

# A Platform for Personalised Neighbourhood Networks: The Case for a Casual Job Market

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## ABSTRACT

In this paper, we describe the ‘Neighbourhood Networks’ platform, a platform that allows residents in an area to create and to join a network based on place, and with the objective to post and to apply for casual household jobs in their neighbourhood. We describe the architecture and implementation of the platform, the website and the smartphone user interfaces that residents use to post and to apply for jobs, and the results of a pilot usability study that has been conducted. We expect platforms like this to become an integral feature of digital cities in the future.

## Keywords

Place-based computing; online neighbourhood networks; hyperlocal content; the casual job market.

## INTRODUCTION

Mobile devices like smartphones have seen significant advances in recent years, and their accompanying application store fronts have also brought with them an abundance of applications dedicated to mobile computing. One mobile computing theme that has received much attention over the past few years is that of context-aware computing [1], and a particular focus has been on location-aware applications [2, 3].

Within this scope, a growing trend has been towards the hyperlocal Internet market [4], i.e. the market sector focussed on very specific local geographical areas such as a neighbourhood. The ‘Neighbourhood Networks’ platform is one such mobile, context-aware, and hyperlocal implementation. It provides its users with the ability - via an online website - to post casual household jobs in the surrounding neighbourhood area, and - through the use of an accompanying smartphone application - allows users to search and to apply for hyperlocal casual household jobs. Though there are many commercial online employment services in existence, few (if any) currently target the hyperlocal casual job market, instead focusing on the stereotypical full- and part-time blue- and white-collar job market instead.

## RELATED WORK

In [5], a particular form of location-based application is described, i.e. ‘place-based’ social networking systems (SNS). In contrast to many location-based systems, where the focus is typically on a particular “user’s” location, a

place-based system focuses on a specific “location” and the local interactions that take place between “geographically proximate users” (e.g. consider neighbourhood residents). The i-Neighbors project [6] (see also <http://www.i-neighbours.org>) is one such SNS that focuses on residential neighbourhoods, and (via technology such as discussion boards, mailing lists, and newsletters) seeks to help neighbours: to meet and communicate, to find neighbours with similar interests, to share information on local companies and services, to organize and advertise local events, and to vocalize local concerns and ideas. Two other similar services are the eNeighbors website (<http://www.eneighbors.com>) and the LivingNetworks’ iVillage (<http://www.livingnetworks.com.au>).

Though the Neighbourhood Networks platform is also targeted to neighbourhood residents that are by nature geographically proximal, our focus is on providing residents with the ability to meaningfully interact with their surrounding casual job market. Indeed, in its attempt to provide neighbourhood residents with a service that we expect to be useful (and which is supported by our initial pilot study), this work takes up a challenge proposed by Foth in [5], namely, “the success of new social networking systems for inner-city neighbourhoods depends to a great extent on the ability of the software to animate and support meaningful interaction between proximate users”.

## THE NEIGHBOURHOOD NETWORKS PLATFORM

The ‘Neighbourhood Networks’ prototype platform focuses on the casual job market, and more specifically casual jobs that exist within urban neighbourhood areas. It allows neighbours to offer and accept casual, simple, one-off jobs such as car washing and house cleaning. As jobs are only posted to a user’s registered proximal neighbourhood network(s), only residents in the same network(s) are able to find and apply to the jobs.

In this section we describe, by way of a walkthrough, the website through which job providers can post jobs, and the smartphone application through which job seekers can find and apply for jobs.

### The Neighbourhood Networks website

#### *Registering with the service*

During the registration process, users are required to provide their residential address. Based on this address -

which is shown to the user visually via a map - the user is able to choose an existing geographical network or create their own (e.g. based on the surrounding street blocks) by mapping out the vertexes of an area. In addition to the street block in which a user lives, and the nearby blocks, the user is also able to define a surrounding area that is relevant to them. As shown in Figure 1, this area is represented as a circle with the centre point being the user's address and the radius being defined by the user. Compared to the nearby blocks (which residents can only register to if they are proximally close to the block), the surrounding area can be thought of as a second level neighbourhood network. When a user posts a job, they choose to allow only neighbours, or also people living in their surrounding area to view and apply to their listed jobs.

