Regional Information Platform and One-Segment Local Broadcast Service for Tourism Promotion and Disaster Prevention

An initial experiment and assessment

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***Abstract*—Repeat tourists tend to gather information on their destination through mobile devices. For this reason, it is necessary to have a regional information platform that allows users to see all the information on an area in a unified format. One-segment local services in Japan are broadcasts targeted at mobile devices; however, these broadcasts are limited to a narrow area. We set out to use this service, which is currently in an experimental phase in Japan, for a large-scale event (the Lake Suwa fireworks show). Results of our experiment showed that the visitors found that this service is very useful, but also showed that it is necessary to provide the information that visitors really want. As the next step in this research, we intend implementing a regional information platform to find out the information that visitors want. And also disaster prevention information system will be implemented.**

Keywords-One-segment local broadcast service; mobile device; regional information platform; tourism; disaster prevention; data mining

I. INTRODUCTION

According to the Japan Tourism Agency, the ripple effect of production resulting from travel expenditure was 51.4 trillion yen (5.3% of the total in the "2005 Input-Output Table"[1]), equating to a value-added effect of 26.5 trillion yen. This is seen as having a large effect on employment and production. Furthermore, despite the problems caused by the earthquake and nuclear reactors, the agency has unveiled the "Visit Japan" project, which aims to attract 30 million foreign visitors to Japan. It is also seeking to expand tourism production. It is apparent that the needs of tourists are shifting away from travel with associated large-scale expenditure, which emphasizes groups, luxury, and well known tourist spots. Instead, this has given way to tourism that is "suited to individuals," which considers aspects such as individuals/small groups, day trips, and secluded destinations. Trips tend to be taken alone, with family, or with close friends. According to the Japanese Association of Travel Agents, the cost of tourism is advancing in two directions: one that emphasizes luxury, and the other that features low prices and includes such activities as day trips. It is thus necessary to devise a strategy that satisfies the changing needs of tourists.

However, with regard to tourism in Nagano Prefecture and the Suwa Region, while there has been a steady annual increase in visitors owing to large-scale events such as the Suwa Taisha Onbashira festival and the Lake Suwa fireworks show, the trend in the medium term has been decreasing.

As a new form of tourism, the Japanese Tourism Agency and other bodies have introduced "landing-type tourism" [2], which is a travel commodity produced by local areas. Volunteer guides from the areas' non-profit and other organizations lead tourists around the area, focusing on experiences, exchange, and education. In this way, it is possible to convey each area's unique charm, something that cannot be organized by large travel agencies.

The ability to send information directly to the visitor, which has been made possible by the spread of the Internet, is a key element in landing-type tourism. Alternative means of transportation have also played a significant part. Currently, travelers using their own cars comprise over 70% of tourists (Tourist Mobility Survey, 2008, Nagano Prefecture[3]). This means that tourists are now free to be selective about their trips, which are typically low cost. Furthermore, regarding the usage of information technology during landing-type tourist activities, the percentage of tourists who collect information while at their destination has risen to 46.5%. This figure has a high correlation with male IT users in their 40s and female IT users in their 30s (Survey Research Regarding the State of Landing-Type IT Tourism and Services for Attracting Visitors, 2007, Ministry of Economy, Trade, and Industry[4]). In particular, repeat visitors have a higher tendency to gather information at their destination. In terms of the IT medium for doing so, mobile devices have become the strong favorite. For this reason, it is necessary to have a regional information platform that allows users to see all the information on an area in a unified format, as well as an information distribution system that transmits information via the Internet and broadcasts aimed at mobile devices.

There is a also a wide range of disaster prevention information that can be covered, including weather information and river (flooding) information, which are transmitted by each area, and national earthquake information. As each type of information is transmitted through a different media and in different formats, it is necessary to consolidate everything. In addition, manual conversion of media and formats would prevent the information from being transmitted in real time. A system structure capable of immediate transmission is preferable.

Moreover, with Japan's terrestrial digital broadcasting format, one channel is split into 13 parts, called "segments."

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A few of these segments are bundled together to send video, data, and audio, while one segment is dedicated to mobile devices; "1seg" uses this for broadcasts. One-segment local services in Japan are broadcasts destined for mobile devices; however, the broadcast is limited to a narrow area.

