SpherePHD: Applying CNNs on a Spherical PolyHeDron Representation of 360° Images
(Supplementary materials)

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1. Introduction

This supplementary material is for better understanding of the proposed SpherePHD, including additional figures that describe our convolution and pooling method. The supplementary material also includes the irregularity score table mentioned in the main paper.

2. Implementation of our convolution and pooling methods

In Figs. 1 and 2, we visualize the actual implementation of the proposed convolution and pooling methods; these figures are enlarged versions of Fig. 7 in the main paper. Figure 3 shows the net of the proposed SpherePHD with a few example kernels actually applied on the SpherePHD image (this is also an enlarged version of Fig. 6 in the main paper) and Fig. 4 shows the process of the proposed pooling method on SpherPHD.

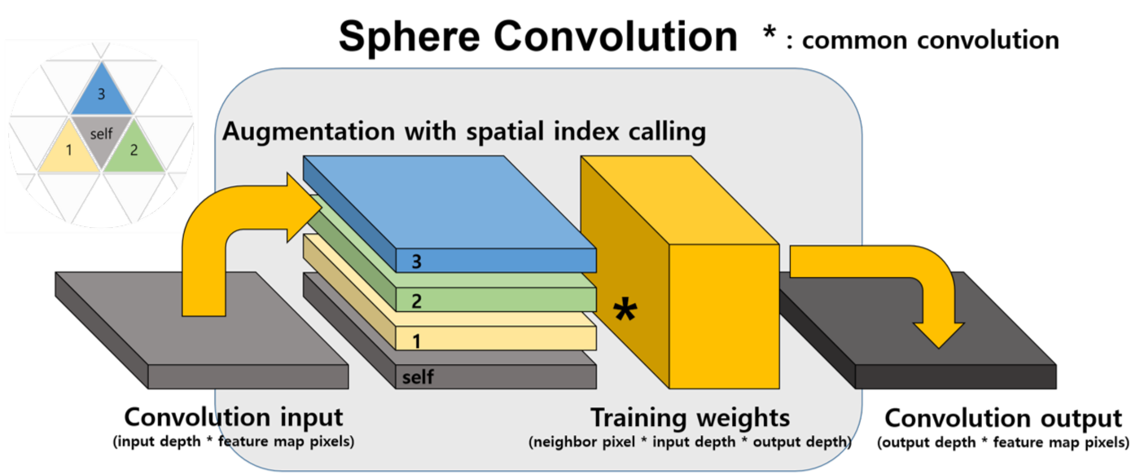

Figure 1. Tensor-wise implementation of our proposed convolution methods.

*These authors contributed equally

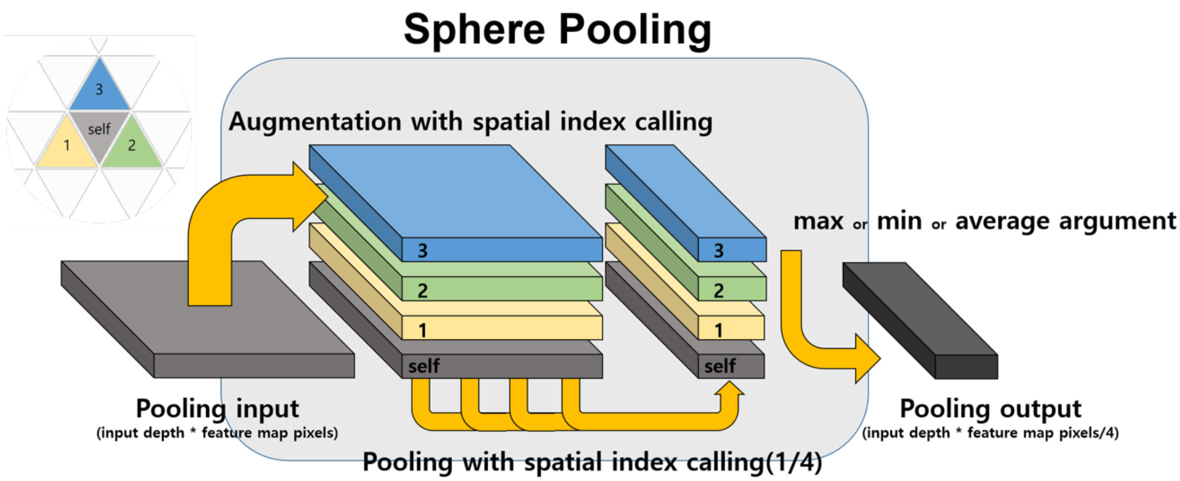

Figure 2. Tensor-wise implementation of our proposed pooling methods.

