

Visualization of Simultaneous Experiences by Multi Sided Recording of an Event

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Abstract—Many people have their own camera or recording devices such as cellar phones and digital cameras. When there is a big event, a lot of pictures and movies are taken from various places at the same time. People want to record events with their digital devices as a memory or remembrance. We have some services to share these photos and movies, however, there is no viewer suitable to summarize and integrate these photos and movies for one event. Especially, when one event does not occur at one place but occur in a large area, it is difficult to visualize them. In this paper, we propose a novel viewer which enable people to see various experiences occurred at the same time. The viewer provides us three-dimensional view which includes space axis and time axis. We selected an event that occur in a large area, "the Last Run of the Express Noto". The Express Noto is a train that runs from Tokyo to Kanazawa in Japan and takes about 7 hours. There is the last run event of the Express Noto in March, 2010. We recorded the event various kinds of recording methods, e.g., a digital camera, an portable movie camera, a voice recorder, tweets at "Twitter" with more than 10 people. Then we apply our data to our viewer that can visualize them three-dimensionally for easy understanding the expanse of simultaneous experience information. For evaluation of our system, we demonstrated this system at "The Railway Museum" in Japan, and find out usefulness which it's used at museum.

I. INTRODUCTION

When a historical event occurs, many people record the event with their diary, their camera, and so on. They can record photos with GPS information using their cellular phone easily. Thus the data for the event are collected a lot. However, these data are for personal usage and from one point of view based on one person's experience. Actually there are large number of experiences generated at the same time. We focused on utilize these data that is impossible to experience them at the real time.

Our concept of this study is to integrate these data as a novel viewer.

To record our daily life not an event is called "life log". In terms of lifelog, various kinds of logging tools have been developed, and their performances are progressed rapidly. For example, VICON REVUE [1] is a life-log device to take pictures every 30 seconds. In addition, some researches have studied searching and reading these life log data efficiently [2]. They study how to utilize these life log data, however, their systems in most of them are targeted for only one person.

In terms of photos, there are large number of photos and have shared via internet photo sharing services, like flickr [3]. Some researches uses these photos to reconstruct 3D world and provide us to explore photo collections based on geometry information. Photo tourism computes each photo's viewpoint, reconstructs 3D world, and provides an interactive viewer to move seamlessly between photos [4]. This system enables a user to experience scenic or historic locations whenever the user likes. Data used in this system are only photos, thus it can only reconstruct objects not sounds, atmospheres.

When we want to record an event, the event consists visually, auditory, semantics and so on. In addition, there are a lot of subjective viewpoints. Thus we focus on collecting multi person's logs for one event and integrating them as a viewer.

In this study, we propose a novel viewer to experience an event from multi viewpoints. We selected "The Last Run of the Express Noto" as the event to record, which was a social event in Japan. We used various kinds of logging tools, and recorded the event at multi side by about 10 persons. We developed the system based on our previous system named VTM (Virtual Time Machine), that proves us to browse multi data in 3D world [5] [6]. Our system utilizes and integrates various kinds of data



Fig. 1. The Express Noto

and many people's data, and a user can re-experience the event at new viewpoints.

II. VISUALIZATION

We thought that there are five main methods to record an event: photographs, movies, sounds, location information and people's opinions. When we visualize these various data, we need to pay attention to four elements: space scale, time scale, integration and UI (User Interface). In case of "The Last Run of the Express Noto", an area we record is too large so that we need express it in large space. Time scale is also essential because the train runs for about six hours. In order to see multi users' logs easily, we had better visualize these data on a same view. To achieve it, we make various data abstract as points. Needless to say, a user can see thumbnails and replay the data. We must pay attention to UI since our visualization is developed as an interactive software. A user can control a view, time, etc. easily using a touch panel. Thus we develop a system that visualize these five data in 3D world.

III. MULTI SIDED RECORDING

The express Noto (Fig. 1), a train in Japan, have run between the Ueno station, Tokyo and the Kanazawa station, Kanazawa, 517.4 km since 1975. The express Noto ran last as a liner and became a special train at March 12, 2010, because a train diagram was changed the next day. For this event, "the Last Run of the Express Noto", a regular run of a bonnet train disappeared. About 3000 people went to see the event on the day. We decided to record the event which was only in history.

We recorded movies, photos, sounds, positions, and tweets in "Twitter". We used various kinds of logging tools such that Fig. 3. They are "LadyBug" [7], "iPod nano", a digital camera, a digital video camera, a voice recorder and a GPS recorder from left. For recording movies, we used LadyBug, iPod nano, and digital video cameras. LadyBug can record a high quality panorama movie. iPod nano can record a movie from the user's viewpoint. We used digital cameras to take photos, voice recorders to record sounds, GPS loggers to record positions. We developed a system which records tweets related to the last run of express Noto automatically, and recorded

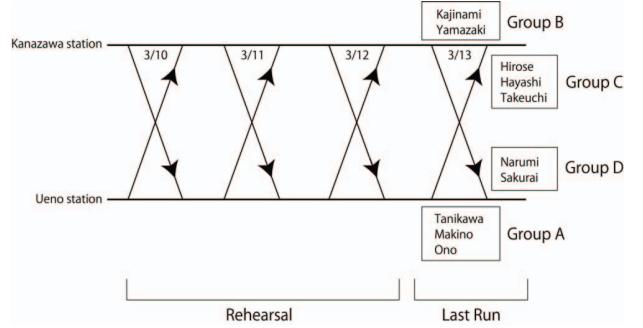


Fig. 2. Recording Plan



Fig. 3. Logging Tools

them from February 15 to March 15. In addition, one of us drew comics about the event, and we used them as data.

