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Reconstructive Platform for Local Communities Damaged by Nuclear Disaster: A Proposal

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Abstract

This paper aims to propose accumulation of information of the affected area by using ICT for reconstruction of the affected communities by the nuclear plant disaster. Such information is accumulated from local governments and inhabitants of towns in the evacuated zone. Goal of the platform proposed herein is to combine information retained by the local governments and memories retained by the inhabitants, and to create environment similar to actual towns in virtual world. Accumulation method of memories is discussed with consideration of results of the inhabitants' survey and based on cognitive psychology theory. Specifically, accumulation of individuals' memories is emphasized, and application of life log and social graph is proposed. Accumulating information and memories help create documents for local governments' recovery planning and good educational materials to evoke memories of the separated inhabitants. It is indicated that by the separated inhabitants learning the accumulated digital archives, identity can be formed.

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1. Introduction

The large earthquake of magnitude 9.0 that occurred on March 11 in Tohoku region in Japan evoked the enormous tsunami and nuclear plant accident. One year has passed from such disaster, but those who live in the neighborhood of the nuclear plant still remain evacuated and cannot return to their hometown.

According to the later described survey result, the evacuees desire to return if their towns become safe. However, there are many evacuees who doubt securement of safe life without threat of radioactive materials. Especially young people of child-raising age tend to doubt the reliability of safety and refuse to return to their hometown. The young with working ability tend to work in the city to which they are evacuated because there are many employment opportunities while the elderly tend to stay at the evacuation center in Fukushima Pref. Therefore, the local communities are in crisis of separation and some families even live separately.

On the other hand, the local governments of the evacuation zone prepare recovery plans and desire to reconstruct their towns as residential towns. Safety securement is the top priority, but it is also necessary to somehow keep connection between the local communities in order to reconstruct their towns as residential areas. According to the survey for the evacuees, the top reason why people want to return to their hometown was feeling of attachment to the towns where they have lived for a long time.

The evacuation zone for standard of homecoming possibility is determined by the government, and it is assumed to be in the active state since the existing evacuation zone classification will be reviewed at the end of March 2012.

This paper, thus, proposes the platform to anchor the people's bonding and feeling of attachment to their hometown under the active and ever-changing circumstance by using life log and social graph.

2. The Report

2.1. Damage Status, Evacuation Zone and Governmental measures

According to the information released by the National Police Agency on June 13, 2012, 15,861 peoples were killed, 2,939 were missing. The tsunami damage was the greatest in Miyagi Pref. with the most death. Reconstruction Agency reported on June 13, 2012, the evacuees are approximately 347,000 persons in total, and the largest number of evacuees is in Fukushima Pref. which had the nuclear plant disaster.

The disaster occurred in Fukushima No.1 Nuclear Plant. The tsunami hit the main facilities area of the plant. A power outage and the failure of the emergency generators to provide backup electricity caused the emergency cooling system to stop functioning which eventually brought the hydrogen explosion in the building of the plant, and the radioactive materials leaked to the atmosphere. Therefore, the evacuation of the inhabitants in the peripheral area of the power plant was unavoidable.

The government appoints the off-limits/evacuation zone, which is radius of 20km range of the nuclear plant and 20km outside area with much quantity of radiological scattering [1]. Even at the time of March, 2012, one year after the disaster, the government has not clearly shown the duration of the evacuation, and 13 villages/towns have been appointed as the off-limits/evacuation zone.

Meanwhile, the government has decided to review and reorganize the evacuation zone classification at the end of March 2012: {zone1} The area where homecoming will be possible in the near future (annual dose: less than 20mm Sv); {zone2} The area where residential use is difficult for a few years (annual dose: 20 to less than 50mm Sv) and; {zone3} The area where homecoming is not possible for a few decades (annual dose: more than 50mm Sv) [2]. Although, it will be good news for some villages/towns classified as zone1 or 2, it will attach severe reality to some villages/towns of zone3.

According to the investigation by Fukushima Pref., on April 28, 2011, 33,912 evacuees and on May 10, 2012, 62,038 evacuees evacuated from Fukushima Pref. to the other prefectures. As time passes the evacuees spread throughout Japan.

