	X		Y		Z	
	$\overline{T_X}$	σ_{TX}	$\overline{T_Y}$	σ_{TY}	$\overline{T_Z}$	σ_{TZ}
(A)	146.054	6.014	-137.498	6.515	214.513	9.021
(B)	146.054	6.268	-137.498	6.79	214.513	9.402

(A)… Three dimensional measurement using all image relations
(B)… Three dimensional measurement using only chosen image relations
$\overline{T_X}$,$\overline{T_Y}$,$\overline{T_Z}$.. The average of each value of the translation matrix of each frame
σ_{TX},σ_{TY},σ_{TZ}.. Standard deviation of the measurement error of the value of each direction of the translation matrix

Table 3. A result of accuracy comparison of camera position

5. DISCUSSION

Table 1 shows that by the proposed method the number of using image pairs decreased to approximately 75% in comparison with before application of method, therefore improvement of the effectiveness of 3D measurement was confirmed. In addition, Table 2 and Table 3 show that the accuracy of 3D measurement using only image pairs selected automatically by proposed method is almost the same level as that using all image pairs. From the above, an effective three-dimensional measurement was realized while keeping accuracy by an application of the proposed method.

6. CONCLUSION

In this paper, we examined the method to enable a more efficient 3D measurement while keeping accuracy using a large quantity of images, and developed method to select using images automatically from a large quantity of images group by considering the network design. Furthermore, we applied proposed method for real data (photographed images) and inspected effectiveness and the accuracy, and examined application possibility of the proposed method. Actually, through the experiments verifying the effectiveness and accuracy of the proposed method, the significance of the proposed method is confirmed, and it is expected that proposed method will lead to development of the future photogrammetry.

On the other hand, there are many future works to apply the proposed method practically. Firstly, it is hoped that the proposed method apply to not only sequential images but also various kinds of images such as shared images on the internet. In such cases, interior orientation elements should be introduced because these images are photographed by different cameras. Additionally, definition of cost function for the edges will be investigated. In this method, only estimation accuracy of the external orientation element between two images is set as variable for cost function. By adding the estimation accuracy of the three-dimensional coordinate of the feature points to cost function as variable, it is expected that we can express the relations between images in greater detail and can obtain result having higher accuracy. Furthermore, discussion about relationships between efficiency and accuracy will be required, because if we apply the graph cuts repeatedly, it is thought that the effectiveness improves, but the accuracy decreases. As a result, applicability of photogrammetry will be more increased.

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