Activity Recipe: Spreading Cooperative Outdoor Activities for Local Communities Using Contexual Reminders

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Abstract. Recently, many civic engagement platforms have appeared on the web and for mobile devices to collect public comments and local information. However, it is difficult to cope with diminishing civic engagement due to the loss of diverse outdoor activities in towns using existing civic engagement platforms. In this paper we present Activity Recipe, a framework for supporting citizens to create and share activities in public spaces and thereby promoting their cooperative outdoor activities. We discuss the methods to 'spread' effective activities for local communities and cultivate citizens' awareness for these activities based on Activity Recipe.

Keywords: Activity recipe · Mobile phones · Civic engagement · Community development · Sharing citizen's activity

1 Introduction

Recently, social connections between friends are increasing through online services such as Facebook and Twitter. On the contrary, interactions between neighbors are becoming weaker and the diversity of citizen's outdoor activities seems to be diminishing in many cities as many urban planning experts pointed out including Jan Gehl [1] and Jane Jacobs [2]. Consequently, many urban design projects are based on the understanding that just building civic facilities is not enough, and it is important to build civic engagement for increasing citizen's motivation and power to challenge problems of their surroundings.

Following that movement, many web platforms such as OpenIDEO [3] and Neighborland [4] pursue a collaborative/corporative working space that match and introduce mates who have similar social aims, and encourage a user participate in creating social problems' solutions with the mates. These open access approaches are succeeding to create opportunities to directly collect grass-roots opinions and ideas more easily. Moreover, nowadays, mobile devices become earning a new position as civic engagement platforms, which support citizen's outdoor activities for local community

N. Streitz and P. Markopoulos (Eds.): DAPI 2015, LNCS 9189, pp. 590–601, 2015.
DOI: 10.1007/978-3-319-20804-6_54

such as Pirika, volunteered trash-picking platform [5], and FixMyStreet, problem reporting in neighborhood [6]. These mobile platforms for civic engagement are excel in supporting simple actions within few minutes in field as in citizen science (e.g., [7]), volunteered geographic information (VGI) projects (e.g., OpenStreetMap [8]), and participatory sensing projects (e.g., [9]). However, little work has been done to support other many complex activities existing in the field flexibly. In other words, many towns suffer from losing diversity of citizen's outdoor activities but they are beyond saving.

In this paper we focus on recipes as a civic engagement framework to encourage citizen's outdoor activities as well as easy/simple tasks. A typical recipe has succeeded as a worldwide tool that can be sharing long/complex cooking processes and DIY (Do it Yourself) instructions. Almost everyone can produce something by following recipe instructions and can write original recipes by themselves. We present Activity Recipe, a contextual reminder framework extended a recipe structure that citizens can create and share activities in public spaces, and thereby seeding and fostering activities that positively impact local communities.

First, we discussed key issues in existing outdoor activities with three scenarios and elicited our research questions, how to 'spread' effective activities for local community and cultivate citizens' awareness for these activities based on Activity Recipe. Second, we introduced the powers of online recipes, which have a potential of promoting their outdoor activities. Based on these discussions, finally, we presented Activity Recipe framework including several modules, which provide opportunities to access recipes and encourage citizens to readily try activities with the recipes.

2 Issues in Outdoor Activities

In this section, we present three scenarios for showing the problems in existing outdoor activities. These scenarios are based on actual experiences of people.

2.1 Problem Scenarios

Use of the Newly Developed Public Square. *Miki* has been running a restaurant for thirty years in front of a train station. Recently, the area around the station had been redeveloped and new public squares, wide sidewalks, and benches were installed gradually. However many people do not use them frequently. *Miki* thinks if people receive ideas how to use and enjoy these facilities, people living/coming her town will make full use of the new public space better.

Use of Vacant Lands and Forestry. Recently, as vacant lands including house lot, parking, rice field and forests, given up manage by the landowners grow in number, crime risks become higher and towns spoil the sight. *Ryoko* is an urban designer who tackles this problem. She thinks it is important to give opportunities to experience of playing in vacant lands and teach various skills to enjoy outdoor life with neighbors. She rent several vacant lands and conducts citizen workshops recreating arid vacant places to common garden, farm, and park with the neighbors in several cities. *Ryoko* want to expand her programs in more many cities, however, it is difficult to do just by

herself. She has published a magazine to promote her programs but she felt it was not enough to make citizens to start acting.

