

# A Study of Practical Use of 3DCG Techniques for Effective Information Sharing :

## Visualization of the Reconstruction Plan of Otsuchi, Iwate Prefecture

### from the Great East Japan Earthquake

Tomoya Ito\* Kenji Sakakibara\*\* Sachio Kurose\*\*

ken Ohshida\*\*\* Akio Doi\*\*\*

\*Hachinohe Institute of Technology, Japan

\*\*Iwate Digital Engineer Training Center, Japan

\*\*\*Iwate Prefectural University, Japan

tomoya (at) hi-tech.ac.jp

{kenji, kurose} (at) iwate-de.jp

{ohshida, doia} (at) iwate-pu.ac.jp

### Abstract

Japan's Sanriku areas received devastating aftermath of the 2011 Great East Japan Earthquake. With a view to a steady progress restoring urban infrastructure and services, information sharing and consensus making among local governments and residents constitute the integral part of a large-scale town re-building processes in these areas.

In progress as it is, use of Construction Information Modeling/Management (CIM) is actively promoted in civil infrastructure design process with the information technology means integrating. As the case may be, the decision making processes in the expanded areas can be accelerated by transforming two-dimensional restoration plans into visualized three-dimensional forms.

This paper reports a case study in which we attempt to utilize computer graphics for the reconstruction purposes in Otsuchi, Iwate Prefecture, Japan.

## 1. Introduction

Great East Japan Earthquake that occurred on March 11, 2011 was the earthquake of scale that could not be predicted by anyone, and Japan received the unprecedented damage. In particular, the Sanriku areas have received extensive damage caused by the tsunami. (Fig. 1) But planning a large-scale transfer of residence hill, land elevation, construction of the breakwater, and new urban development are not progressing smoothly. One of the reasons for this unfortunate situation is that the consensus making among local residents and the government is difficult.

One way to help the situation is to create a reconstruction plan by means of 3D computer graphics (CG) model which transforms two-dimensional into three-dimensional data and "visualizes" the reconstruction plan. In this way, it becomes possible to smoothly share information among residents and local governments, accelerating decision making processes throughout the region.

In addition, the data produced in these processes are expected to be used for a tsunami simulation projects, CG animation production, and the promotion of tourism in the region. It is to promote the introduction of CIM in the process of public works in the Ministry of Land, Infrastructure and Transport and Tourism [1,2]. In this paper, we report

a case study in which we attempt to utilize computer graphics for the reconstruction purposes in Otsuchi (Iwate Prefecture, Japan).



Figure 1. Disaster situation of Otsuchi.

## 2. Visualization of the Reconstruction Plan

First, we explain the technique of 3D model construction of the reconstruction plan, then, we go on to describe the case of Otsuchi.

### 2.1 Outline of our work

3D reconstruction planning model is intended to contribute to a wide range of fields, such as civil engineering, building architecture, and 3DCG model (people, car, plant, etc.). Reconstruction planning model reported in this paper used Civil3D (civil engineering design software),

Infracad (infrastructure design software) , 3dsMax (3D modeling software) [3]. Figure 2 shows a workflow to produce a 3D model reconstruction.

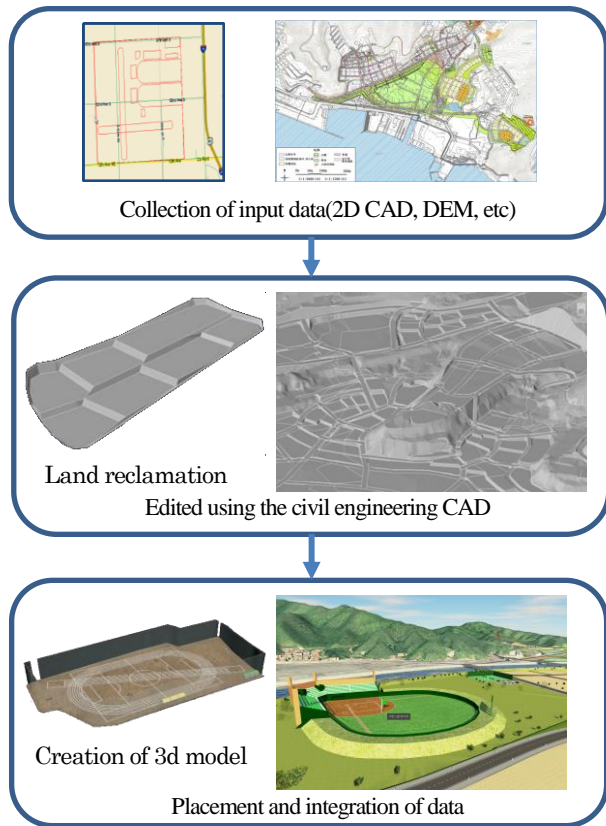


Figure 2. Workflow to create a reconstruction plan.

### 2.2 3D Reconstruction plan of Otsuchi

The materials were provided from the Otsuchi town government. Data included a 1-m resolution DEM (Digital Elevation Model) produced by airborne laser scanning. Based on this data, we simulated the future appearances of reconstruction sites and public infrastructure including roads and residential areas in visually discernible forms.

### 3. Experimental Results

Figure 3 shows the reconstruction plan of Otsuchi which is modelled in 3D form. This model was also utilized to draw a plan for the reconstruction the town. In addition, it was used as the draft plan at the information session for local residents (Fig 4(a)).

In response to local residents' request to videostream the information over the Internet, various videos are now accessible on the official website of Otsuchi, ,public spaces such as shopping malls and town hall (Fig 4(b)).



Figure 3. Reconstruction plan 3D model of Otsuchi.



(a) Briefing session to residents. (b) Information Plaza.  
Figure 4 Practical examples of the use of video for the residents

We also conducted site visits in order to cross-check the 3D model and the real landscape. In these experiments, we used the Augmented Reality application on tablet terminal.

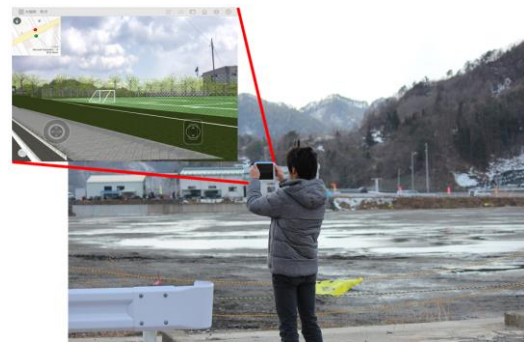


Figure 5. Experiment of Augmented Reality using mobile terminal.

### 4. Conclusions and Future Work

We presented the efforts to construct the 3D model that integrates the reconstruction plans to tackle with the damage caused in the Great East Japan Earthquake. We also reported the case which made use of the 3D model reconstruction plan of Otsuchi.

In the future work, we plan to move forward with the modeling work of the Sanriku areas. We would improve and extend the environment for the utilization of three-dimensional data.

### Acknowledgement

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