A Community Enhanced Personalisation System for Digital and Physical Social Spaces

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Abstract. The SOCIETIES project aims to provide a pervasive and social platform that seamlessly integrates pervasive computing technologies from the user's physical spaces with social computing technologies in the user's digital spaces. This paper focuses on the design of the SOCIETIES personalisation system which supports three key concepts: the exploitation of data from digital and physical spaces, the use of community personalisation information to enhance personalisation at an individual level and the personalised autonomous adaptation of an individual's digital and physical spaces. The SOCIETIES platform is currently under development following a user centric participatory design stage. Details of early paper trial results are under publication and a complete prototype will be released for live user trials in September 2012.

Keywords: Personalisation, Community, Physical, Digital

1 Introduction

The SOCIETIES project [1] aims to exploit the successes of social networking to promote the uptake of pervasive technologies. In doing so, the project aims to provide a pervasive and social platform that will combine the two paradigms in an integrated and seamless fashion. For example, consider the following scenario:

John is a Fresher on his first day at University and he has already used his SOCIETIES device to join the "Freshers" community. His SOCIETIES device suggests a lunch venue on campus based on John's physical location, his mood, his food preferences and the preferred venue of the Freshers community. John accepts the suggestion and his device navigates him to the lunch venue. On the way he passes other Freshers with very similar interests and a shared intent to go for lunch. His SOCIETIES device suggests an introduction and they all go for lunch together. This information is posted to John's SNS status (in line with his status update preferences).

This short scenario highlights three key concepts. Firstly we can see examples of data from both digital and physical social spaces being used together to provide a personalised experience for the end user. Secondly the scenario also demonstrates how community personalisation data (the preferred lunch venue of the Freshers

community) can also enhance the decision making and personalised experience of an individual community member. Thirdly, the scenario describes how John's digital and physical social spaces are both adapted by personalisation processes. The SOCIETIES personalisation system supports all three concepts building on the level of personalisation support provided by platforms that target the pervasive domain alone [2, 3, 4, 5, 6, 7]. This also extends beyond the level of personalisation supported by current SNS profile standards [8, 9, 10].

2 The SOCIETIES Personalisation System

Fig. 1 below shows the high level architecture of the SOCIETIES personalisation system. It also illustrates how the User & Community Context Management System (UCCMS) plays a vital mediating role in the collection of data from both digital and physical social spaces.
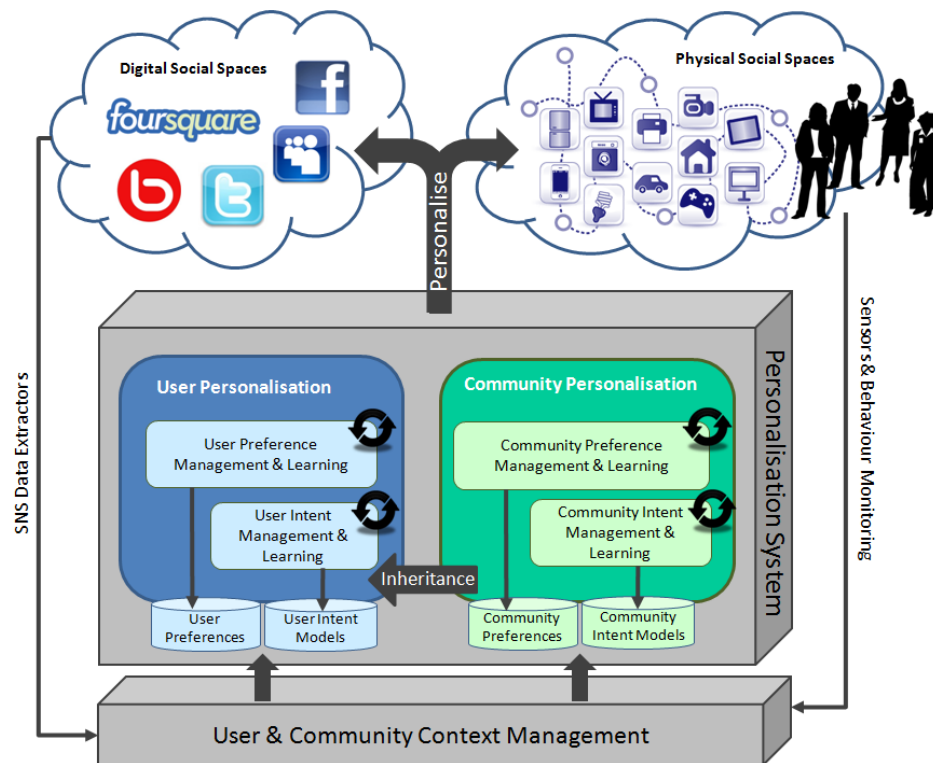

