

# **A study on archives of the revival process from the Great East Japan Earthquake disaster using Unmanned Aerial Vehicle and Mobile Mapping System**

**—A case study in Iwanuma City, Miyagi Pref.—**

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**Abstract:** We took photographs and recorded movies of the revival process from the Great East Japan Earthquake disaster using UAV (Unmanned Aerial Vehicle) and MMS (Mobile Mapping System). We examine the effectiveness of the archive by the UAV and MMS. There are many UAVs and MMSs system, We used 6-roter unmanned multicopter called “GrassHOPPER” made by Information & Science Techno-System Co.,Ltd. and MMS system called “IPS2-lite” made by TOPCON CORPORATION.

**Keywords:** Unmanned aerial vehicle, Mobile Mapping System, Great East Japan Earthquake, Iwanuma City

## **1. Introduction**

There are several good archive system of the revival process from the Great East Japan Earthquake, such as “Archives of the revival process from the Great East Japan Earthquake disaster (<http://www9.nhk.or.jp/311shogen/>)”, “Whole Archives of the 3.11 (<http://311archives.jp/>)” and “Memories for the future (<https://www.miraikioku.com/>)”. But there is no archive using the UAV and MMS.

So we tried to archive the revival process from the Great East Japan Earthquake using UAV and MMS and examine the effectiveness of the archive. In addition, we examine the practical use possibilities of the UAV and MMS when a disaster occurs.

## **2. Study area**

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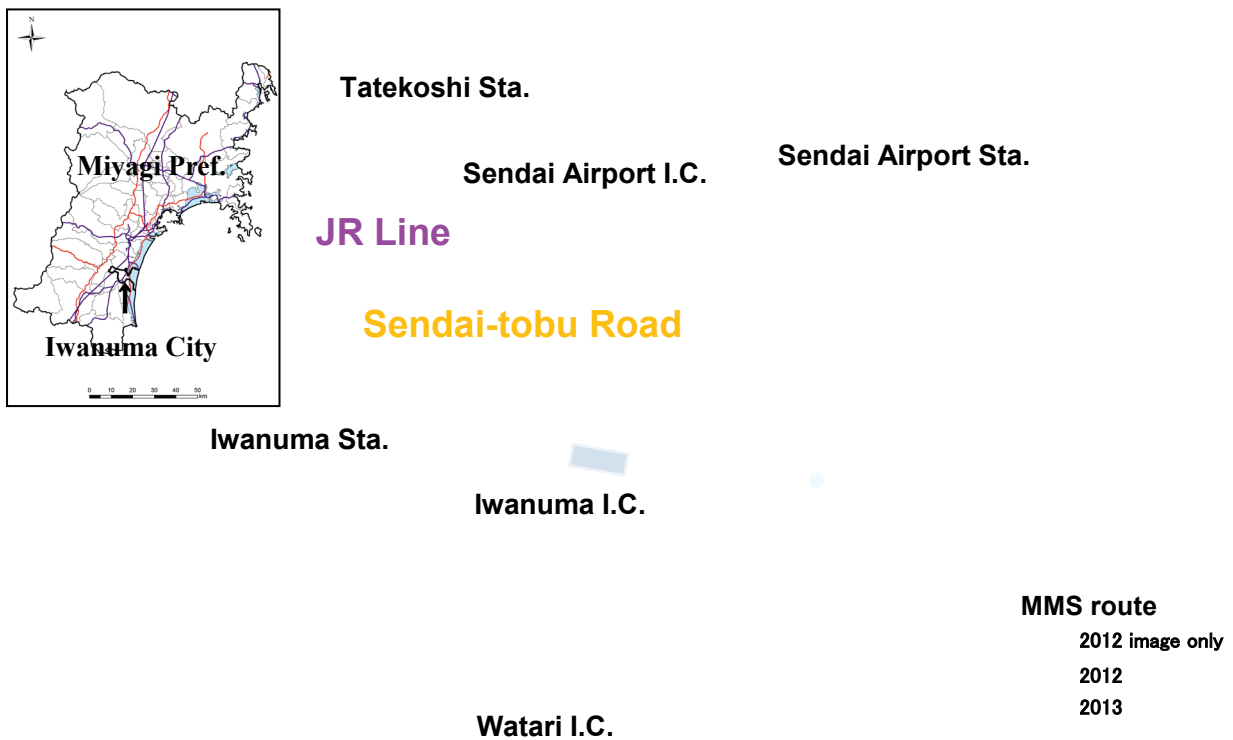
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Study area (Fig.1) is the Iwanuma city, Miyagi prefecture in JAPAN. 181 persons have died and 1 person has missed and 686 buildings were destroyed by the 3.11 in Iwanuma city. There are so many big reconstruction projects in Iwanuma city such as a group relocation project, a seawall revival project and sea shore forest revival project.

