1 SUPPLEMENTAL MATERIAL

1.1 Aggregated Performance Results

Table 1. Average frametimes for all methods and camera poses in the CryTek Sponza scene [2011].

Platform	Method	Mode	Level						
RTX 4080	Micromap	2-State	1	5.0	4.3	4.5	4.1	4.8	4.3
			2	5.0	4.3	4.6	4.1	4.8	4.3
			3	5.1	4.3	4.6	4.1	4.8	4.4
			4	5.1	4.3	4.6	4.1	4.9	4.4
			5	5.1	4.3	4.6	4.1	4.9	4.4
			6	5.1	4.3	4.6	4.2	4.9	4.4
		4-State	1	5.2	4.4	4.6	4.2	4.9	4.6
			2	5.2	4.4	4.6	4.2	5.0	4.6
			3	5.2	4.4	4.6	4.2	5.0	4.6
			4	5.3	4.4	4.6	4.2	5.0	4.6
			5	5.2	4.4	4.6	4.2	5.0	4.6
			6	5.3	4.4	4.6	4.2	5.0	4.6
	Tree	2-State	1	4.9	4.3	4.5	4.1	4.8	4.2
			2	5.0	4.3	4.6	4.1	4.8	4.3
			3	5.1	4.4	4.6	4.1	4.9	4.4
			4	5.6	4.4	4.6	4.2	5.0	4.9
			5	9.1	4.8	4.7	5.1	6.3	8.4
			6	19.3	6.5	5.9	9.7	12.0	18.6
		4-State	1	5.2	4.4	4.6	4.2	4.9	4.6
			2	5.3	4.4	4.6	4.2	5.0	4.7
			3	5.5	4.4	4.6	4.2	5.1	4.9
			4	7.4	4.6	4.6	4.6	5.7	6.9
			5	14.9	5.7	5.3	7.4	9.2	16.0
			6	34.6	9.7	9.2	17.8	20.8	38.0
	Vulkan (FT)	2-State	1	4.9	4.3	4.5	4.1	4.8	4.2
			2	5.0	4.3	4.6	4.1	4.8	4.3
			3	5.0	4.3	4.6	4.1	4.8	4.3
			4	5.0	4.3	4.5	4.1	4.8	4.3
			5	5.0	4.3	4.6	4.1	4.8	4.4
			6	5.0	4.3	4.6	4.1	4.8	4.3
		4-State	1	5.2	4.4	4.6	4.2	4.9	4.6
			2	5.2	4.4	4.6	4.2	4.9	4.6
			3	5.2	4.4	4.6	4.2	4.9	4.6
			4	5.1	4.3	4.6	4.2	4.9	4.5
			5	5.2	4.3	4.6	4.2	4.9	4.5
			6	5.2	4.3	4.6	4.2	4.9	4.5
	Vulkan (FB)	2-State	1	4.9	4.3	4.5	4.1	4.8	4.2
			2	5.0	4.3	4.6	4.1	4.8	4.3
			3	5.1	4.3	4.6	4.1	4.9	4.4
			4	5.1	4.3	4.6	4.2	4.9	4.4
			5	5.1	4.3	4.6	4.2	4.9	4.4
			6	5.1	4.3	4.6	4.2	4.9	4.4
		4-State	1	5.2	4.4	4.6	4.2	5.0	4.6
			2	5.3	4.4	4.6	4.2	5.0	4.7
			3	5.3	4.4	4.6	4.2	5.0	4.7
			4	5.2	4.4	4.6	4.2	5.0	4.6
			5	5.2	4.4	4.6	4.2	5.0	4.6
			6	5.2	4.4	4.6	4.2	5.0	4.6
	Bitmask	2-State		5.1	4.3	4.6	4.2	4.9	4.4
		4-State		5.2	4.4	4.6	4.2	5.0	4.6
