2014년도 추계학술대회 논문집 pp. 219~221

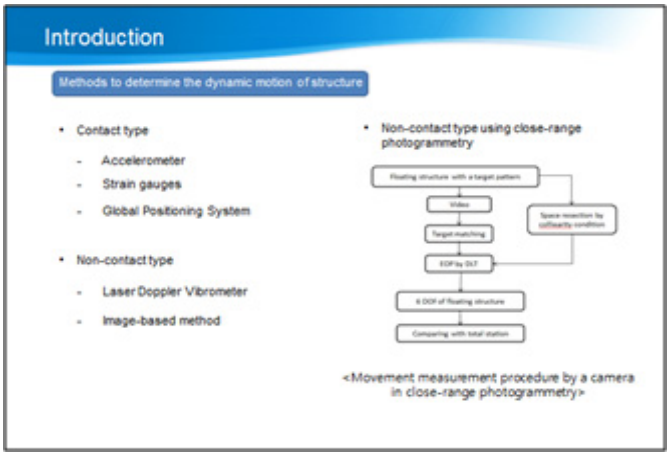
Sensors Comparison for Observation of floating structure's movement

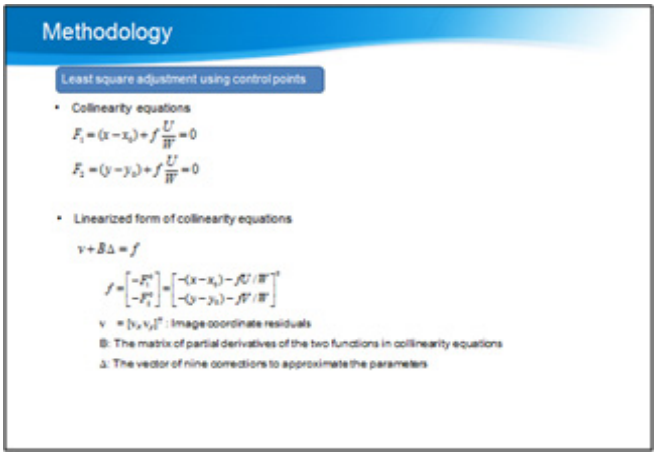
*Trieu, Hang Thi · † Han, Dong Yeob

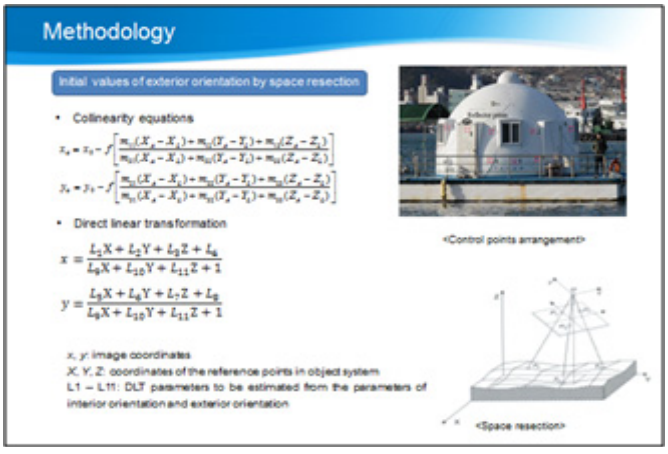
* *Department of Civil and Environment Engineering, Chonnam National University, Jeollanam-do, Korea*
† *Department of Marine and Civil Engineering, Chonnam National University, Jeollanam-do, Korea*

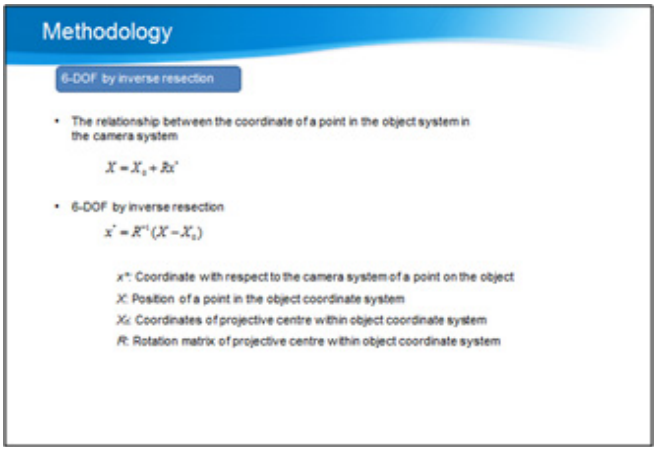
Abstract : *The objective of this paper is to simulate the dynamic behavior of a floating structure model, using image processing and close-range photogrammetry, instead of the contact sensors. Previously, the movement of structure was presented through the exterior orientation estimation of a single camera by space resection. The inverse resection yields the 6 orientation parameters of the floating structure, with respect to the camera coordinate system. The single camera solution is of interest in applications characterized by restriction in term of costs, unfavorable observation conditions, or synchronization demands when using multiple cameras. This article discusses the theoretical determinations of camera exterior orientation based on Direct Linear Transformation and photogrammetric resection using least squares adjustment. The proposed method was used to monitor the motion of a floating model. The results of six degrees of freedom (6-DOF) by inverse resection show that the appropriate initial values by DLT can be effectually applied in least squares adjustment, to obtain the precision of exterior orientation parameters. Additionally, a comparison between the close-range photogrammetry and total station results was feasibly verified. Therefore, the proposed method can be considered as an efficient solution to simulating the movement of floating structure.*