We fell into four groups to record the event totally and at multi side. Four groups are A group (the Ueno station), B group (the Kanazawa station), C group (Ueno to Kanazawa), and D group (Kanazawa to Ueno) (Fig. 2). A group stayed at the Ueno station and recorded movies using LadyBug and digital video cameras, photos, and sounds. B group recorded the same data as A group at the Kanazawa station. C and D group took the express Noto and recorded data in a car. They recorded iPod nano movies, photos, sounds, positions, and tweeted tweets including GPS data. And at our laboratory's server PC recorded large number of tweets automatically.

We rehearsed the recording on March 10 and 11, and researched best positions to record. On March 12, we succeeded in recording "the Last Run of the Express Noto". We recorded about 6 hours panorama movies, 28 hours iPod nano movies, 10 hours digital videos, 2000 photos, 60 hours sounds, 14 hours GPS data each one second, and 7000 tweets.

IV. ANALYZING DATA

Large number of data we recorded were separate and difficult to operate, so we needed to analyze them. Most of them were unrelated or insufficient for using our system.

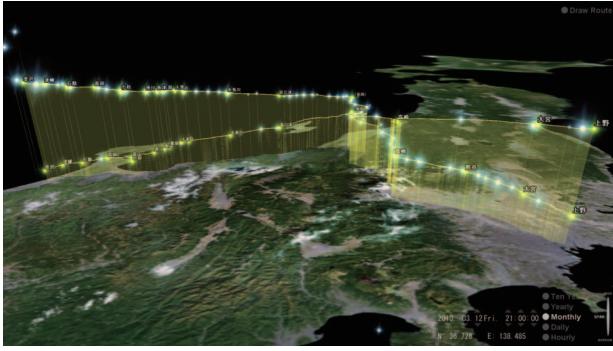


Fig. 4. VTM Noto

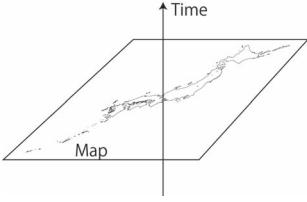


Fig. 5. Coordinates



Fig. 6. Emphasis on Data

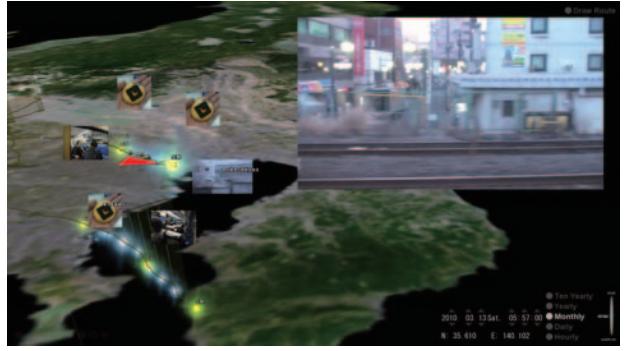


Fig. 7. Replay a Movie

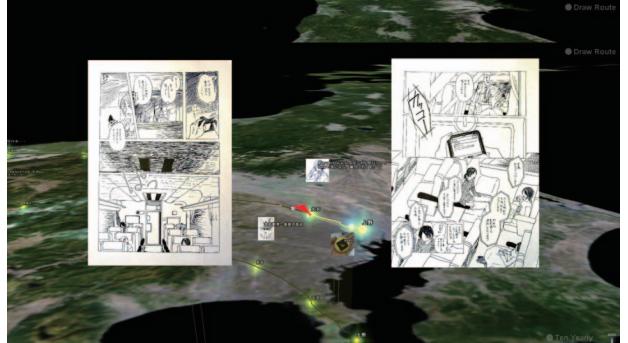


Fig. 8. Comics

A. Adding Position Data

First, we added position data to movies, photos, and sounds. GPS loggers record current latitude, longitude and time. Movies, photos, and sounds also have time data which they are recorded, and we add latitude and longitude to a data recorded same time.

B. Removing Unrelated Tweets

Second, we removed tweets which were not related to “The Last Run of the Express Noto”. Because we searched tweets by the searching query “Noto”, some unrelated tweets included “Noto” were recorded. 3000 tweets were removed for this removal.

C. Making Thumbnails

Original data were very large size, then we made small size thumbnails. Movies and sounds are become thumbnail images each five minutes. We collected Twitter icons as thumbnails of tweets.