Fig. 1. Societies Personalisation System

SNS data extractors are used to extract data from the user's digital social spaces. This is limited to the API provided by a particular SNS. Extracted SNS data (such as interests, friend lists, "likes", etc.) is stored as context in the UCCMS to enhance already existing user and community context. Sensors are used to capture

environment data (such as location, proximity, temperature, etc.) from physical social spaces. This collected data is also stored as context in the UCCMS. Inference and fusion processes are applied across SNS and sensor data where appropriate to provide additional or more accurate context information.

Once stored as context in the UCCMS, no further distinction is made between context information extracted from a digital social space and that extracted from a physical social space. All context, regardless of its source, is accessed and handled by the other components of the SOCIETIES platform in exactly the same way. In addition to sensors, user behaviour monitoring mechanisms capture service usage behaviour from the user's physical social spaces. Each time the user interacts with a service, the SOCIETIES monitoring mechanisms capture the interaction and store it with a snapshot of the user's current context (potentially from both digital and physical spaces) to build up a User Behaviour History (UBH).

The SOCIETIES Personalisation system contains two subsystems; User Personalisation (UP) and Community Personalisation (CP). The UP subsystem acts on behalf of an individual user, processing the user's UBH to extract user preferences and user intent models (or user task models). Management mechanisms then continue to monitor user context and behaviours to predict future preferences and intents in order to personalise both digital and physical social spaces accordingly.

In addition, the CP subsystem acts on behalf of communities of users. Firstly, it retrieves the UBH of each individual user (in accordance with their privacy settings). Secondly a fusion process merges the individual UBHs to create a Community Behaviour History (CBH). Machine learning algorithms are applied to extract community preferences and community intent models which are stored with each community. This data can be utilised in two beneficial ways. Firstly, community members can choose to inherit all or parts of the community personalisation data to enhance their own preference or intent sets. Secondly a new user can inherit all or parts of the community data to give them initial preference and intent sets, avoiding the "starting from scratch" situation where minimal personalisation would be available.

The usage of community personalisation data in an inherited way also reduces the risk of individual personalisation being overridden by community personalisation since all personalisation is applied at an individual level, not a community level. Any conflicts between the community data and an individual's data are handled during the inheritance process and are biased towards the individual's personalisation data.

3   Preliminary Results

In March and May 2011 two paper trials were completed with low-fidelity prototypes of the SOCIETIES platform. All trial participants were Computer Science and Information Systems students in their first year at Heriot-Watt University. In the first paper trial, participants were presented with graphical representations of key SOCIETIES scenarios (relevant to students) and questioned on each. In the second paper trial the participants took part in an immersive environment where they physically experienced key platform behaviours (mocked using Wizard of Oz

techniques) and were then questioned about their experiences. Results from both trials were processed and compared. In general, feedback relating to personalisation concepts has been positive and is summarised here.

Regarding the exploitation of data from digital and physical spaces, 73% of users indicated that they would provide personal data to the system as long as they have final control over their data and it is kept private and secure at all times. 60% of users said they wouldn't mind being monitored by the system if it led to more accurate personalisation.

Regarding community enhanced personalisation for individuals, 100% of users said they would find community personalisation data helpful in their individual decision making tasks. Finally, with regard to personalised autonomous adaptations of digital and physical spaces, only 47% of users said they would like their device to predict their behaviour and make suggestions to them. However, 77% of users said they would allow the system to take decisions on their behalf if the system was highly confident that the decision was correct. Additionally, 67% of users said they would find personalised autonomous adaptations useful for organisation and planning tasks in everyday life.

The SOCIETIES platform is currently under development following a design that has been driven by the user feedback received from the paper trials. Full details of both paper trial results are under publication and a complete prototype of the SOCIETIES platform will be released for live user trials in September 2012.

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