The governmental measures including the reduction of taxes, the setting of the temporary houses, the filling of the lease debt of the private houses, support of the cost of living, health support of the evacuees, have already made with a considerable success, however, more governmental helps are needed.

At last, The governmental measures for the mental bond of the evacuees have just started. Also, the government has opened the website named “My Reconstructive Letter” from September, 2011, and the collection of the photographs and messages with sounds are going on [3].

Fukushima Prefecture has entrusted the NPO “Utsukushima NPO Network” with the issue of a monthly newspaper “Fukushima Kizuna Shinbun” from November 1, 2011, which reports the present situations of the evacuees. This monthly newspaper introduces about ten persons' present situations [4].

Futaba town, where the damaged nuclear power plant locates and has been appointed as the off-limits zone, is introducing residents' letter and mail about revival in the town public relations magazine, from the January, 2012 issue. This magazine has published twice a month, which introduces about two persons' present situations in a single issue [5].

2.2. Residents' Survey for Intention to Return under Non habitable Environment

How many of the evacuated inhabitants desire to return to their hometowns?

Firstly, the result of the survey conducted by Disaster Recovery Research Institute of Fukushima University in September and October 2011[6] is mentioned. This “Disaster Reconstructive Situation Survey for Futaba Region Residents” was mailed to 28,184 households of 8 towns in the evacuation zone, and responses were obtained from 13,576 households.

Those who are in the 60's were the largest number who surveyed: 24.9%, the second largest was the 50's: 23.5%; these age groups dominated approximately half of the number who surveyed.

According to the survey, 24.8% answered that they do not have intention to return to their hometown, and by age group, those who are younger than 34 years old were the largest number: 46%. The most popular reason why they do not want to return (multiple answers allowed) was “difficulty of radioactive decontamination”: 83.1%.

Those who answered that they want to return “after infrastructure development,” “decontamination planning,” and “homecoming of other inhabitant” were totally 66.9%. The reasons why they want to return (multiple answers allowed) were “feeling attachment to the town they lived” (69.6%, 1st), “having ancestral land, house and grave” (64.7%, 2nd), “desiring to recover the town with the local people” (45.2%, 3rd) and “preferring the life in the community” (42.6%, 4th).

The number of years they can wait for: “1-2 years” (35.7%, 1st), “2-3 years” (22.8%, 2nd), and “forever” (13.9%, 3rd). By age group, people of 65-79 years old were the most number who answered “1-2 years,” people of 50-64 and 65-79 years old were the most number who answered, and people of under 34 years old were the most number who answered “forever” (21.8%).

2.3. Residents' Survey for Intention to Return when Local Governments Confirm the Habitability

Next, the result of returning intention survey [7] conducted by Kawauchi village, which was press released on March 6, 2012 is mentioned. The entire area of this town was the evacuation zone, but on January 31, 2012, the mayor made homecoming announcement and appeal to the town inhabitants evacuated all over the country for return. In the town, they are planning to start governmental activities such as restarting of

elementary schools and junior high schools from April 2012 with assumption of safety securement in residential areas for living except for mountains and forests.

The survey was conducted with total town inhabitants of 2,894 from February 3 to March 2 after homecoming announcement and 1,817 answered to the survey.

In the survey, 32.6% answered “will return” and 28.2% answered “will not return.” Among the answers, the largest number was “Don’t know” (34.0%) and 5.2% answered “have already returned.” When asking those who answered “will return” when they would return, 13.8% answered “before April,” 11.5% answered “within one year” and 3.5% answered “within two years.” The most popular reason of those who “will not return” (28.2%) (multiple answers allowed) was “fear for radioactive damage” (39.3%).

3. The Study

In discussion of the above survey, it seems that the young tend to want to wait until their towns recover to be habitable although they do not feel like returning due to their serious consideration of radioactive contamination impact.

In addition, as the reason why they desire to return to their hometown, not only physical bond such as houses, but also mental bond with their hometown such as attachment to the town and desire to live with their neighbors can be assumed to give great effect according to the survey result.