Please choose the social networks you want to belong to OR create your own social network. (Maximum 5)



Please define a surrounding neighbourhood area relevant to you:  km radius

[Back](#)

[Continue](#)

Figure 1: Creating a new street block through the Neighbourhood Networks website. The dark shaded blocks represent those that have already been defined. The middle point represents the user's address, and the circle represents the region within which this user is allowed to join blocks.

*Finding the user's home block and nearby street blocks*

After a user has provided their residential address to the system, we use Google Maps to convert the textual description of the address to a geographical coordinate. We then use the ray-casting algorithm to determine if the address lies within any pre-existing neighbourhood networks. The ray-casting algorithm essentially allows us to determine if a point lies inside a polygon by testing how many times a ray starting from the point intersects the edges of the polygon. If the number of intersections is an

odd number, the point lies inside the polygon; otherwise, the point lies outside the polygon.

Usually, people also think of those living on the other side of the street as their neighbours. These neighbours are however not in the same street block as the user. Therefore, the nearby street blocks may also be a part of a user's proximal network. To determine which blocks are nearby to a user, we measure the distance between the centre point of each block and the user's residential address (see also Figure 1).

*Creating a new street block*

In the case that no pre-defined neighbourhood blocks exist, a user is able to create their own. To create a new block, the user adds nodes by clicking on the map. In Figure 1, the shaded triangle is a block in the process of being completed. The user can drag the marker to change the location of the node. As it is not possible to recognise individual street boundaries in the currently used Google Maps JavaScript API, it is assumed that users will not create nonsense blocks. In the future however, systems like this may come with the street blocks already pre-defined.

**The Neighbourhood Networks smartphone application**

In order to find and apply to neighbourhood jobs, we have created an Android application for smartphones. Using this application, users can search for jobs, view job details, bookmark interesting jobs, and most importantly, apply for jobs. Using the smartphone application, residents can find relevant jobs in a number of different ways, in particular: based on time (i.e. by scrolling through the list of most recently posted jobs; see Figure 2A); based on keyword (i.e. by typing in particular search terms); by selecting from the available job categories and sub-categories (i.e. the advanced search; see Figure 2B); and by location (i.e. by selecting from jobs posted in their neighbourhood and jobs posted in their surrounding area; see Figure 2E).

As shown in Figure 2A, the main page contains a scrollable list of the 20 most recently posted jobs. Users can do a simple job search from the main page, or they can choose to perform a more advanced search based on matching the provided keyword, category, and distance between the job location and the user's address (Figure 2B). All jobs stored in the online jobs database have a location associated with them, namely the address of the resident that is posting the job. In the 'Job Details' page (Figure 2C), users can view the information about a job and they can also bookmark or apply for jobs. The 'My Jobs' page (Figure 2D) shows two scrollable lists that summarise those jobs that the user has bookmarked and applied to. It also shows the status of the jobs that the user has applied to. Finally, in Figure 2E, the 'My Network' page is shown, from which the user can view jobs based on location, i.e. those jobs available within their neighbourhood and those jobs available within their surrounding area.