Anticrime Patrol. *Yasutaka* is a businessman and he has lived with his family in this city for 5 years. His office is also in this city so he can go back home in early evening everyday. In the past few months, he worries about his family and neighborhood because he often hears small crime news in the city. He decides to join a local anticrime patrol group in his town every week because he wants to do something for the problem. In the patrol group, most members are retired elderlies or people who come back home in early evening, such as like *Yasutaka*. This is one day of his anticrime patrol; Today's patrol started at 6 pm. *Yasutaka* and other 3 members gathered in a park, then they walked around and check any suspiciousness on one hour in the south part of the town. They greeted passerby and gave them to anticrime goods such as a light reflection band. Recently, *Yasutaka* became realizing that the number of patrol participants are decreasing and in this month, there are even two times that they could not find enough participants for the patrol. *Yasutaka* feels anxiety about this activity's future.

2.2 Research Questions

From these three scenarios, key problems in outdoor activities can be summarized as follows: the first and second scenarios show that many places cannot afford fertile outdoor activities by themselves and the difficulty of penetrating new activities in a target place. The former one implies the luck of ideas of how to use the place well. The later one implies the luck of spreading power of good activities for local communities. While, third scenario shows the difficulty of working with neighbors together. If these activities disappear, citizens will lose their quality of life, however it becomes difficult to participate in and continue such social activities by citizens nowadays.

Consequently, the key research questions we address are: (1) how to spread effective activities for local community and (2) how to cultivate citizens' awareness for these activities based on Activity Recipe.

3 Recipes for Activity

In this section, we summarize our survey about online recipes focusing on their formats and the environment for sharing their repositories, in order to uncover applicable recipe essentials in supporting outdoor activities.

3.1 Recipe Formats

For discussing typical recipe formats effects, we pickup three kinds of recipe formats from representative online recipe sharing services, hRecipe [10], Cookpad [11], and Instructables [12] (see Table 1).

hRecipe is one of the widely used cooking recipe formats on the web because the format is used for a crawling service by Google search. If people upload their recipes

Table 1. Recipe formats of hRecipe, Cookpad, and Instructables

Recipe format contents	*Title*	*Author*	*Images*	*Instructions*	*Licenses*	*Published date*	*Tag / Keywords*	*Categories*	*Ingredient, Yield*	*Duration*	*Introduction*	*Summary*	*Tips, Caution points*	*Background*	*Social Network*
I. Necessary information	N	N	N	N	N	N	N								
II. Information for Searching	S	S	S		S		S	S	S	S					S
III. Information for Performing	P	P	P	P	P				P	P	P	P	P	P	P
hRecipe	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔			
Cookpad	✔	✔	✔	✔	✔	✔	✔		✔		✔		✔	✔	✔
Instructables	✔	✔	✔	✔	✔	✔	✔	✔			✔				✔

written in this format on blogs, Google automatically create a summary (Rich Snippets) from their cooking recipes; therefore we expect that this format contain common attributes for many recipes. For users searching proper ones from a large number of recipes, the format prepares various tags to generate several categories helpful in many situations such as nutrition automatically, and also use duration and ingredients data for generate categories to be helped exploring a recipe.

Cookpad is one of popular sharing recipe site in Japan, which stock 1,920,000 cooking recipes and has 50,420,000 unique visitors in one month (in December, 2014). This recipe format seems to include some contrivances to increase cooking motivation such as introduction, tips, and background of a recipe. This information becomes important when choosing one recipe in many similar choices after searching recipes. In addition, comments and ratings of recipes using social network services are also strong information to influence whether to try or not.

Instructables is an online sharing recipe service for not only cooking but also anything including Food, Living, Outside, Tech, Play and Workshop. Although we may think we need to prepare proper instructions in proper ways for each type, Instructables provides just one recipe format for all types and it seems to be enough. Especially in the format contents, 'introduction' covers various kinds of information, which is not provided own form, such as ingredients, duration, tips and backgrounds. However the diverseness of coverage and the facility of searching are tradeoff relation, this service inspires us that outdoor activities will be able to be described and shared by using recipe formats.

From them, we propose essentials for extending recipe formats to outdoor activities. A recipe format for an outdoor activity needs to include not only *necessary information*, but also, *information for searching*, and *information for performing*. For information for searching, we can consider a possibility of automatically narrowing down recipes with current location and other surrounding context from mobile sensors

as well as generating useful categories. While for information for performing, we can consider showing recipe contents directly when affording the recipe activity, because the impression from these information inside of the recipe are big factors to decide whether to try it or not.