Despite the local governments’ announcement of safety, the inhabitants are somewhat doubtful and do not return immediately. Therefore, it is difficult to recuperate vitality such that the town has been recovered.

In consideration of the above situations, it is assumed necessary to plan out the system which continues to evoke memories of the towns including human relations in order to avoid reduction of the inhabitants’ attachment to the towns after completion of decontamination and infrastructure development and securement of employment for living so that the towns in the evacuation zone recover as residential areas.

Accumulating information of the towns by ICT and creating educational materials to continuously evoke the memories are considered as the best measures in order for the inhabitants separated all over the country to retain connection with their past neighbors and to make the best of their nostalgia for the hometown for the recovery, and furthermore to create a “Ba” where the inhabitants report their current situations to each other.

Here, accumulation of memories for reconstruction of communities affected is discussed by the nuclear plant disaster by using cognitive psychological viewpoint.

3.1. Cognitive Process and the Rehearsal/Recalling of Memory

In which cognitive process, the memories which can be accumulated in order to execute our proposing learning can be categorized? About cognitive process, Atkinson & Shiffrin [8] proposed three structural components: the sensory register, short-term store and the long-term store, in which they illustrated “incoming sensory information first enters the sensory register, where it resides for a very brief period of time” and “the short-term store is the subject’s working memory” and is “lost within a period of about 30 seconds, but control process called rehearsal can maintain a limited amount of information in this store as long as the subject desires.”

All the information accumulated in the memories is the event of the past. Shiffrin & Atkinson [9] analyzed that the long term memory was to be obtained and fixed information such as remembrance among the short term memory which was retained and reinforced by rehearsal (repetition) and transferred to the long term memory without forgetting. In addition, Raaijmakers & Shiffrin [10][11] stressed the importance of heteroassociative memory of context or words, concerning the recalling of the long term memory.

This paper may contribute to the rehearsal of the short term memory and to the recalling of the long term memory, as we intend to propose an e-learning by retaining the information for a long time with an application of ICT.

3.2. Long Term Memory Accumulation Models

As for our proposing platform, we will review some reference long term memory models. Anderson [12] proposed a network model as an analogy of node and link.

In addition, Conway & Pleydell-Pearce [13] proposed a modeling of autobiographical memory as a network with layer structure where a specific life event is pointed out on a time axis and any general events are described under the line and in addition any individual memory which may specify more detailed events shall be positioned beneath.

This model will enable to recall the event more concretely and activate the individual memories.

3.3. Transformation of Long Term Memory

How long the long term memory can remain to be a stable memory? If the long term memory is divided into verbalized memory (declarative memory) and non-verbalized memory, and such declarative memory is divided into semantic memory and episode memory, a vivid personal memory among the episode memory may be categorized as an autobiographical memory. Linton [14] examined that 30% of the autobiographical memory was lost after six years. The autobiographical memory may be restructured and transformed in the recalling context of the present self [15]. Furthermore, any false memory may come out in the autobiographical memory (e.g. [16]) and any action may even be determined influenced by such false memory [17].

As the long time memory may be lost, transformed or produce any false memory, it is needed to protect such transformation and to retain objectively the long term memory, using ICT. As the autobiographical memory is the one which may directly be concerned to personal event, and all of such information may not be disclosed, the information should be collected dividing into public/open information and confidential information.

3.4. Sharing of New Memories

ICT is effective also as the method to retain memories of actual dwelling before they change or disappear.

However, if inhabitants continue to live in the hometown, they must have new memories. If actually living in the hometown, memories they want to share in the community among their new memories can be talked about and shared in person.

New memories cannot be shared under the circumstance of separation. Then using ICT helps it become possible to share new memories in the community by recording them each time.

It is considered effective for not only recovery of the hometown, but also smooth life reconstruction in the hometown after recovery by chasing virtual changes which are similar to such actual changes with ICT.

4. Proposal; Reconstructive Platform for Damaged Communities

As previously mentioned, the long-term evacuation will undoubtedly take place on account of the nuclear plant disaster. Considering the examples of the nuclear plant disaster in Chernobyl, the reconstruction of the off limit in Fukushima Pref. may take several decades to become a safe residential area.