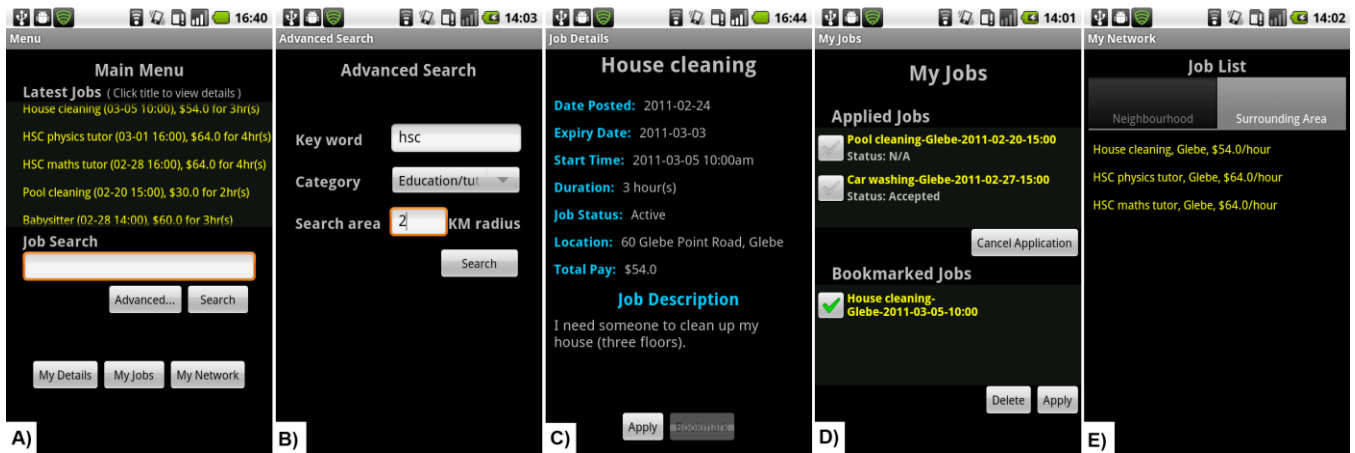


Figure 2: The smartphone application, showing the main interface (A), advanced search functionality (B), a particular job’s details (C), the summary of applied and bookmarked jobs (D), and jobs categorised by location (E).

### SYSTEM ARCHITECTURE

The Neighbourhood Networks platform is based on a typical three-layer architecture. As shown in Figure 3, a MySQL database acts as the storage layer; it stores all data relevant to users and jobs. The Tomcat web server is the application layer, which links the storage layer and the presentation layer together. It receives HTTP requests from the front end and sends SQL queries to the database. After processing the data, the server sends this data back to the front end. The smartphone application and the website represent the presentation layer. The smartphone application uses XML to specify the user interface and uses Java to achieve all of the application's functionality. The website user interface is based on HTML, JavaScript, and CSS, and uses AJAX to interact with the web server. JSON is used by both the smartphone application and the website to communicate to/from the server.

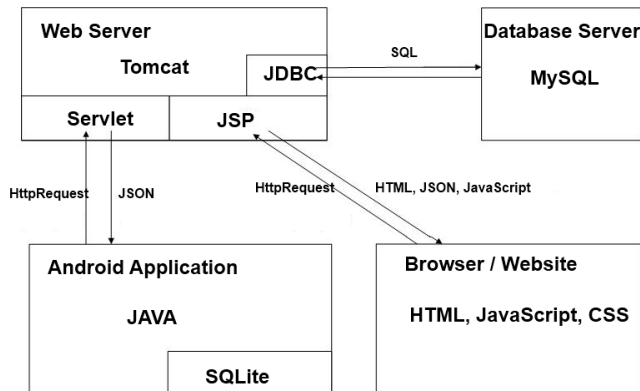


Figure 3: System architecture of the Neighbourhood Networks platform and accompanying website and smartphone application.

### Job models suited to individual neighbourhoods

The target job market for the Neighbourhood Networks platform is that of simple, one-off household jobs. Existing

job models for blue- and white-collar workers do not fit with the casual and ad-hoc nature of household jobs, and although in our system a small number of casual job categories and sub-categories have been pre-defined (see also Figure 4), it is a goal of the platform to allow each neighbourhood network to personalise the underlying job categories that are applicable to their own network. For this reason, the platform allows users to extend and configure the ontology of casual job types as they see fit. Furthermore, each model is shared only inside a particular network, which limits the total number of sub-categories and thus also ensures applicability of the model to each individual neighbourhood. Figure 4 shows the process of adding a new job sub-category. In particular, a user selects the “Other” sub-category (see Figure 4A) and then provides a name for the sub-category, e.g. “Kitchen cleaning” (see Figure 4B). This new sub-category is then added by the system into the database and is shared in that user’s neighbourhood network. From a systems perspective, the new sub-category is assigned to all blocks to which its creator belongs to; thus, if a creator A belongs to blocks ‘m’, ‘n’, and ‘o’, the sub-category is also added to the models for these three blocks.