With regard to the discussion above, in the context of trial services for one-segment local services, many areas have been conducting experiments using the unused portion (white space) of television broadcast signals as a platform for research and development, as well as for demonstration experiments. These activities aim to utilize this white space to facilitate the initiation of new services and systems, as well as the development of business. The expectation of utilizing this for local tourism promotion and disaster prevention is particularly high.

II. Related Work

There are no previous studies that address local area information and information distribution systems comprehensively, as this research aims to accomplish. However, the following are mentioned as examples of research on individual technological levels.

A. Transmission of Information using One-Segment Local Services

There are several reports in the literature on experiments that have been conducted to transmit information using one-segment local services, for example, those by Saito et al. [5] and Nishikawa [6].

B. Research on Data Mining Technology

Basic research on data mining technology is being addressed, and its effectiveness is expected to improve. Deguchi [7] suggested the possibility of content navigation through recommendation and data mining. Additionally, Haseyama and Hisamitsu [8] considered the use of video search technology to allow users to access videos they wish to view from amongst a great number of videos.

C. Regional Information Platform

An effort has been made to further standardize area information platforms from the viewpoint of municipalities [9]. Additionally, in [10] it is reported that through the optimal use of telecommunication and broadcasts, the satisfaction level of users can be maximized.

Thus, although there has been some research on individual technologies, to the best of our knowledge, no research has focused on a comprehensive area information platform and information distribution system.

III. Area Information Platform and Information Distribution System

The Suwa Region has been designated as a white space specific district. In this study, for the purpose of tourism promotion and disaster prevention in the area, we conducted an experiment to determine the efficacy of a one-segment local service transmission service. In particular for this region, the timely transmission of weather, tourism, and disaster prevention information for the fireworks show (which attracts approximately 500,000 visitors) was a priority. But until now this kind of experiment was not yet conducted. To distribute tourist and disaster prevention information in a timely fashion to those who need it, the development of a regional information platform was required. Data mining and content understanding technology are also necessary on such a platform, to gather and analyze information, and then automatically generate and organize the information requested by the user.

In the current state, tourism information for large areas is scattered, and therefore, the desired information cannot be obtained instantly. In addition, accessing to individual hidden information is challenging. For these reasons, a regional information platform including social media information and the ability to find information on small areas through data mining is crucial.

In addition, a tourism and disaster prevention information (one-segment local service) distribution system will be developed on top of the regional information platform, as illustrated in Figure 1.

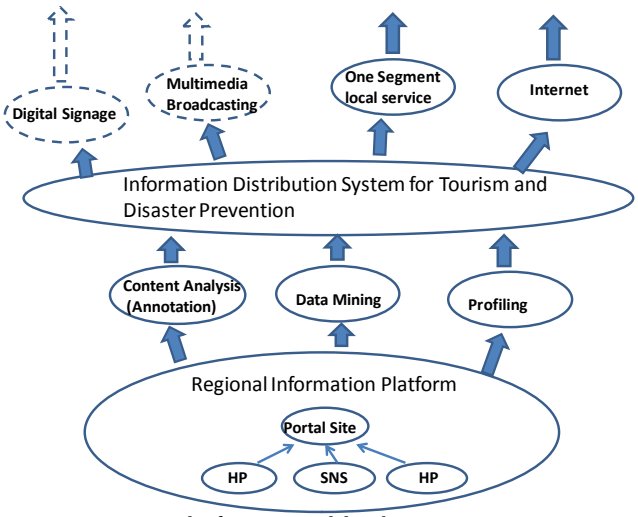

Figure 1. Regional information and distribution system.

In terms of the content transmission, the distribution system must be able to connect to broadcast and telecommunication units in a coordinated fashion. The aim of this system is to optimize the content in order to deliver programs better suited to the users' needs. Another aim of this system is to optimize the content distribution method suited to the users' environment. Finally, an autonomous disaster prevention information system, which has the ability of using broadcast and telecommunication units in the event of a disaster, is will be developed in next step.

IV. System Design

A. Regional Information Platform (corresponding to (1) in Figure 2)

First, by holding a workshop on the effective usage of social media, the utilization of social media transmissions by tourism officials was increased. In addition, as shown by the

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area demarcated as (1) in Figure 2, the regional information platform can centrally manage not only official local area websites, but also personal sites, blogs, and social networking services. Through the realization of a one-stop portal site such as this, users (tourists) will be able to find the information they seek without having to search several sites. Moreover, by crawling websites for regional information, gathered knowledge about an area can be sampled, the information requested by users can be analyzed, and this can leveraged through broadcasts.