	Texture			5.2	4.4	4.6	4.2	5.0	4.6
RTX 3080	Micromap	2-State	1	8.1	7.1	7.5	6.7	7.9	7.1
			2	8.3	7.2	7.6	6.8	8.0	7.2
			3	8.4	7.3	7.6	6.8	8.0	7.3
			4	8.5	7.3	7.7	6.8	8.0	7.4
			5	8.5	7.3	7.7	6.9	8.1	7.5
			6	8.5	7.3	7.7	6.9	8.2	7.5
		4-State	1	8.7	7.3	7.7	7.0	8.3	7.9
			2	8.7	7.4	7.7	7.0	8.3	7.8
			3	8.6	7.4	7.7	6.9	8.3	7.8
			4	8.7	7.3	7.7	6.9	8.3	7.8
			5	8.7	7.4	7.7	7.0	8.3	7.8
			6	8.6	7.3	7.7	6.9	8.2	7.8
	Tree	2-State	1	8.2	7.2	7.6	6.8	8.0	7.1
			2	8.3	7.3	7.6	6.8	8.0	7.2
			3	8.4	7.3	7.7	6.8	8.1	7.3
			4	9.4	7.5	7.7	7.0	8.4	8.4
			5	14.9	8.0	7.9	8.4	10.4	14.0
			6	30.6	10.5	9.6	15.4	19.2	30.1
		4-State	1	8.6	7.4	7.7	6.9	8.3	7.8
			2	8.7	7.3	7.7	6.9	8.3	7.9
			3	9.1	7.4	7.7	7.0	8.5	8.4
			4	12.0	7.7	7.8	7.8	9.5	11.7
			5	23.9	9.4	8.7	12.0	15.0	25.5
			6	54.9	15.3	14.4	27.6	32.5	60.8
	Vulkan (FT)	2-State	1	8.1	7.2	7.6	6.8	8.0	7.1
			2	8.2	7.3	7.7	6.8	8.1	7.2
			3	8.3	7.3	7.7	6.9	8.1	7.3
			4	8.3	7.4	7.7	6.9	8.1	7.4
			5	8.3	7.4	7.7	6.9	8.2	7.4
			6	8.3	7.4	7.8	6.9	8.2	7.5
		4-State	1	8.6	7.4	7.8	7.0	8.3	7.9
			2	8.6	7.5	7.8	7.0	8.3	7.8
			3	8.5	7.5	7.8	7.0	8.4	7.8
			4	8.5	7.4	7.8	7.0	8.4	7.8
			5	8.5	7.5	7.8	7.0	8.4	7.8
			6	8.5	7.5	7.8	7.0	8.4	7.8
	Vulkan (FB)	2-State	1	8.2	7.3	7.6	6.8	8.0	7.1
			2	8.3	7.3	7.7	6.9	8.0	7.3
			3	8.4	7.3	7.7	6.9	8.2	7.4
			4	8.5	7.4	7.8	6.9	8.2	7.5
			5	8.5	7.4	7.8	6.9	8.2	7.5
			6	8.5	7.4	7.8	6.9	8.2	7.5
		4-State	1	8.7	7.4	7.8	7.0	8.4	7.9
			2	8.7	7.4	7.8	7.0	8.4	7.9
			3	8.7	7.5	7.9	7.1	8.4	7.9
			4	8.6	7.4	7.8	7.0	8.4	7.9
			5	8.7	7.5	7.9	7.0	8.4	7.9
			6	8.7	7.5	7.8	7.0	8.4	7.9
	Bitmask	2-State		8.4	7.2	7.7	6.8	8.1	7.4
		4-State		8.6	7.4	7.8	7.0	8.3	7.8
	Texture			8.6	7.4	7.8	7.0	8.3	7.9

Table 2. Average frametimes for all methods and camera poses in the Ecosys scene [1998].