3.2 Recipe Sharing Environment

Nowadays, online repositories for recipes or something similar to a recipe can be found in many fields other than cooking. To understand the potentials of recipe sharing environments, we surveyed interfaces and functions of following online repositories in several fields: cooking (Cookpad), anything (Instructables), 3D modeling (Thingiverse [13]), programming (wonderfl [14]), furniture (Architecture for Dogs [15]), and personal smart task (IFTTT [16]). From this survey, we can summarize key roles and corresponding components of sharing recipe environment as follows:

Search. Most of repositories provide a search box for narrowing down recipes. This component is used by people who have already decided what he creates with rough details, such as what ingredients they use, or what event they prepare for. They can meet by chance and practice a better process, which is someone's knowhow. Additionally, this component is useful especially when a repository holds large number of recipes.

Explore. Many repositories provide several components for exploring recipes such as various unique categories, keywords/tags. Furthermore, a top-page of sharing recipe sites arranges popularity ranking and featuring contents (e.g., 5 min cooking, for diet, seasonal ingredient in Cookpad). These components is used by people who want to create something but do not decide to create what and make opportunities of finding good recipes.

Perform. Some repositories promote links between a recipe and performing environments. First, a video component for the recipe instruction is one of easy and popular methods to link performing and can help to perform step by step (e.g., [11, 12]). As a second example, some repositories provide sub-repositories of tools (e.g., outsourced 3D print [17]) and materials (e.g., furniture blueprints, dress pattern, and 3D drawing data). These components support troublesome preparing phases for performing and encourage people to quick start. As a third example, some repositories include execution environments, which are directly connected with recipes and contribute to the ease of making recipes. For example, in wonderfl [14], sharing ActionScript codes can be done in a preview screen on the web, which provides the functions to perform and refine the codes easily.

Create. Unless people attempt to serve carefully selected high quality contents, they can use the recipe design components provided by repositories for anyone. Because they have good user interfaces and provide samples of recipes, most recipes can be created easily. In addition, some provide special user support including a staff calling to advise a draft phase of recipes. Without such services, people still have a lot of chances to learn how to write recipes better because they are familiar with recipes by reading

and performing. In some repositories, people can create branch recipes based on other one's recipe [14]. This way can cut a workload for writing recipes and improve recipe qualities cooperating with each other.

Furthermore, we found an essential but overlooked characteristic in online repositories, 'encounter'. Most of online repositories just premise active access (i.e., 'pull'), and *searching*, *exploring, performing, and creating recipes* are ushered by user's active action. In other words, we cannot obtain recipes in the repositories without our active actions. While, we may know intuitively that 'encountering' recipes are valuable experiences for us. Indeed, we encounter recipes frequently in our lives. For example, about cooking, recipes appear on TV cooking show in lunchtime, on a package of food, and in a supermarket vegetable corner. They sometimes plant an idea, "let's try to do it" in people's mind. We consider that encountering recipes is a necessary idea for spreading outdoor activities in neighborhood.

For supporting this idea in outdoor activities, location-based contextual reminder technologies can be focused on. These technologies will create a chance to encounter recipes in proper place and proper timing. Then, the possibility that people try to perform the activity will become higher. We have developed Community Reminder, a smartphone-based contextual reminder system for local communities, which include notification co-design platform and local information notification repository [18]. It can encourage citizens to do small tasks that will benefit their neighborhoods. We finished testing the prototype in 1-month field study and revealed that this system worked well in serving opportunity to 'encounter' local issues with small works or local relevant knowledge. In addition, the encounter experiences put high concerns in neighborhood into participant's mind long time [19]. From these results, we expect to embed an Activity Recipe as a contextual notification, in Community Reminder frame for spreading outdoor activities in local community.

4 Activity Recipe Environment

In this section, we present the Activity Recipe Environment model and the four key modules strongly tying recipes to citizen's activities based on the strengths and weaknesses of recipes discussed in Sect. 3. To illustrate how the Activity Recipe environment can support citizens, we also show an activity scenario that describes the case when people use this system. This scenario is based on one of the problem scenarios in Sect. 2.