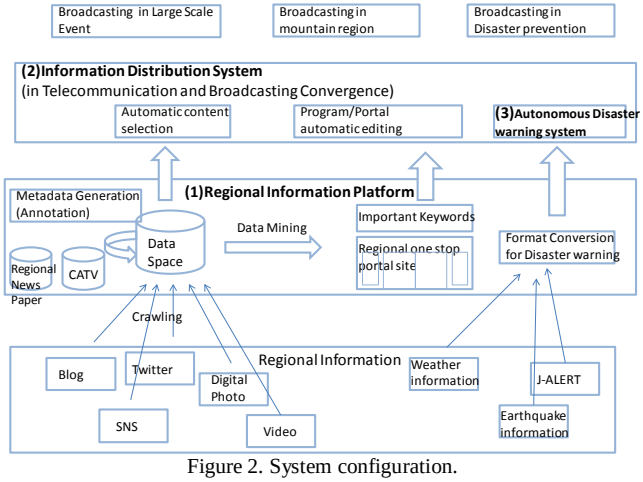

Figure 2. System configuration.

1) Workshop on the Effective Usage of Social Media

As depicted in Figure 3, workshops regarding portal sites and the effective use of social media will be held. Aimed at key individuals (from volunteer guide organizations and different tourism associations, tourism officials, and executive committees for special events) who are (or wish to be) involved in social media such as blogs, these workshops are intended to advance the utilization of such media.

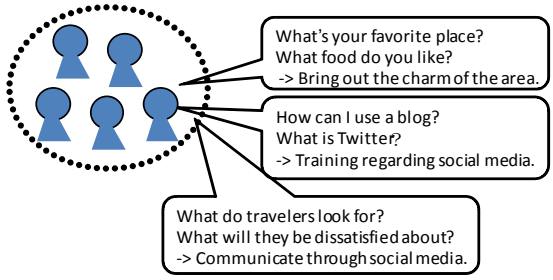

Figure 3. Social media workshop.

2) Construction of a Landing-Type Tourism Portal Site that Utilizes Social Media

a) Construction of a Functional Navigation Site

Using crawler programs employed by search engines, data regarding tourism websites including currently existing tourism organizations, hot spring associations, tourism project officials, and executive committees for special events will be collected. As shown in Figure 4, data from websites related to the Suwa Region will be imported, and using a clustering function, sorted by place, time (season), keyword, target consumers, and so on. Displayed as a navigation site, these data will provide comprehensive information as a one-stop service for those planning trips.

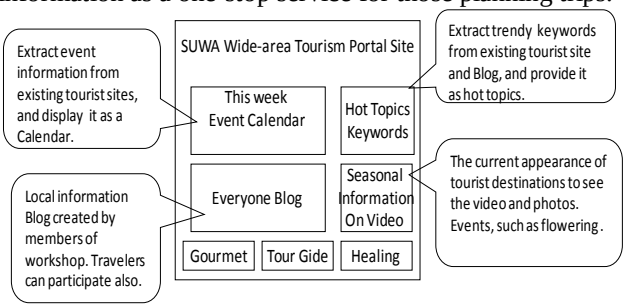

Figure 4. One-stop regional portal site.

b) Information Exchange for Volunteers and Tourists and Participation through Social Media, and System Structure

In addition, the website will include social media information from volunteer guides and others, created at the workshops discussed in 1) above.

Seasonal or rare events will be displayed on the main screen, and using mining functions such as the clustering described above. Analysis will be performed on customers (like what kinds of events certain customers are likely to participate in), and top-selling tourism commodities and so on. And also the cultivation of customers and information providers (the satisfaction level of customers and information providers, determining what is unsatisfactory for each, and raising their awareness of one another) will be performed. However, so as not to depend too much on mining technology, mined information will be used as a starting point to deepen the understanding and awareness between volunteer guides/tourism officials and tourists.

B. Construction of an Information Distribution System using Broadcast and Telecommunication Units (corresponding to (2) in Figure 2)

1) Incorporating Market Needs into Broadcasts

Through the use of data feature extraction (mining), for each time and place, the degree of interest and popularity can be extracted, and the program organization can be dynamically changed to match the users' interests. Also, through content selection (automatic annotation) technology, the necessary content can be searched for in an extensive archive and displayed. In this way, the program to be broadcast can be created with less manual intervention.