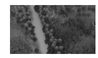
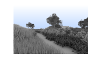
Platform	*Method*	*Mode*	*Level*					
RTX 4080	*Micromap*	*2-State*	*1*	5.8	6.8	8.7	9.9	4.9
			2	6.2	7.0	8.9	10.1	5.1
			3	6.6	7.1	9.0	10.1	5.1
			4	6.8	7.2	9.1	10.1	5.2
			5	6.9	7.3	9.2	10.3	5.3
			6	7.1	7.3	9.3	10.3	5.3
		4-State	*1*	7.4	7.5	9.4	10.3	5.5
			2	7.3	7.4	9.3	10.3	5.5
			3	7.2	7.4	9.3	10.2	5.4
			4	7.1	7.4	9.3	10.3	5.4
			5	7.1	7.4	9.3	10.4	5.4
			6	7.1	7.4	9.3	10.2	5.4
	Tree	*2-State*	*1*	5.9	6.8	8.8	10.0	4.9
			2	6.2	7.0	8.9	10.0	5.1
			3	6.6	7.2	9.1	10.1	5.2
			4	7.7	7.5	9.3	10.4	5.6
			5	11.4	9.0	10.2	10.4	6.8
			6	22.0	14.5	14.5	11.8	10.8
		4-State	*1*	7.4	7.5	9.4	10.4	5.6
			2	7.3	7.5	9.4	10.3	5.5
			3	7.7	7.6	9.4	10.3	5.6
			4	9.5	8.3	9.8	10.3	6.2
			5	15.1	10.8	11.6	10.8	8.1
			6	25.9	16.7	16.3	12.6	12.4
	Vulkan (FT)	*2-State*	*1*	5.7	6.9	9.0	10.9	5.2
			2	5.8	7.0	9.2	11.0	5.2
			3	5.9	7.1	9.2	11.0	5.3
			4	6.0	7.1	9.3	11.0	5.3
			5	6.1	7.2	9.3	11.1	5.3
			6	6.1	7.2	9.4	11.1	5.4
		4-State	*1*	7.5	7.8	10.0	11.4	5.9
			2	7.0	7.5	9.8	11.3	5.7
			3	6.7	7.4	9.6	11.2	5.6
			4	6.4	7.3	9.5	11.2	5.5
			5	6.3	7.2	9.5	11.2	5.5
			6	6.2	7.2	9.4	11.1	5.4
	Vulkan (FB)	*2-State*	*1*	5.7	6.9	9.1	10.9	5.2
			2	5.9	7.0	9.2	11.0	5.3
			3	6.1	7.1	9.3	11.0	5.3
			4	6.2	7.2	9.3	11.2	5.4
			5	6.3	7.2	9.4	11.2	5.4
			6	6.4	7.3	9.5	11.1	5.5
		4-State	*1*	7.5	7.8	10.0	11.6	5.9
			2	7.1	7.6	9.8	11.3	5.8
			3	6.8	7.4	9.7	11.2	5.7
			4	6.6	7.3	9.6	11.2	5.6
			5	6.5	7.3	9.6	11.1	5.5
			6	6.5	7.3	9.5	11.1	5.5
	Bitmask	*2-State*		7.6	7.9	10.0	11.4	6.0
		4-State		7.6	7.9	10.0	11.5	6.0
	Texture			7.7	7.9	10.1	11.5	6.0
RTX 3080	*Micromap*	*2-State*	*1*	10.3	11.9	15.1	17.3	8.9
			2	11.2	12.5	15.7	17.8	9.2
			3	11.6	12.8	16.0	17.9	9.4
			4	12.0	12.9	16.2	18.1	9.6
			5	12.3	13.1	16.3	18.1	9.7
			6	12.4	13.2	16.3	18.1	9.8
		4-State	*1*	12.8	13.4	16.6	18.2	9.9
			2	12.7	13.3	16.4	18.2	9.8
			3	12.6	13.3	16.4	18.2	9.8
			4	12.5	13.2	16.3	18.2	9.8
			5	12.5	13.2	16.4	18.2	9.8
			6	12.5	13.2	16.3	18.2	9.8
	Tree	*2-State*	*1*	10.6	12.2	15.3	17.5	8.9
			2	11.3	12.6	15.8	17.9	9.3
			3	11.8	12.9	16.1	17.9	9.5
			4	13.5	13.5	16.3	18.1	10.1
			5	19.2	15.8	17.8	18.3	12.0
			6	35.9	24.2	24.5	20.4	18.3
		4-State	*1*	12.9	13.4	16.6	18.3	9.9