4.1 Activity Recipe Environment Model and Four Supporting Modules

As shown in Fig. 1, we designed the Activity Recipe environment model based on an online recipe repository. We learned that a recipe could encourage people to perform not only cooking but also other types of activities enhancing a connection between people and creative artifacts (e.g., programming, DIY). From this finding, we believe that outdoor activities should be also described with a proper format and collected in an online repository. Then, the Activity Recipe environment provides various methods of

repository access to increase a chance to encounter recipes. It can be accessed while searching, exploring, performing, and creating recipes and from several platforms including the web and mobile devices. In this model, searching and exploring recipes supposes a user-driven access (i.e., 'pull'). In contrast, system-driven access (i.e., 'push') is necessary for performing and creating recipes on mobile devices so that recipes embedded in the real world can be discovered and elicit people's actions in a natural way. This environment model uses extended context reminder engine to support a system driven access by notifying recipes to citizens with appropriate formats and timing.

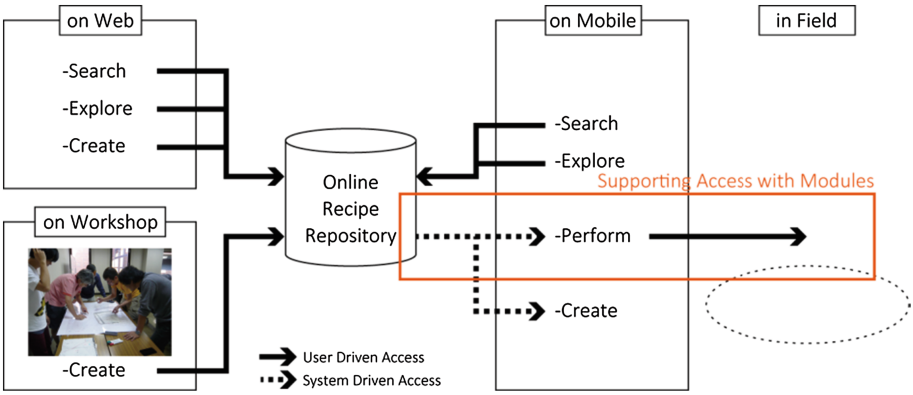

Fig. 1. Activity Recipe environment model. Online Recipe Repository can be accessed various purposes and platforms. Four modules support system driven access on mobile (see the red rectangle) (Color figure online).

Furthermore, we focus on the mobile platform in Activity Recipe environment because it has a potential to connect recipes and citizens' activities tightly in their life. We propose four modules that support system driven access on smartphones based on different approaches to involve citizens widely in outdoor activities and enhance their awareness of their surroundings, which can produce various activities. (1) *Trial recipe module* and (2) *Neighbor Sourcing module* provides triggers for enhancing people's motivations to try recipes and (3) *Notification control module* provides a scheme for controlling suitable timing of a recipe encounter in outdoor spaces. (4) *Activity Sprinkler module* focuses on passers-by near the people who are performing a recipe to change the mind of the passers-by.

4.2 Trial Recipe Module

A Recipe is One Thing and Doing is Another. An ordinary recipe is separated from action, so unless we try, we won't know whether the activity is interesting or not, or provides good effects or not for our city. As instructables, many workshops provide people experiences of trying recipes in a real space such as "instructables restaurant".

We also should remark the hurdle when designing ways of access to activity recipes and prepare a mechanism of decreasing the starting hurdle.

Trial recipe module focuses on user-friendly recipe format. It generates a short trial guidance, which work as a stepping stone to perform a recipe's activity easily by converting a regular recipe automatically. A role of trial recipe is to encourage people to perform a short version of activity described in a regular recipe and afford great understanding of a recipe content. The following shows four conditions on trial recipe that is able to lower the starting hurdle:

- Allowing to comple the process within x minutes
- Including a start point and an end point in the process
- Providing a opportunity that information of regular recipes is clear
- Providing a opportunity to try the process empty-handed

The method of trial recipe creation is described in Fig. 2. First, an Activity Recipe creator fills out a target activity title, introduction, performing conditions, duration, and all steps to perform a target activity with a feature tag showing appropriate place in digital format of a regular recipe (Fig. 2a). Changing from current format to map-based format, the creator can plot all steps at each appropriate location (Fig. 2b). Then the recipe is completed as regular one. Additionally, he can collect and setup photos and location data used for the recipe in the field so Activity Recipe can be created quickly.

