If $\exists r \in (CCGP), r \text{ fits Q }$:
   a. $\text{Apply}(r)$
   b. $(IPP)_i \cdot \text{Adopt}(r)$
   c. Verify Adoption with user
4. If not $\exists r \in (CCGP), r \text{ fits Q }$:
   $r = \text{Consult}(\text{Community})$.
5. If $\exists r \text{ fits Q } \Rightarrow \text{Apply}(r)$.

Figure 4: Strategy of Manipulating a Request in the Context of The Assistant Agents Community Architecture
A Hierarchy of Profiles
Although each individual should be having his own preferences profile, all the individuals within a certain community should be sharing a common profile that we can consider it as the governing profile for that community, namely the Community Cultural Governing Profile (CCGP). The CCGP, like the individual profile, can be built in two different ways. The first is the rules that are mandated and explicitly expressed, e.g., the code of ethics and the community regulations (we call it the Regulatory Rules). The second is the preferred behavior learnt through the practices of the members of the community (is called Cultural Rules). All individuals should obey the Regulatory Rules while some only follow the Cultural Rules. It is not necessarily that all individual profiles are subsets of the Community Cultural Governing Profile (CCGP). This research presents a hierarchical knowledgebase structure that organizes the different profiles in such a way to facilitate coordinating the response behaviors and the sharing of expertise.

The Regulatory rules are maintained by the Community administrators, while the Cultural rules are reconciled from the behaviors and profiles of the individual assistant agents in the community.

Reconciliation of the Governing Community Profile
A major problem that might take place in such a complex organization is how to reconcile the gained profiles of several individuals of the same community into the general community governor profile. In this research, two approaches are proposed for profile reconciliation, namely election and reputation. Communicating and conflicting rules of preferences are two main problems that are addressed by the profile reconciliation mechanism.

References