2) One-Segment Local Services Usability Trial

By experimenting with transmission of one-segment local services to 500,000 users, the usability of this type of product can be confirmed.

At the trailhead of the Yatsugatake Mountains, information about aspects such as weather conditions, changing leaves, snowfall, lodgings, transportation (buses, etc.) will be transmitted. This will confirm the quality of the radio reception and the effectiveness of the one-segment local service.

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C. Development of an Autonomous Disaster Prevention System (corresponding to (3) in Figure 2)

1) Sharing of Local Area Disaster Prevention Information and Conversion Technology for Sharing Information

A disaster prevention information system will be developed as part of the regional information platform. Through the use of data mining and automatic annotation functions, this can be used to detect early disaster information in a timely manner and assist in evacuation guidance. Functionality to convert information regarding aspects such as weather, disaster prevention, and emergencies into a consolidated format will also be developed.

2) Emergency Information Transmission System

It is vital that residents in local areas become familiar with emergency information such as J-ALERT(The civil protection warning system in Japan) without delay. It is necessary to develop the automated technology that can transmit such information in real time. With linked together with various forms of media (networks, cable television, one-segment local services, and so on), the information transmission can be carried out in the most suitable manner. For example, it is possible to make prompt reports using text superimposed over a television program that is being telecasted, and at the same time setting up a data broadcast using Broadcast Markup Language (BML) to report information on evacuation areas, and so on. Under these circumstances, any delay in sending such information is unacceptable, so it is necessary to generate and send such information from the regional information platform in as automated a way as possible.

V. TRANSMISSION EXPERIMENT AT LAKE SUWA FIREWORKS SHOW

Transmission using one-segment local services at large-scale events is one of the focus areas of this research. As such, a transmission experiment was carried out on August 15, 2012, at the Lake Suwa fireworks show.

On the day, the weather was mostly pleasant. Including the surrounding areas, 500,000 people participated in the event, with 40,000 fireworks being set off. As visitors who have come to see the fireworks tend to arrive in the early afternoon to secure good seats and have time to spare before the fireworks show begins, a survey was conducted between noon and 5 pm (before the fireworks show began).

A. One-Segment Local Broadcasting System

The upper portion of the diagram in Figure 5 shows the broadcasting system, which is in the media center in the main office. At this media center, archived videos of tourist information that had previously been collected and recorded, as well as live video captured on the spot, are encoded in real time using H.264, which is the video coding standard for one-segment local services. BML editing for the data broadcasting portion is also performed. Video information and data broadcasts, as well as schedule information, are then sent to a remote broadcasting location over the Internet following IP (Internet Protocol) conversion.

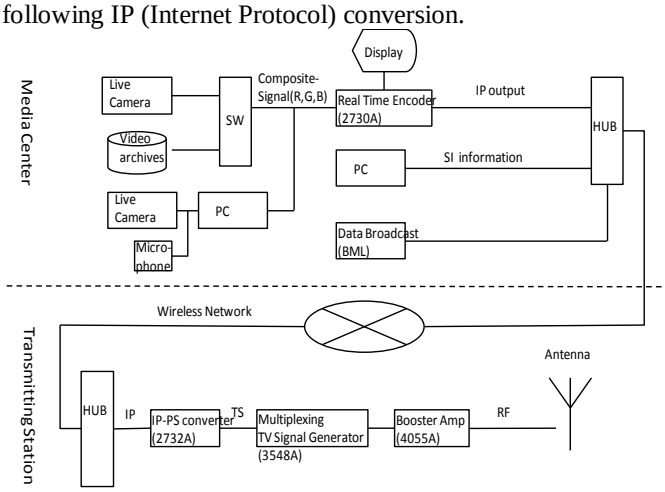

Figure 5. One-segment local broadcasting system.

Shown in the lower portion of Figure 5 is the system structure, which is in a broadcast location set up on the rooftop of a hotel. Here, after a TS (Transmission Stream) conversion of the video-type and broadcast-type data that have been received, the data are multiplexed and converted into a signal for program broadcast. They are then sent to an antenna and broadcast by orthogonal frequency division multiplexing.