To set up a trial recipe, the recipe creator needs to segment partial steps in the regular recipe and set proper duration, which will be shorter than regular one (Fig. 2a). After the setup, this module can notify the trial recipe as well as regular one automatically in proper place and at proper timing referring conditions described in these recipes (Fig. 2c). The trial recipe interface is very simple; it displays the activity title, the short introduction and just one instruction of the steps. The recipe notification changes the display of the activity process step by step along with a user's move. Moreover, it equips two buttons, one is "next step", and the other is "view a regular recipe".

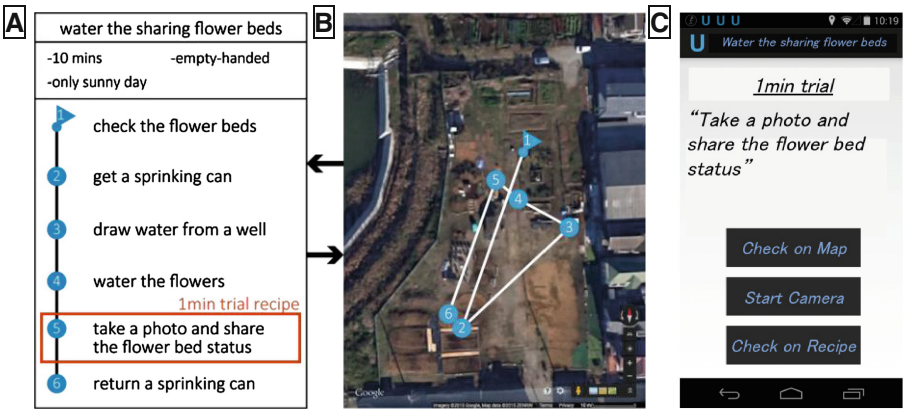

Fig. 2. A regular recipe converts into a trial recipe notification automatically

4.3 Notification Control Module

Notification control module supports timely access to the activity recipe repository because it is important to calculate appropriate timing from user circumstances as well as appropriate situation described in a recipe and also difficult to setup timely notifications to a recipe under complex context by laypeople.

Some researches revealed that a notification is less annoying when pausing manipulation of smartphones [20] and when shifting to another action mode (e.g., start walking when sitting) [21]. Fischer et al. discuss that notifying content is important more than notifying timing [22].

In our notification control, first, this module narrows the list of activity recipes down referring the proper conditions described in each recipe (e.g., weather, hour), then narrow down the list again with current user's circumstances (e.g., weather, hour, location) and situation (e.g., busy, free, walking, stay in same place) earned from sensors in user smartphone. Consequently, this module notifies a proper trial or a regular recipe in a timely manner. We confirmed two rules of notification control for different targets (see Table 2). One target is people walking periphery of recipe points because they have high potential of dropping in a recipe spot on the way. Trial recipes are easier to perform in the spare time than regular one. The other one is people staying within walking distance of recipe points. They also have potential of dropping in a recipe spot but they need some motivations or purposes to go there in particular. This rule finds people's spare time from smartphone use, and triggers and notifies regular recipes.

Table 2. Two rules of notification control for different targets

Target	*Aim*	*Recipe Type*	*Conditions*
People walking periphery of recipe points	encourage to drop in and make the attempt	trial recipe	enter within a 50-meter radius of the city on foot
People staying within walking distance of recipe points	encourage to visit and make the attempt	regular recipe	still or walk within a 800-meter radius of the city (walkable distance) more than 1 hour, and when unlocking a smartphone display

4.4 Neighbor Sourcing Module

Neighbor Sourcing module focuses on participative motivation to cooperating activities. Some activities can be continued/concluded by multiple people but not one person. For supporting continuous working, a recipe of such activities needs not only notification control module but also additional set of functions to tell some urgency and ask for some assistance.

This module generates another type of notification, a status board visualizing cooperative work progress (e.g., counting individual achievements) and notifies them in order of priority to rise in neighbor's awareness of status of tasks for their community

existing their surrounding. This interface has referring recipe button, so that someone interested in the status immediately join and try the activity using the trial recipe.

4.5 Activity Sprinkler Module

Activity sprinkler module focuses on rise in awareness of someone performing recipe activities for increasing neighbors' motivation of participating various activities in their surroundings. This module supports several physical outputs (e.g., shining key holder, smart street lamp) visualizing "doing the activity now" and it can draw attentions of passers-by. It can be expected that increasing participants of the activity can increase the opportunity attracting people's notice.

