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**Title: View Similarity of Multi-view Depth Sequences**

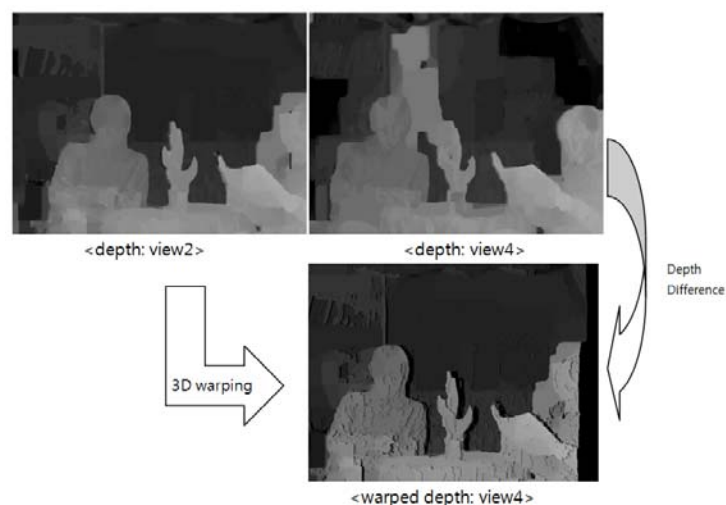
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## **1. Introduction**

This document contains our analysis of view similarity of test sequences. We measure the similarity of multi-view depth regarding the test scenarios listed in the Call for Proposals (CfP) on 3D Video Coding (3DVC) [1]. The main objective is to provide the degree of how views are correlated in the test sequences.

## **2. Depth Similarity Measure**

We introduce a measure called similarity of multi-view depth (SIMD). This measure is based on the disparity difference between original view depth and warped view depth. SIMD is the reciprocal of the average of differences. Thus, small disparity dissimilarity leads to high SIMD, which means the views are highly correlated.



**Figure 1. SIMD Calculation Process**

D denotes disparity, while p and q are corresponding pixels. N represents the number of disparity matches, disregarding occluded areas. By warping the left view to the right view, we compute the sum of disparity differences and take the average. Similarly, this can be computed by warping the right view to the left view. As a result of warping, occluded regions exist, meaning depth values are empty. Thus, we do not count the differences computed from such regions. In Figure 1, unnatural black marks indicate occluded areas

$$SIMD = \frac{1}{\left\{ \left( \frac{1}{N} \right) \sum \left| D_{warped,L}(p) - D_{original,R}(q) \right| \right\}}$$

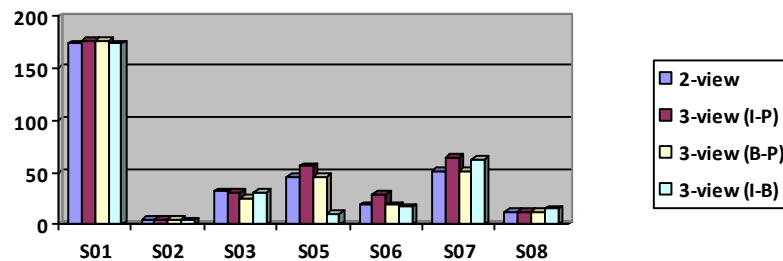
For 2-view, we computed the SIMD values of I-to-P and P-to-I and took the average. For 3-view, we took averages for I-P, B-P, and I-B. Table 1 and Table 2 show SIMD values of test sequences. As a result of our multi-view depth similarity measuring process, Poznan\_Hall2 showed the highest correlation while Poznan\_Street displayed the lowest. Meanwhile, Kendo views exhibited the highest variance. The numbers are represented graphically in Figure 2.

**Table 1. SIMD Values of Class A Test Sequences**

Seq. ID	Test Sequence	2-view input		3-view input		
S01	Poznan_Hall2	7-6	7-to-6: 172.00	7-6-5	7-to-5: 173.00	
						5-to-7: 180.00
						<b>Avg: 176.50</b>
		6-7	6-to-7: 175.00		6-to-5: 175.00	
					5-to-6: 179.00	
					<b>Avg: 177.00</b>	
			<b>Avg: 173.50</b>		7-to-6: 172.00	
					6-to-7: 175.00	
					<b>Avg: 173.50</b>	
S02	Poznan_Street	4-3	4-to-3: 5.00	5-4-3	5-to-3: 5.00	
						3-to-5: 4.00
						<b>Avg: 4.50</b>
		3-4	3-to-4: 4.00		4-to-3: 5.00	
					3-to-4: 4.00	
					<b>Avg: 4.50</b>	
			<b>Avg: 4.50</b>		5-to-4: 4.00	
					4-to-5: 4.00	
					<b>Avg: 4.00</b>	
S03	Undo_Dancer	5-2	5-to-2: 37.88	9-5-1	9-to-1: 26.00	
						1-to-9: 36.13
						<b>Avg: 31.07</b>
		2-5	2-to-5: 26.00		5-to-1: 26.00	
					1-to-5: 26.00	
					<b>Avg: 26.00</b>	
			<b>Avg: 31.94</b>		9-to-5: 26.00	
					5-to-9: 36.13	
					<b>Avg: 31.07</b>	

**Table 2. SIMD Values of Class C Test Sequences**

Seq. ID	Test Sequence	2-view input		3-view input	
S05	Kendo	3-5	3-to-5: 53.00	1-3-5	1-to-5: 64.00
					5-to-1: 48.00
					<b>Avg: 56.00</b>
					3-to-5: 53.00
					5-to-3: 38.00
					<b>Avg: 45.50</b>
					1-to-3: 11.00
					3-to-1: 10.00
<b>Avg: 10.50</b>					
S06	Balloons	3-5	3-to-5: 18.56	1-3-5	5-to-1: 29.02
					<b>Avg: 29.12</b>
					3-to-5: 18.56
					5-to-3: 18.87
					<b>Avg: 18.72</b>
					1-to-3: 16.93
					3-to-1: 17.11
					<b>Avg: 17.02</b>
S07	Lovebird1	6-8	6-to-8: 48.00	4-6-8	8-to-4: 81.00
					<b>Avg: 65.00</b>
					6-to-8: 48.00
					8-to-6: 54.00
					<b>Avg: 51.00</b>
					4-to-6: 49.00
					6-to-4: 75.00
					<b>Avg: 62.00</b>
S08	Newspaper	4-6	4-to-6: 11.27	2-4-6	6-to-2: 12.26
					<b>Avg: 12.49</b>
					4-to-6: 11.27
					6-to-4: 12.07
					<b>Avg: 11.67</b>
					2-to-4: 15.30
					4-to-2: 14.76
					<b>Avg: 15.03</b>



**Figure 2. SIMD Values of the Test Sequences**

### **3. Conclusion**

In this document, we have measured multi-view depth similarity of 3DV CfP test sequences by means of SIMD. By applying them to the test sequences, we acquired numerically represented information of similarity among view-selections.

### **4. Acknowledgements**

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### **5. References**

- [1] ISO/IEC JTC1/SC29/WG11 "Call for Proposals on 3D Video Coding Technology," N12036, March 2011.