Figure 6 shows the reception range of the signal, which was sent at 30mw for a full-segment and 2.3mw for a one-segment. The reception range covered an area with a maximum linear distance of approximately 500m from the antenna, although obstructions such as buildings within the range caused a deterioration in the reception conditions.

Figure 6. Broadcast service area.

B. Broadcast Program

The program that was broadcast is described below.

Followings are the program which was broadcasted at the Lake Suwa fireworks show.

Archived Video Content (basic content) compiled into a 15-minute broadcast:

- Welcome to the Suwa fireworks show
- Welcome message from the Mayor
- Fireworks photo digest

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- How to enjoy the fireworks show
- Oguchi Enka (fireworks company)
- 1seg and lost child information
- Twitter
- Suwa area navigation information

Special Content compiled into a one-hour broadcast:

- Introduction to Suwa city by the Mayor
- Suwa city tourism

Live Content introduced by a master of ceremonies (MC):

- Fireworks show
- Information on congestion
- Toilet information
- Parking information
- Tourism information
- Explanation of Twitter and Facebook
- Address by the Mayor to open the show
- Fireworks stream

Live Content (output automatically by a PC):

- Clock detailing congestion times (during of the actual fireworks)
- Fireworks program and participating companies
- Messages for the fireworks
- Twitter content

Only lost child information was transmitted as Data broadcast content with using BML. This was because BML, the content language used for data broadcasting, was found to be too complicated to author content in timely fashion. For example, in order to transmit Parking information, comparing to BML authoring, it was easier to create a PowerPoint presentation and transmit Power point Screen image. Therefore all the information except lost child information were transmitted as a screen image.

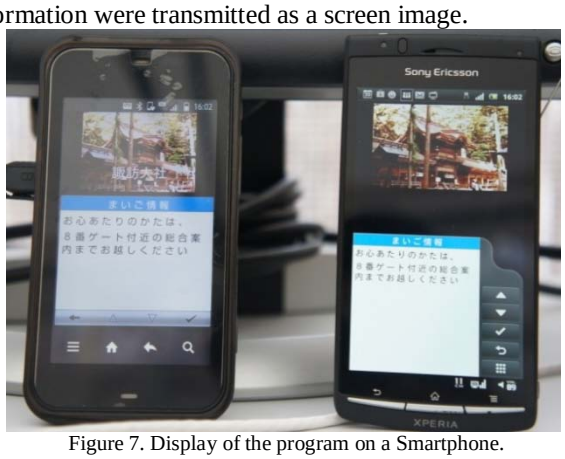

Figure 7. Display of the program on a Smartphone.

Figure 7 shows how the program is displayed on an actual Smartphone. In this example, the image in the upper portion of the display is the program promoting a tourism location in the local area. The text in the bottom portion of the display pertains to lost child information. When a lost child is reported, his/her name, age, and description are displayed.

C. Questionnaire Results and Observations

Prior to the start of the fireworks show, five university students carried out an interview-style survey.

As the survey also included an explanation of one-segment local services, the survey took about 20 minutes per person. Although fewer surveys were performed than anticipated, 71 completed questionnaires were collected from visitors. Figure 8 shows what kind of information visitors want. And it is evaluated on a scale from 1 to 5 (1 denotes the lowest score, while 5 denotes the highest).

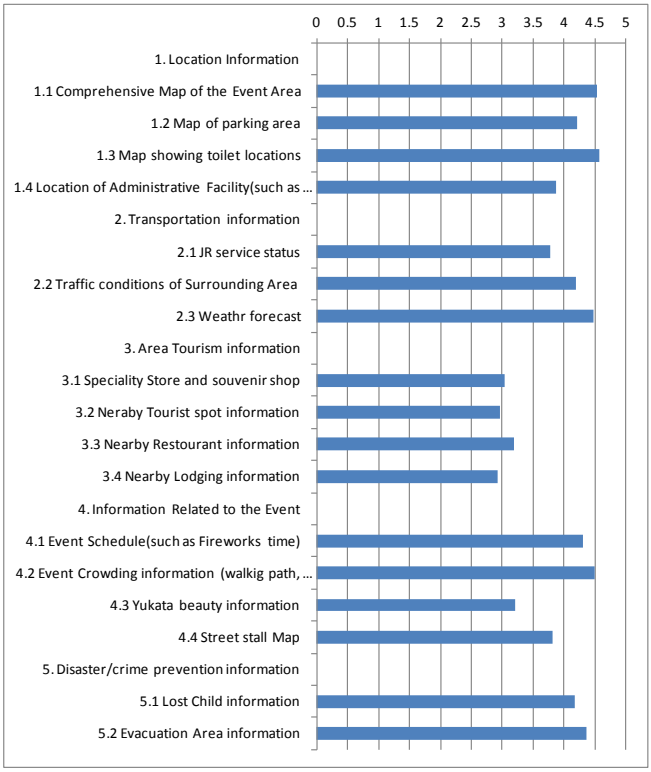

Figure 8. Evaluation of each item in the survey.