			2	12.9	13.4	16.5	18.2	9.9
			3	13.4	13.5	16.6	18.2	10.1
			4	16.3	14.7	17.2	18.3	11.0
			5	24.8	18.7	20.0	18.8	14.0
			6	41.9	27.8	27.6	21.6	20.7
	Vulkan (FT)	*2-State*	*1*	10.8	12.6	16.1	19.0	9.5
			2	11.2	12.8	16.3	19.1	9.7
			3	11.6	13.0	16.4	19.2	9.9
			4	11.9	13.2	16.6	19.3	10.0
			5	12.1	13.2	16.7	19.3	10.0
			6	12.2	13.3	16.8	19.4	10.1
		4-State	*1*	13.2	13.8	17.2	19.7	10.5
			2	12.8	13.6	17.1	19.6	10.3
			3	12.6	13.5	16.9	19.4	10.2
			4	12.5	13.4	16.9	19.4	10.2
			5	12.4	13.4	16.8	19.4	10.1
			6	12.3	13.4	16.8	19.4	10.1
	Vulkan (FB)	*2-State*	*1*	10.8	12.6	16.1	18.9	9.5
			2	11.5	13.0	16.3	19.2	9.8
			3	12.0	13.2	16.6	19.3	10.0
			4	12.4	13.4	16.8	19.4	10.2
			5	12.6	13.5	17.0	19.4	10.3
			6	12.8	13.6	17.0	19.5	10.3
		4-State	*1*	13.3	13.8	17.4	19.7	10.6
			2	13.1	13.7	17.2	19.6	10.5
			3	13.0	13.7	17.1	19.6	10.4
			4	13.0	13.7	17.1	19.5	10.4
			5	13.0	13.6	17.1	19.5	10.4
			6	12.9	13.6	17.1	19.5	10.4
	Bitmask	*2-State*		12.8	13.6	17.2	19.9	10.6
		4-State		13.1	13.8	17.2	19.6	10.5
	Texture			13.3	13.8	17.3	19.7	10.5

Table 3. Average frametimes for all methods and camera poses in the New Sponza scene [2022].

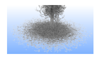
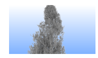
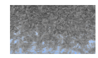
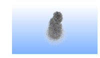
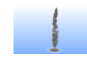
Platform	*Method*	*Mode*	*Level*					
RTX 4080	*Micromap*	*2-State*	*1*	1.9	1.3	4.3	0.6	0.5
			2	2.0	1.5	4.5	0.7	0.5
			3	2.3	1.7	4.9	0.8	0.6
			4	2.7	2.2	5.7	0.9	0.8
			5	3.1	2.6	6.5	1.1	0.9
			6	3.6	3.3	7.7	1.3	1.1
		4-State	*1*	5.7	5.8	12.8	2.3	1.9
			2	5.8	5.7	12.7	2.3	1.9
			3	5.7	5.6	12.6	2.3	1.8
			4	5.5	5.4	12.3	2.2	1.8
			5	5.4	5.3	12.3	2.1	1.8
			6	5.4	5.2	12.3	2.1	1.7
	Tree	*2-State*	*1*	1.8	1.3	4.2	0.6	0.5
			2	2.0	1.5	4.5	0.7	0.5
			3	2.7	1.9	5.5	0.9	0.7
			4	6.1	4.2	13.0	1.9	1.4
			5	19.2	13.3	43.0	5.6	3.9
			6	72.4	50.3	179.1	21.8	15.0
		4-State	*1*	5.8	5.7	12.8	2.3	1.9
			2	5.9	5.8	13.3	2.4	1.9
			3	6.9	6.0	16.9	2.5	2.0
			4	12.1	9.6	32.1	4.0	3.1
			5	37.8	28.1	104.3	11.8	8.6
			6	141.4	102.7	401.3	43.9	31.7
	Vulkan (FT)	*2-State*	*1*	1.7	1.2	4.0	0.5	0.5
			2	1.7	1.2	4.0	0.6	0.5
			3	1.8	1.3	4.3	0.6	0.5
			4	1.9	1.5	4.5	0.6	0.5
			5	2.0	1.7	4.7	0.7	0.6