Under such special situation, we have reported the disaster situations and the restore perspectives from viewpoint of the knowledge management [18][19], now we propose to accumulate the local memories into digital archives by the time scale of the short, middle and long terms, from view point of cognitive theory.

4.1. Outline of the Platform

The digital archives makes relatively easy to gather the memories of the separated inhabitants. It can visualize memories, and also make possible to learn the visualized memories by e-learning.

First, we classify the accumulated archives and memories in variable and long-lasting, as the archives and memories change.

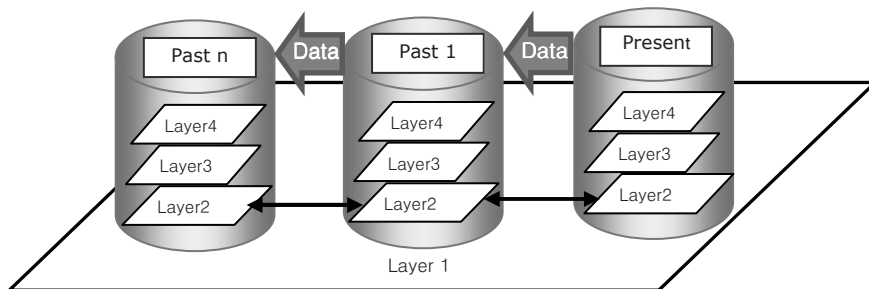


Fig. 1. The platform for the accumulation of archives and memories

Table 1. The details of the simplified and conformed Layers given in Fig.1

Time Scale	Layer	Archives/Memories	Details	
Micro Scale 1-5year	Layer 4	Inhabitants	Layer 4-2	Life log (both open and closed contents)
			Layer 4-1	Social graph
	Layer 3	Communities	Layer 3-2	Combination of public/open part of social graph and life log
			Layer 3-1	Local event & local history
Meso Scale 10-30year	Layer 2	Government etc. Public institutions Fundamental and Variable Information	Layer 2	Three dimensional maps including the buildings etc.
Macro Scale 100year	Layer 1	Government etc. Public institutions Fundamental and Long-lasting Information	Layer 1-4	Lon-lasting three dimensional maps including the land elevation maps etc.
			Layer 1-3	Long-lasting two dimensional maps including the road maps etc.
			Layer 1-2	Shallow under-ground maps including the water pipe maps etc.
			Layer 1-1	Deep under-ground maps Including the stratum maps etc.

Long-lasting and governmental archives are indicated on Layer 1. Variable archives and governmental archives are on Layer 2. Layer 2 is meso scale accumulation, which does not so often change as micro scale, and which can use interactively the neighboring layers information. Layer 3 and Layer 4 are the changeable personal and community archives and memories as classified to micro scale.

The micro scale, the core scale, indicates Layer 2 to Layer 4 by the temporal axis.

‘Present’ means from now to the past one year, and we categorize into “n” unit, approximately every past five years from ‘Past 1’ to ‘Past n’.

In Fig.1, we show the simplified and conformed Layers to indicate archives/memories, but each layer consists of plural layers, as we show on Table 1.

4.2. The Structure of Inhabitants Layer

As the community consists of the members, in other words the inhabitants, it is important to record the bond of human relationship of the community members to restore and reconstruct the communities.

We place the detailed variable data/information to the upper layers showing the personal inhabitant’s layer at the top.

