4 Development of a prototype system for visualizing community cleanup activities

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Applicable principle

Principle 9: A commitment to promoting sustainability through education

1. Activity background

There are now worldwide concerns over the negative impact that environmental pollution caused by waste in oceans and rivers has on ecosystems, living environments, the fishing industry, and tourism. This is particularly true for the issue of microplastics, which ultimately flow to oceans through rivers from waste discarded in living areas. It is for this reason why daily community efforts such as measures to prevent littering and cleanup activities are so important. In Japan, it is crucial for everyone involved in basin zones—from mountains and rivers to the sea—to work together to reduce the amount of coastal debris, and regional local governments are being urged to implement related measures ("Basic Policy on the Comprehensive and Effective Promotion of Measures against Articles that Drift Ashore," Ministry of the Environment, May 2019).

This is also true in Iwate Prefecture. Established in March 2023, the "Second Iwate Prefecture Regional Plan for Promoting Coastal Debris Countermeasures" stresses that promoting environmental beautification activities in coastal areas and all throughout the prefecture is necessary in order to reduce the amount of marine plastic waste being generated.

2. Activity development

With these circumstances in mind, a team of researchers working with students in the Faculty of Software and Information Science gradually began developing a system that would serve as a platform for surveying actual coastal and river debris, as well as a data provision application to urge prefecture residents to participate. Focusing on the fact that organized cleanup activities conducted by community residents were more effective in maintaining environments, these researchers are now working to determine the most appropriate system to deploy throughout Iwate Prefecture, by prototyping a platform system to determine the amount of trash being discarded, along with a data provision application handling a wide variety of data.

In 2024, the researchers prototyped a platform system to visualize the results of community cleanup activities, as well as an application for sharing route information on cleanup efforts, based on their research thus far. These were shown at EcoPro 2024 held at Tokyo Big Sight in December.

(1) Prototyping a platform system for visualizing the results of community cleanup activities

The system was developed with three objectives.
1) Visualize community environments maintained by individuals engaged in cleanup activities (education)
2) Provide opportunities for individuals to participate in environmental activities (participation)
3) Conduct public relations on Iwate Prefecture communities (PR)

Maps are used for the first objective. Graphs and other tools are also used to statistically represent data that has been submitted. The second objective is to allow for groups, organizations, and individuals to participate. The third objective is to accept landscape photos of scenic spots and other locations, in order to introduce the positive aspects of environments in Iwate Prefecture. Data can be submitted by groups, organizations, or individuals, although groups and organizations must provide all data as a single submission by a chosen representative. Information submitted includes the amount of trash picked up (the number of trash bags), as well as the name of the activity or event, the approximate number of participants, a group photo of the participants, and a photo of the activity being performed. It will also be possible to confirm what types of trash were picked up. Individuals submit the amount of trash picked up, along with photos of the trash prior to cleanup, and landscape photos. It will also be possible to submit a report to authorities in situations where trash is dangerous and cannot be picked up. In addition to implementing a standard submission function in the platform system, developers will allow submissions to be accepted though an application programming interface (API) that will allow access from the data submission system to functions provided by other systems. The platform system provides the following major functions:

[Data submission function] This function receives data submissions. Access will likely be provided through smartphones.

[Visualization function] This function visualizes submitted data on maps and graphs.

[Authority reporting function] This function notifies a user (the authorities) whenever submitted data must be reported.

[User registration function] This function is used to register groups, organizations, and individuals with attribute information (account names, addresses, etc.). Attribute information is used during visualization.

Example prototype platform system screens
(From left to right: Home screen, submission screen, detailed view screen)

(2) Prototyping a data provision application to share route information

The data provision application is being prototyped based on ideas from students as a part of their graduation work. Applications incorporating health promotion and game elements have been prototyped in the past.

This year, students prototyped a data provision application for recording and sharing cleanup activity route information on a map. Three design principles were established for the application: [1] Provide efficient support of cleanup activities through visualizing and sharing route information for cleanup activities conducted by community residents, [2] Provide access to the system through a standard web browser making use of a simple interface for recording route information and [3] Provide data to the platform system. The following major functions are provided:

[Login function] This function is for logging in by entering a user ID and password. It will also allow for new users to be registered.

[Map activity record display function] This function displays the user's previous cleanup activity routes on a map. New and old recording times are indicated by line shading.

[Cleanup activity record function] This function records the activity route once the user presses the start button, and is also used to submit route severity along with photos and amounts of trash picked up when the activity is finished.

[Activity record filtering function] This function can be used to filter route information by period or user.

Example prototype data provision application screen

(3) Discussions with interested parties

After providing a brief explanation of the platform system, developers asked employees of NPOs active in Iwate Prefecture for their thoughts, and were told that, while being able to actually see the situation on the screen was encouraging, it was hoped that the system would serve as an opportunity for learning with an eye on the future since cleanup activities are such a vital part of resident interaction. They also mentioned that it would be important for the system to be easy to use.

Experts in the environmental field were shown the data provision application, and indicated that they were impressed with the simple interface, that it would be useful during review meetings, and that they thought that elementary school students would be happy to use it. They also indicated that it would be a good idea to develop elements that would promote use, and to provide descriptions of content on the screen.
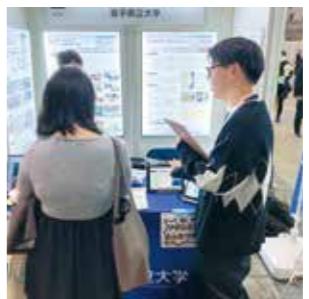
Discussions during EcoPro 2024

(4) Discussions with experts

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3. Future activities

The prototype platform system received mostly positive feedback. With this in mind, developers are now considering releasing it in stages, starting with minimal functionality. They are also considering integrating its use with support measures aimed at assisting cleanup activities for groups and organizations. This is because data accumulates during actual use, but also because it will be possible to consider specific methods of using data. As for the data provision application, it will be important to continue to empirically consider a wide range of ideas, in order to raise awareness of environmental issues and develop a system that would allow individuals of diverse interests and concerns to participate in cleanup activities.

Organized volunteer cleanup activities are helping to maintain attractive scenery and protect ocean resources at river and coasts throughout the prefecture, but many residents are simply not aware of these efforts. Routine cleanup activities conducted by individuals are also crucial in conserving natural environments. The system will continue to be developed in order to contribute toward natural environment conservation activities.