4.6 Scenario in Case Using Activity Recipe – Activate Anticrime Patrol

Yasutaka worried about sustainability of the voluntary anticrime patrol activity in his town because of decreasing the group members. He had known Activity Recipe because his friend living different city told him that his friend's town uses it for sightseeing. Accordingly, he conceived of eliciting cooperation from citizens such as people who take a dog walk and who come back home in evening by Activity Recipe environment. *Yasutaka* described his 1 h patrol activity process, significance, and several proper conditions into a regular format of Activity Recipe. He wrote 10 checkpoints and the tips about anticrime in each step based on his anticrime patrol experiences and plotted these steps in the map view of his town (e.g., This parking is a poor visibility so you need to check to the bottom.) He also wrote "17:00–19:00" as proper time to do it and "walking with a dog, coming back home" as a better situation in the condition blank. Then the regular recipe is completed. Additionally, he decided to design a trial recipe because he wants to give many busy people an opportunity to experience small actions for anticrime contribution. He cut and divided the regular recipe's 10 steps into 4 parts, grouping some steps if they are close, then each part of work could be finished in 5–10 min. Just from this operation, *trial recipe module* in the Activity Recipe environment generated 4 trial recipe notifications from Yasutaka's anticrime patrol recipe. Moreover, to encourage the participation in this activity, he created anticrime key holders for dogs with LED lighted during taking the recipe action using *activity sprinkler module*. The key holder includes an NFC tag inside, and people can receive the patrol recipe just approaching their smartphones to it when getting out of a house and thereby start blinking and start guiding the recipe on their smartphones. He distributed the key holders to his friends and passers-by with dogs.

Yoshie is an office worker and she is interested in anticrime activities. However she usually came home at 8 pm, so it is difficult to participate in anticrime patrol in her town. It is a reason she installed the smartphone app, Activity Recipe in her phone. Today, she was able to leave her office earlier than usual and receive one notification at 18:30 at the bus stop near her home. Because her current place is close to one of the recipe points, *the notification control module* sent a trial recipe notification to her. The notification was an anticrime patrol recipe telling that you could do it in just 10 min.

Yoshie decided to try it because she usually thinks that she wants to contribute some activities for her town. When she pushed start button in the trial recipe, the trial recipe start navigating a first checkpoint that is a parking side of a supermarket. Arriving the point, the recipe asked to check whether this parking is safe and take a photo. She did these steps then the recipe displayed "Thank you for your cooperation! This recipe was completed." She felt small satisfaction.

Toru is a student and today he was on duty for walking with a dog. Walking around his town with his dog, suddenly his smartphone received a notification. He checked it right away and then the notification told the urgent place to treat an anticrime patrol. At that time, *a neighbor sourcing module* works because Toru was coming near the recipe point where is less traffic street and not treated well recently. He understood the urgent message from attached information of the regular recipe for the patrol and decided to go the street to check safety. When he pushed start button on the notification, a recipe was appeared and started to navigate the first step spot of the recipe. At last, he completed all steps of the recipe easily and this minor street was taken care by him.

Reiko was drinking tea and talking with her friend in a café. When she checked her phone, a notification arrived on her phone. The notification told her introduction of anticrime patrol in her town. At that time, *a notification control module* works and sent a regular recipe to her because Reiko was staying long time in the café, which was not 800 m far from one recipe spot. Her friend and she didn't know well about the anticrime patrol group, and they were interested in the activity. So they decided to perform a trial recipe on the way their home.

Recently, *Takashi* often saw dogs wearing neck bands with blinking key holders. One day, by word of mouth, he knew that the blinking dogs are related with anticrime patrol in his town then he wanted to try it and started the activity getting the key holder from official anticrime patrol group.

After designing and sharing the anticrime patrol recipe, *Yasutaka* was surprised and now he knows that many people participate in his designed trial recipe of anticrime patrol. This trial activity is different from an official patrol way but it also contribute to anticrime.

5 Conclusion and Future Works

We have proposed Activity Recipe environment, a civic engagement platform to encourage outdoor activities using the recipe framework. We focused on recipes' potential, and our survey made clear that proper formats and sharing environments are needed to encourage people to "try to do it." To integrate the recipes' potential with outdoor activities, we decided to prepare a flexible access model of online recipe repository including mobile-based contextual notification and four modules to facilitate performing recipes.

We verified our approach using several scenarios in this paper, however, we are yet to verify its effects and feasibility in real towns. In addition, we will explore other triggers to encourage outdoor activities in cities besides context notification on mobile devices. We believe that outdoor activity information included in recipes can seed and foster activities to positively impact local communities and make cities better places.

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