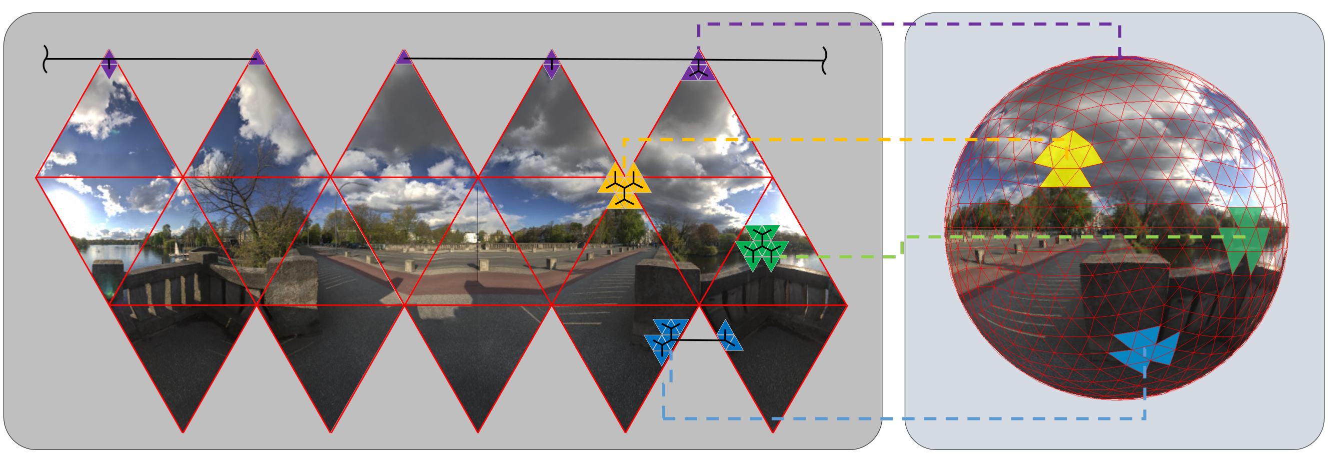

Figure 3. The net of the proposed SpherePHD with a few sample kernels actually applied on the SpherePHD image. The kernels are zoomed in for the visualization.