Key words : *floating structure, 6-DOF, space resection, tracking, displacement, DLT*









† Corresponding Author, Member, hozilla@chonnam.ac.kr
* Member, trieuhang@gmail.com

Experimental verification

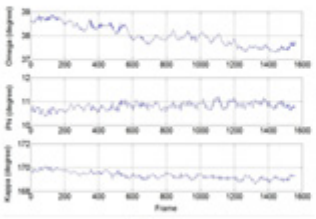
<Accommodation unit>

<Experiment view>

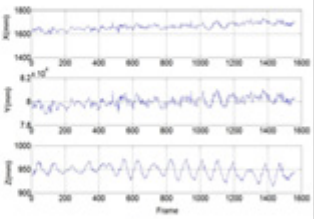
- Floating model at Kyong do island
- Tracking devices: Total station TS15 A1"R400 and camera Nikon D800

Experimental results

Initial values of exterior orientation by DLT



<Translation>



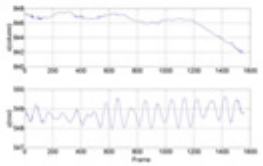
<Rotation>

Experimental results

Automatic tracking results of reference points using image processing

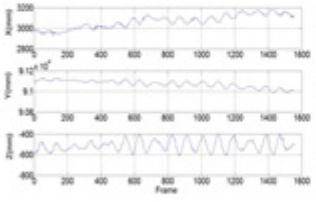
- Interest points and matched pairs

- Automatic tracking results of reference point

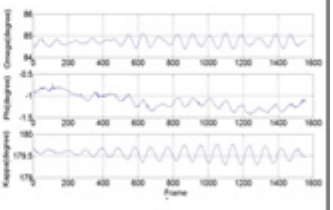


Experimental results

6-DOF of floating structure by least square adjustment and inverse resection



<Translation>



<Rotation>

Experimental results

- Affine transformation results

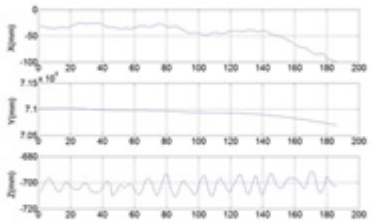
Rotation		Translation
0.999310	0.001086	-0.03987
0.000345	1.000342	-0.534424

- Matching pairs and transformation errors

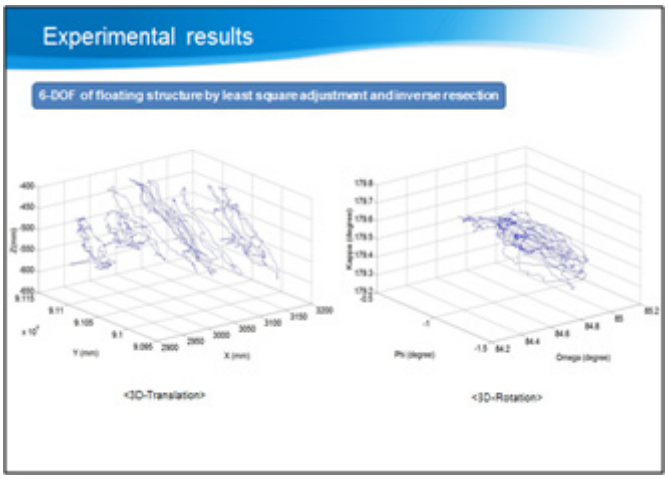
First image		Second image		Error (pixel)	
Column	Row	Column	Row	Column	Row
847	549	847	550	0.00	0.94
967	549	968	549	-0.26	0.29
718	539	718	539	-0.12	0.09
843	624	843	625	0.12	-0.91
914	629	913	629	0.37	0.03
1078	542	1077	541	0.65	0.70
978	621	988	620	0.39	-0.04
777	545	776	554	-0.09	0.54

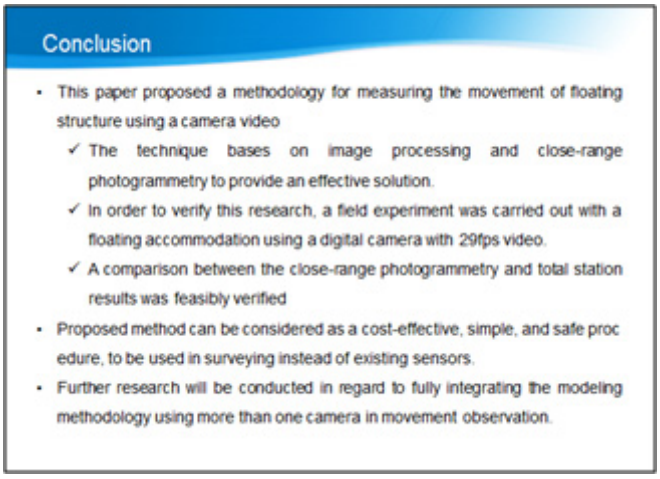
Experimental results

Displacement of floating model measured by Total station



<Translation>





Acknowledgment :
This research was supported by a grant(10 RTIP B01) from Regional Development Research Program funded by Ministry of Land, Infrastructure and Transport of Korean government.