V. IMPLEMENTATION

We developed a system called “VTM Noto (Virtual Time Machine Noto)” (Fig. 4). Map floats in 3D world, and each data is placed at appropriate position and twinkling like stars.

A. Visual

x-y plane shows location, and z axis shows time (Fig. 5). Small thumbnails made from photo data, and Twitter icons are placed at location and time that they are recorded. Movies and sounds are become thumbnails each five minutes, and placed. A user can replay them at time the user wants to start.

Yellow line on map is a railway that the express Noto runs. It is drawn using GPS data that C and D group recorded. Stations

the express Noto stops are also drawn. The express Noto’s current location is drawn on the railway as a red triangle. Two triangles, an up and down train, are on the map, and some thumbnails of data float around them. Some of data around the time and location a user focuses are emphasized, and the user can see the data efficiently (Fig. 6).

When a user selects a data, its large thumbnail image and details appears at the lower left. The detail information are the filename, the date and time, and the location. When a user double-clicks a data, the original data shows or plays in full screen.

A control panel is placed at the lower right. For the panel, a user can change time and scale freely. The center longitude and latitude in the window also shows.

B. Replay

Each kind of data plays when a user double-clicks it. Movies and sounds play from selected thumbnail’s time (Fig. 7). Original size photos show in full screen.

VTM Noto have “Story mode”. This mode is that a user can re-experience the last run of the express Noto. Start is the Ueno station, then a red triangle goes toward the Kanazawa station, and many data plays on the way. After the triangle reaches the Kanazawa station, another triangle starts to the Ueno station. Someone drew comics about the last run of the express Noto, the comics are showed on the way (Fig. 8). The movie about the last announcement is played just before reaching the Ueno station. The user can see the event at multi point of view along

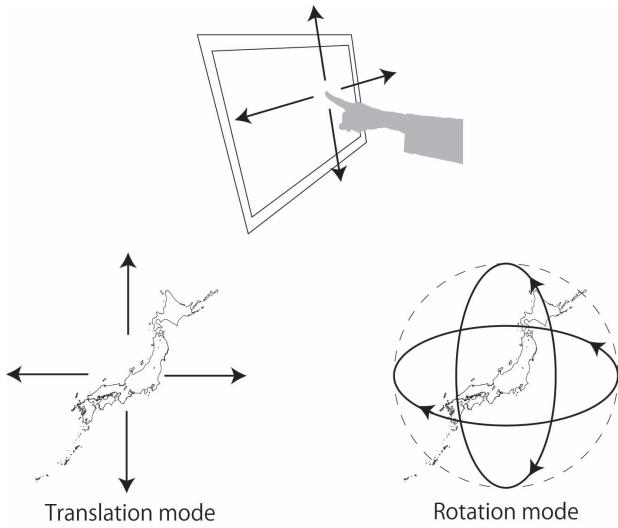


Fig. 9. Single Finger Control

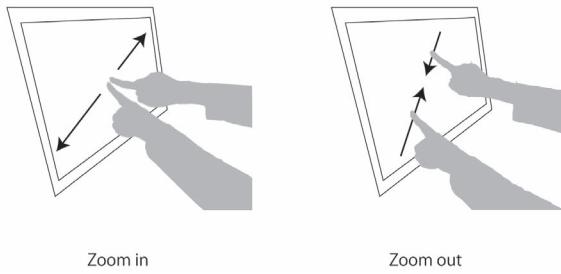


Fig. 10. Double Fingers Control

the story.

C. User Interface

We use a touch panel as a user interface of VTM Noto. This touch panel can recognize one or two fingers movements.

VTM Noto have two modes, "Translation mode" and "Rotation mode", to move a 3D world (Fig. 9). Two modes are changed when a user double-clicks on a non data point. When a user moves the single finger at "Translation mode", the user translates the 3D world parallel. When "Rotation mode", the user rotates the 3D world.

The user can zoom in or out the window using two fingers like Fig. 10. It is easy for a user to control VTM Noto intuitively.

VI. DEMONSTRATION AT THE RAILWAY MUSEUM

We demonstrated VTM Noto at the Railway Museum in Japan on April 13, 2010 (Fig. 11). The Railway Museum exhibits many trains and related objects in a large space. We thought a content of our system, the last run of express Noto, is much suitable to there.

We used a corner of the museum, and show VTM Noto to more 20 persons. Some of them evaluated our system that it was good to overlook an event, or it was a novelty expression. They seemed to feel VTM Noto had more potential. And we



Fig. 11. Demonstration at the Railway Museum

found out our system is very useful at a museum, because a museum collects historical objects or events,

VII. CONCLUSION

A user can see various kinds of data and multi sided data simultaneously by VTM Noto. In addition, the user replays the data with the event story, then the user re-experiences the event at another point of view. The point of view is not same as people's one who experienced the last run of the express Noto actually. And we found out that our system was useful at a museum from the demonstration.

Future works are collecting more various kinds of data, and importing to our system. In this research, we collected tweets related to an event. However, much more experience logs are exist in the vast Internet like news, blogs, etc. Using these data, our system will present more various viewpoints and more true experiences simultaneously.

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