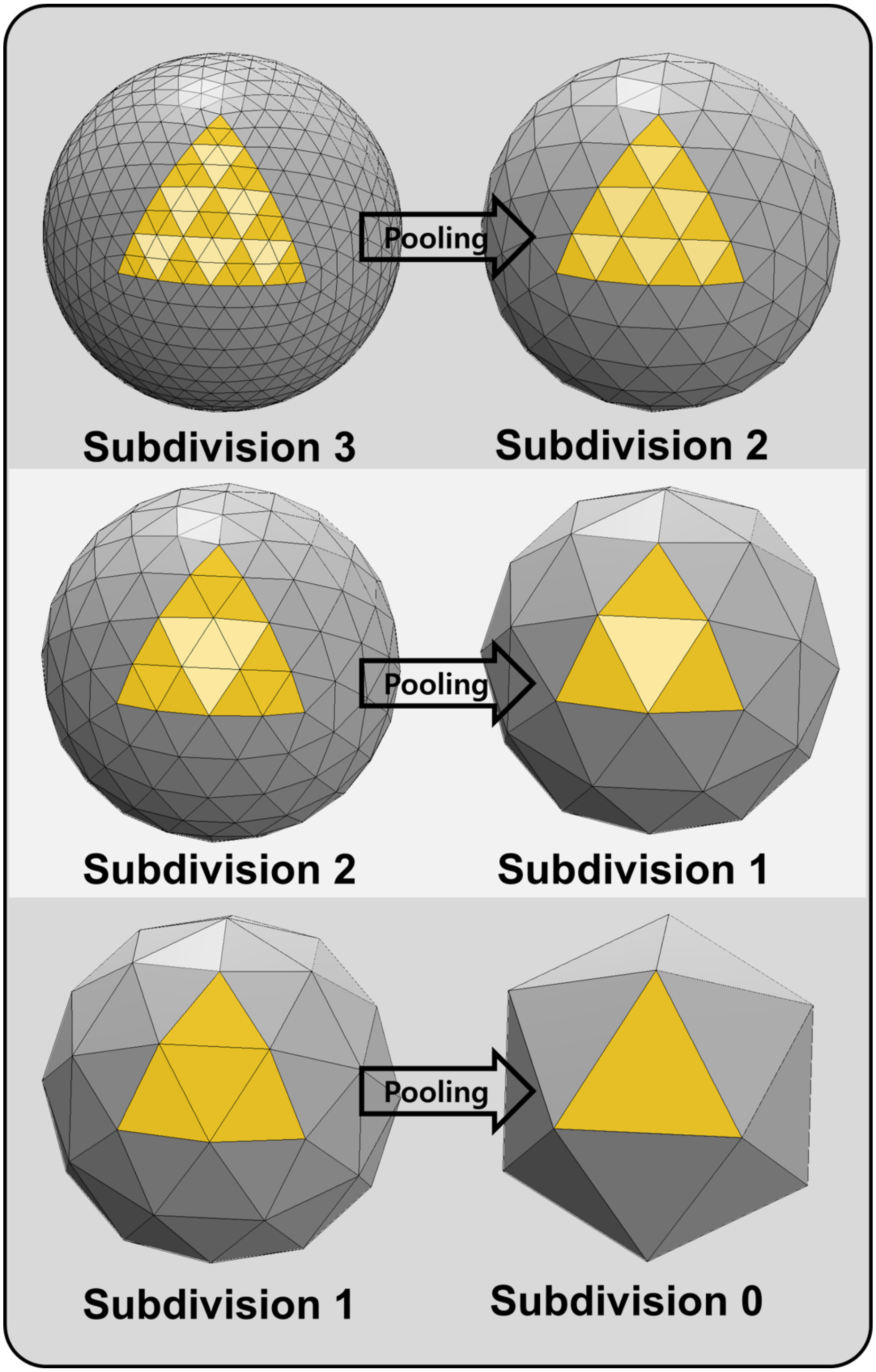

Figure 4. The proposed pooling method on SpherePHD from subdivision 3 to 0.

3. Irregularity score table

Table 1 is the irregularity score table that is mentioned in Section 3 of the main paper. The irregularity scores are calculated from the areas of the triangles in each n-th subdivision spherical polyhedron; the irregularity was calculated through the equation presented in the main paper.

Table 1. Irregularity values of different spherical polyhedrons (from different regular polyhedrons) according to the number of subdivision. The subdivisions represent the n-th subdivisions of different spherical polyhedrons.

	ERP			Tetrahedron			Cube			Octahedron			Icosahedron		
subdivisions	irregularity	min	max	irregularity	min	max	irregularity	min	max	irregularity	min	max	irregularity	min	max
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0.2048	-0.1398	0.3303	0.1879	-0.2977	0.2295	0.1747	-0.1166	0.2852	0.0744	-0.0458	0.1259
2	0.4506	-0.5348	0.3466	0.3898	-0.3126	0.8584	0.2167	-0.4200	0.3287	0.2077	-0.2053	0.4353	0.0811	-0.0067	0.1710
3	0.6488	-1.1891	0.4257	0.5005	-0.8545	1.0854	0.2235	-0.4553	0.3583	0.2161	-0.2322	0.4851	0.0824	-0.0730	0.1835
4	0.7683	-1.8726	0.4451	0.5478	-1.1366	1.1606	0.2252	-0.4644	0.3660	0.2182	-0.2392	0.4986	0.0827	-0.0745	0.1867
5	0.8399	-2.5634	0.4500	0.5631	-1.3606	1.1841	0.2256	-0.4667	0.3680	0.2187	-0.2410	0.5020	0.0828	-0.0749	0.1875
6	0.8821	-3.2559	0.4512	0.5666	-1.5740	1.4798	0.2257	-0.4673	0.3685	0.2189	-0.2414	0.5029	0.0828	-0.0750	0.1877
7	0.9066	-3.9489	0.4515	0.5671	-1.7862	2.0666	0.2258	-0.4675	0.3686	0.2189	-0.2415	0.5031	0.0828	-0.0750	0.1878
8	0.9207	-4.6420	0.4516	0.5669	-1.9986	2.6538	0.2258	-0.4675	0.3686	0.2189	-0.2416	0.5032	0.0828	-0.0750	0.1878
9	0.9286	-5.3352	0.4516	0.5669	-2.2113	3.2407	0.2258	-0.4675	0.3686	0.2189	-0.2416	0.5032	0.0828	-0.0750	0.1878