			6	2.2	2.1	5.2	0.8	0.7
		4-State	*1*	5.8	6.0	12.6	2.4	1.9
			2	5.5	5.8	11.8	2.3	1.8
			3	5.2	5.5	11.2	2.2	1.7
			4	4.7	5.1	10.1	2.0	1.6
			5	4.4	4.8	9.5	1.9	1.5
			6	4.0	4.5	8.9	1.7	1.4
	Vulkan (FB)	*2-State*	*1*	1.7	1.2	4.0	0.5	0.5
			2	1.7	1.2	4.2	0.6	0.5
			3	1.9	1.4	4.5	0.6	0.5
			4	2.0	1.6	4.9	0.7	0.6
			5	2.2	1.8	5.3	0.8	0.6
			6	2.4	2.2	5.9	0.9	0.7
		4-State	*1*	5.8	6.0	12.6	2.4	1.9
			2	5.6	5.9	12.1	2.4	1.8
			3	5.4	5.7	11.8	2.3	1.8
			4	5.0	5.3	11.1	2.1	1.6
			5	4.7	5.1	10.5	2.0	1.6
			6	4.4	4.8	9.9	1.9	1.5
	Bitmask	*2-State*		5.4	5.7	11.7	2.3	1.8
		4-State		5.9	6.2	12.6	2.5	2.0
	Texture			5.7	6.0	12.4	2.4	1.9
RTX 3080	*Micromap*	*2-State*	*1*	3.4	2.3	8.3	1.1	0.9
			2	3.7	2.6	8.8	1.2	0.9
			3	4.1	3.0	9.5	1.4	1.1
			4	4.8	3.7	10.9	1.7	1.4
			5	5.4	4.5	12.1	2.0	1.7
			6	6.2	5.6	14.0	2.4	2.0
		4-State	*1*	10.8	10.8	22.6	5.3	4.4
			2	10.9	10.8	23.1	5.2	4.4
			3	10.7	10.5	22.7	5.0	4.3
			4	10.0	10.0	21.7	4.7	4.0
			5	9.9	9.8	21.7	4.5	3.8
			6	9.6	9.4	21.6	4.2	3.6
	Tree	*2-State*	*1*	3.4	2.3	8.4	1.1	0.9
			2	3.7	2.6	8.8	1.2	1.0
			3	4.7	3.4	10.2	1.6	1.3
			4	10.0	7.0	21.5	3.2	2.3
			5	30.4	21.2	69.9	9.3	6.3
			6	116.6	80.4	291.2	34.4	23.1
		4-State	*1*	10.8	10.8	22.7	5.2	4.4
			2	11.2	10.9	24.2	5.3	4.4
			3	12.6	11.5	29.5	5.4	4.5
			4	20.3	16.7	54.3	7.2	5.6
			5	60.5	45.4	170.8	19.1	13.8
			6	227.6	164.7	649.6	69.0	48.9
	Vulkan (FT)	*2-State*	*1*	3.5	2.3	8.5	1.1	0.9
			2	3.7	2.6	8.7	1.2	1.0
			3	4.0	3.0	9.3	1.4	1.2
			4	4.4	3.6	10.1	1.6	1.4
			5	4.9	4.4	11.0	1.9	1.6
			6	5.5	5.4	12.5	2.3	1.9
		4-State	*1*	11.0	11.4	22.7	5.6	4.6
			2	10.6	11.1	22.1	5.4	4.5
			3	10.2	10.6	21.3	5.1	4.3
			4	9.6	10.2	20.2	4.8	4.0
			5	9.1	9.7	19.5	4.5	3.8
			6	8.7	9.3	19.0	4.2	3.6
	Vulkan (FB)	*2-State*	*1*	3.5	2.4	8.5	1.2	0.9
			2	3.8	2.6	9.0	1.3	1.0
			3	4.1	3.1	9.7	1.5	1.2
			4	4.8	3.8	11.0	1.7	1.5
			5	5.3	4.7	12.2	2.0	1.8
			6	6.1	5.8	13.9	2.4	2.1
		4-State	*1*	11.0	11.5	22.9	5.7	4.7
			2	10.8	11.3	22.6	5.5	4.6
			3	10.5	11.0	22.1	5.2	4.4
			4	10.1	10.6	21.6	5.0	4.2
			5	9.8	10.3	21.2	4.7	4.0
			6	9.3	9.8	20.7	4.4	3.8
	Bitmask	*2-State*		9.3	10.0	20.0	4.8	4.1
		4-State		9.3	10.1	20.0	4.6	4.0
	Texture			10.0	10.6	21.3	5.0	4.2

Table 4. Average frametimes for all methods and camera poses in the San Migeul scene [2010].