## **3. UAV and MMS**

The multicopter used in this study called “GrassHOPPER” (Fig.2) made by Information & Science Techno-System Co.,Ltd. This multicopter can fly about ten minutes with GoPro HERO2 and about six minutes with RICOH GX200. The maximum payload is about 600g.

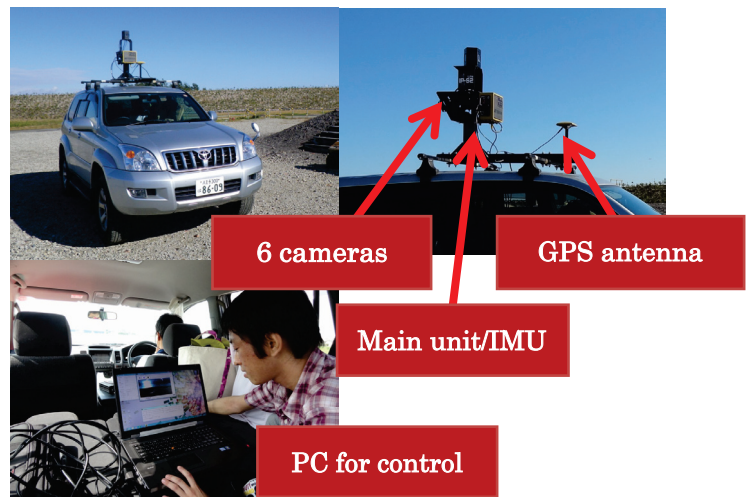
The MMS system used in this study called “IPS2-lite” (Fig.3) made by TOPCON CORPORATION. This system equipped on the roof of a car like Fig.3. The system has 6 cameras, IMU and GPS, and can record 16 images per one second.



**Fig. 1** Study area



**Fig. 2** The UAV “GrassHOPPER”



**Fig. 3** The MMS “IPS2-lite”

### 3. Results

#### 3.1 UAV’s archive data

We investigated in 19 April, 13, 19-20 May, 5 June, 9, 21 July, 5 August and 22 November in 2012, 3,18 May, 28-30 June and 18-19 November in 2013, and 9-10 March in 2014.

The places where photographs were taken by UAV were illustrated in Fig.1.

Fig.4 shows the seashore forest condition. According to the panorama photograph, seashore forest remained at the back of constructions such as a baseball stadium despite almost all the seashore forest were destroyed



**Fig. 4** Panorama image taken by the UAV



**Fig. 5** The local events taken by the UAV

completely.

Fig.5 illustrates the events such as athletic meets and rice-transplanting festivals.

Fig.6 shows the relocation project in Tamaura-Nishi district which is the fastest project in all stricken area by 3.11.

#### 4.2 MMS's archive data

We investigated in 4-7 August in 2012 and 18-19 November in 2013.

Fig.7 illustrates conditions of the seashore forest in



**Fig. 6** The relocation project taken by the UAV

Iwanuma city.

Fig.8 shows the relocation project in Tamaura-Nishi district which is the fastest project in all stricken area by 3.11.

Fig.9 illustrates the Ainokama district where the flood control warehouse had severely damaged. In



**Fig. 7** The seashore forest taken by the MMS



**Fig. 8** The relocation project taken by the MMS



**Fig. 9** Ainokama district taken by the MMS

2013 we can see “Sennen Kibouno Oka” was under construction.

### 5. Conclusion

We took photographs and recorded movies of the revival process from the Great East Japan Earthquake disaster using UAV and MMS. We can archived many digital images and movies and so many people who lived in Iwanuma city told us how effective if these type of system had worked in 3.11. and advised the points to improve the system. We continue to upgrade the both UAV system and MMS system.

### Acknowledgement

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### References

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