### Administering the job models

As time passes, the ontology in a network may require administration. To solve this issue, certain users within a neighbourhood network will need to be given administrative permission to edit and delete job categories and sub-categories. Currently this is the role given to the creator of a neighbourhood block, though in the future, the allocation of administrative rights would need to be further investigated in systems like this one. The modification of a model is also tied to a single street block. Thus, in the example above, if creator A edits or deletes a sub-category in block ‘m’, s/he will still see the sub-category in his/her list of sub-categories as blocks ‘n’ and ‘o’ (to which s/he also belongs) still contain the sub-category.

**A)**

(\* Job Title:

(\* Job Category:

(\* Sub-Category:

(\* Position Required:

(\* Date: (yyyy-mm-dd)

(\* Time:

**B)**

(\* Job Title:

(\* Job Category:

(\* Sub-Category:

Other(Optional):

Note: This new sub-category will be added to the neighbourhood online jobs model.

(\* Position Required:

Figure 4: Adding a new job sub-category to a neighbourhood network.

### Network privileges

With regards to privacy, jobs posted by a user are only visible inside their neighbourhood network. The neighbours – i.e. people living in the same or nearby blocks as the job provider - are able to view the jobs. They are also able to apply to the jobs and to use the job categories and sub-categories defined in the network. The surrounding area is however a second level network. If a job posting is made also available to the surrounding area, users who live in the surrounding area will be able to search and view the job sub-category, but they will not be able to re-use the category for their own job placements. If the job is set to ‘visible for neighbours only’, the users who live in the surrounding area will not be able to view or use any information about the job and the respective job-category.

### EVALUATION

In this section, we describe the results of a pilot usability study we conducted on the Neighbourhood Networks platform. The goal of the study was to evaluate, on an initial small number of subjects, the ease of use and perceived usefulness of the system, as well as to gauge privacy concerns in using such a system. The study was conducted on a total of six subjects aged between 21 and 28 years of age; all but one were very familiar with smartphones and the subjects were, on average, moderately familiar with online job sites. The usability study consisted of the subjects completing two tasks and then subsequently answering a questionnaire consisting of 5-point Likert-scale questions and several short-answer questions. The first task asked that the subjects assume the role of a neighbourhood resident and post two casual jobs of their own choosing via the website. The second task asked that the subjects then assume the role of a young teenager looking to find a couple of jobs for the coming weekend. The subjects in both tasks were provided with pre-defined

residential addresses, and for the second task subjects were also provided with login details.

The results of this pilot study show that on a Likert scale from 1 to 5 (with 1=“definitely not” and 5=“yes definitely”), subjects would use the service to post jobs ( $A_v=3.67$ ) and would use the service to apply for jobs ( $A_v=4.00$ ). On a similar 5-point Likert scale on the ‘usefulness’ of a casual job finding service for neighbourhood residents, subjects rated the system even higher ( $A_v=4.5$ , with 5 being ‘very useful’); this supports our initial goal to provide neighbourhood residents with a service considered to be useful. On ‘ease-of-use’, the registration process was found to be adequate ( $A_v=3.83$ ), while the ability to add new sub-categories was rated  $A_v=4.17$ . Searching for jobs (via each of: time, keyword, advanced, and location) were all rated easy or better ( $A_v \geq 4.0$ ; with 5 being ‘very easy’). Finally, regarding privacy, when asked if the subjects’ response to using the service to post and to apply to jobs would change if they had logged in using their “real” name and address, the responses dropped to  $A_v=2.67$  (to post jobs) and  $A_v=2.83$  (to apply for jobs); this indicates that there are some privacy concerns that will need to be addressed; this was also supported in the qualitative short-answers, e.g. subjects stated that age, reputation, and address would be relevant factors in accepting job applicants for posted household jobs.

### CONCLUSIONS

This paper has outlined the ‘Neighbourhood Networks’ platform. It has described the architecture and accompanying website and smartphone user interfaces for posting and applying to jobs in a user’s neighbourhood. The paper has also reported on real-world experiences with the system and found that although considered a very useful platform for neighbourhood residents, the use of the platform also carries with it a number of relevant real-world privacy concerns that need to be further investigated.

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