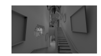
Platform	Method	Mode	Level									
RTX 4080	*Micromap*	*2-State*	*1*	6.6	7.6	6.9	10.3	6.2	5.3	7.1	6.4	6.1
			2	6.5	7.7	6.8	10.5	6.2	5.2	7.0	6.4	6.0
			3	7.0	8.3	6.9	11.8	6.8	5.4	7.3	6.6	6.2
			4	7.3	8.7	6.9	12.8	7.2	5.5	7.4	6.7	6.2
			5	7.4	9.0	6.9	13.5	7.5	5.5	7.5	6.8	6.2
			6	7.7	9.3	6.9	14.2	7.8	5.6	7.6	6.9	6.3
	Tree	*2-State*	*1*	6.5	7.6	6.9	10.3	6.2	5.2	7.0	6.4	6.0
			2	6.6	7.8	6.8	10.5	6.2	5.2	7.1	6.4	6.0
			3	7.3	8.7	6.9	12.5	7.2	5.5	7.4	6.8	6.2
			4	9.1	11.0	6.9	18.6	9.7	5.8	8.4	7.4	6.4
			5	15.9	18.8	7.1	32.2	15.7	7.8	11.8	9.7	7.6
			6	35.9	42.0	8.4	76.2	35.1	13.9	22.4	17.2	12.0
	Vulkan (FT)	*2-State*	*1*	6.5	7.4	6.9	9.8	6.1	5.3	7.0	6.4	6.1
			2	6.6	7.5	6.9	10.0	6.2	5.3	7.1	6.4	6.1
			3	6.6	7.6	6.8	10.4	6.3	5.2	7.0	6.3	6.0
			4	6.7	7.7	6.8	10.7	6.4	5.2	7.1	6.4	6.0
			5	6.8	7.9	6.9	11.0	6.6	5.4	7.2	6.5	6.1
			6	6.9	8.0	7.0	11.3	6.7	5.4	7.3	6.6	6.2
	Vulkan (FB)	*2-State*	*1*	6.5	7.3	6.9	9.7	6.1	5.2	7.0	6.3	6.0
			2	6.6	7.6	6.9	10.0	6.2	5.3	7.1	6.4	6.1
			3	6.7	7.8	6.9	10.6	6.4	5.4	7.2	6.5	6.1
			4	6.8	8.0	6.9	11.0	6.6	5.4	7.3	6.6	6.1
			5	6.8	8.0	6.8	11.1	6.6	5.3	7.3	6.5	6.1
			6	6.9	8.1	6.8	11.4	6.7	5.3	7.3	6.5	6.1
	Bitmask	*2-State*		8.1	9.9	7.0	15.3	8.1	5.7	7.7	7.0	6.3
	Texture			8.4	10.4	7.0	16.0	8.4	5.9	7.9	7.2	6.5
RTX 3080	*Micromap*	*2-State*	*1*	13.4	15.1	13.5	19.7	12.8	11.1	14.0	12.9	12.4
			2	13.5	15.5	13.5	20.4	13.0	11.7	14.1	13.7	12.4
			3	14.1	16.3	13.5	22.7	13.8	11.4	14.4	13.3	12.5
			4	14.5	17.0	13.5	24.5	14.6	11.4	14.5	13.5	12.6
			5	14.9	17.4	13.6	25.7	15.1	11.6	14.7	13.6	12.6
			6	15.2	17.9	13.6	26.8	15.5	11.6	14.8	13.9	12.9
	Tree	*2-State*	*1*	13.3	15.1	13.5	19.8	13.0	11.1	14.0	12.9	12.8
			2	13.6	15.5	13.5	20.4	12.9	11.9	14.2	13.0	12.5