The top-ranked items were as follows: maps showing toilet locations (4.57), comprehensive map of the event area (4.53), event crowding information (4.49), and evacuation area information (4.37). It seems that visitors want a comprehensive view of the event area and would like information about their current location. It is also clear that they desire information on when toilets are expected to be overcrowded and on congestion.

The lowest-scoring items were nearby lodging information (2.93), nearby tourist spot information (2.96), and descriptions of souvenirs from nearby shops (3.04). A likely reason for this is that, as the majority of people attending the fireworks show were on day-trips. They were more interested in receiving real-time information about the fireworks show itself than about the surrounding area.

Figure 9 displays the average scores for each information category. According to this data, those attending the fireworks show were not particularly interested in tourism information about the surrounding area. However, location information related to the user's actual position within the area, as well as disaster and crime prevention information, attracted a high level of interest.

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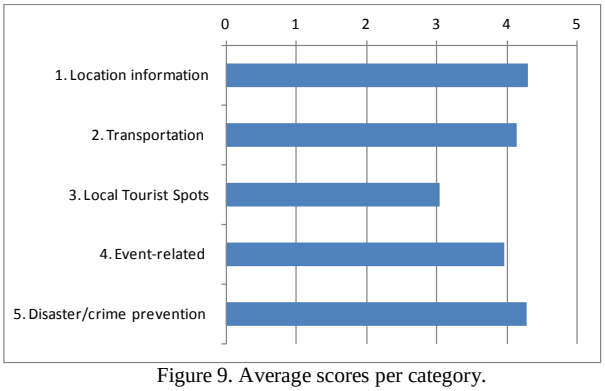

Figure 9. Average scores per category.

Finally, the question "Is the one-segment local service useful?" returned a score of 4.03. This confirms that visitors feel that this service is useful, but that it needs to be improved to be able to present the information that visitors want.

VI. CONCLUSION AND FUTURE WORK

In this study, we set up an experimental one-segment local transmission system (one of the themes of this research) and used it as a demonstration experiment at a large-scale event.

Based on the survey responses by visitors at the fireworks show, there is little interest in tourism information about the surrounding area. However, it seems that location information related to the user's position within the area, as well as disaster and crime prevention information are of high interest. This means that an optimal system should have broadcasts containing event area maps and real-time congestion information, in addition to a feature whereby the user can locate places relative to his/her location using a GPS. In particular, it would be desirable to be able to locate the nearest toilet or food/drink vendor. Also, as a form of disaster/crime prevention, there is a high demand for knowledge of the nearest exit in the event of an emergency, or the location of evacuation areas if a disaster were to strike.

Important lessons obtained in this experiment is that visitors felt that the one-segment local broadcast service was useful but that it should be improved to be able to present the information visitors want. These lessons gave us the several ideas regarding what kind of features to be developed in a regional information platform to fill the user's requirement. Especially, in terms of the promotion of tourism, it was found that it is necessary to push the local tourist information and event information to be involved with it.

During this one-segment local service transmission experiment, we found that creating programs for data broadcasts was complicated. The process involved taking BML files created with BML authoring tools, which are specialized and have professional specifications, and then performing a TS conversion on each before transmission. If there was a way to take content that has been entered and display it through broadcasts without carrying out the long-winded process, anyone would be able to use such technology.

It is also necessary to consider an optimal linking method for broadcast and telecommunication units.

At the time of the experiment, the regional information platform was not yet implemented, and so keyword detection technology through data mining was not available. However, the undeveloped parts of the system will be developed before the next transmission experiment is carried out.

By developing regional information platforms and one-segment local service broadcasting systems, we hope to facilitate the initiation of one-segment local broadcast services in many areas.

ACKNOWLEDGMENT

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