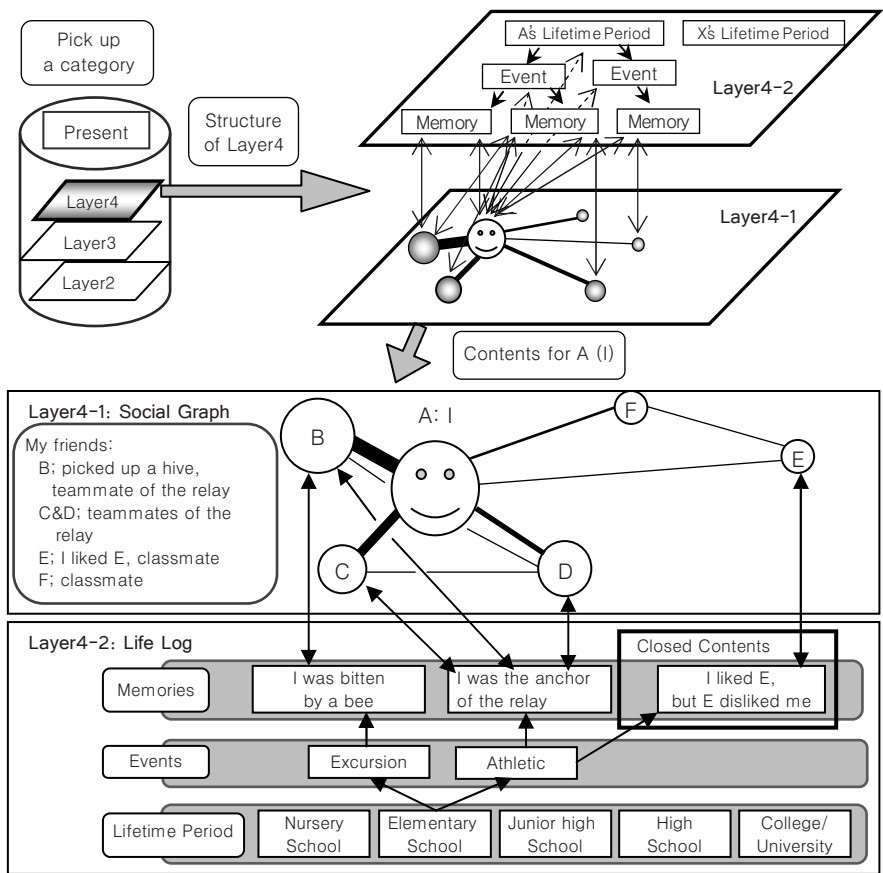


Fig. 2. Details of Layer 4

On the personal/inhabitant layer, we propose to use life log and social graph. Social graph shows human relation, and life log records daily events revealed in their literatures, pictures, sounds or movies.

Life log information in Layer4-2 is Layer4-1 is correlated to the person in social graph. Life log memory organization is composed by using Conway & Pleydell-Pearce [10]’s autobiographical memory network

model. If some other person's existence is correlated to the memory content, it is assumed that mutual approach from social graph and life log becomes possible and it becomes easier to "recall." The integration of life log and social graph are called "the advanced life log". Extension of personal "the advanced life log" will accumulate the digital archives for the communities. If we carry out our proposal, we can investigate the various changes of the personal memories as well as the communities memories.

5. Limitations and Future Directions

We understand the difficulties of our platform, if carried among countries on account of the complexities involved. But it is more practicable when the communities are the very limited areas such as villages and towns where the small populations have closer human relation.

We propose to practice our platform at the expense of the central government so the local government can manage the platform as a part of the reconstruction policy.

6. Discussions and Conclusions

Our proposal is much newer to prevent the communities from the total destruction than the already existing measures such as Google, the government and the others which accumulate the local memories by pictures/movies with maps/sounds. It is not sufficient to depend on the ready-made measures. Putting the pictures/movies with maps/sounds is the personal and individual information, which can never become the collective memories for the communities as an organization. We have a strong intention to restore and reconstruct the local communities, thus our platform indicates to accumulate not only the memories of the event memory but also of the human relationships.

Accumulating personal memories and human relationship with Life Log and Social Graph as "the advanced life log", is not only to prevent the transformation or lost of memories, but also to assist the extension of "the advanced life log". That will improve to reconstruct the memories of the communities contributing to reconstruct of the communities.

When we e-learn these digital archives, we can establish/reconfirm our personal identity, and reconfirm the communal identity of the local organization.

Such digital archives will be a helpful reference for planning the political reconstruction and for personal planning of recalling their homeland, as we may regard these are the learning materials for their future.

Our proposal is very meaningful under special situation, which needs to restore and reconstruct the local memories of the evacuees and the communities damaged by nuclear power plant disaster.

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