			3	14.4	16.7	13.6	23.8	14.4	11.4	14.5	13.4	12.5
			4	17.2	20.9	13.6	33.1	18.4	11.9	16.0	14.6	13.7
			5	27.5	32.7	13.8	55.0	28.0	14.9	21.3	18.0	14.7
			6	59.6	69.2	15.8	126.3	58.9	24.7	37.9	29.8	21.8
	Vulkan (FT)	*2-State*	*1*	13.4	15.1	13.6	20.0	12.9	11.2	14.0	12.9	12.4
			2	13.5	15.5	13.5	20.6	13.0	11.2	14.0	12.9	12.7
			3	14.0	16.1	13.5	22.7	13.8	11.5	14.2	13.1	12.5
			4	14.4	16.7	13.6	24.2	14.4	11.4	14.5	13.4	12.6
			5	14.6	17.0	13.6	25.3	14.8	11.8	14.5	13.5	12.9
			6	15.1	17.3	13.6	26.1	15.1	11.6	14.7	13.5	13.0
	Vulkan (FB)	*2-State*	*1*	13.4	15.1	13.5	20.1	13.4	11.2	14.0	12.9	12.3
			2	13.6	15.7	13.6	20.8	13.1	12.2	14.3	13.2	12.5
			3	14.3	16.4	13.6	23.1	14.0	11.4	14.5	13.4	12.6
			4	14.6	17.1	13.6	24.9	14.8	11.6	14.7	13.6	13.2
			5	15.0	17.5	13.6	26.0	15.1	11.6	14.9	13.7	13.2
			6	15.3	18.0	13.6	27.0	15.6	11.8	14.9	13.8	12.8
	Bitmask	*2-State*		15.9	18.6	13.6	28.8	16.3	11.8	15.1	14.0	13.5
	Texture			16.4	19.7	13.6	30.3	16.8	12.1	15.3	14.5	13.1

Table 5. Average frametimes for all methods and camera poses in the San Migeul scene [2010].

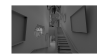
Platform	Method	Mode	Level									
RTX 4080	*Micromap*	*4-State*	*1*	8.2	10.1	6.9	15.6	8.3	5.8	7.8	7.1	6.4
			2	8.3	10.1	6.9	15.8	8.4	5.8	7.8	7.1	6.4
			3	8.2	10.0	6.8	15.6	8.2	5.7	7.7	7.0	6.3
			4	8.2	10.0	6.8	15.5	8.2	5.7	7.7	7.0	6.3
			5	8.2	10.0	6.8	15.6	8.3	5.7	7.7	7.0	6.3
			6	8.3	10.0	6.9	15.8	8.5	5.8	7.8	7.1	6.4
	Tree	*4-State*	*1*	8.3	10.2	7.0	15.6	8.4	5.9	7.9	7.2	6.5
			2	8.7	10.7	7.0	17.1	9.2	6.0	8.0	7.3	6.6
			3	10.1	12.3	7.2	21.0	10.9	6.4	8.5	7.8	6.8
			4	13.8	16.9	7.0	31.2	15.4	7.1	10.2	8.9	7.3
			5	28.0	32.8	7.9	60.8	28.6	11.6	15.8	13.2	10.2
			6	62.3	72.5	11.8	134.5	61.2	23.7	32.5	26.1	18.6
	Vulkan (FT)	*4-State*	*1*	8.2	10.2	7.0	15.9	8.4	5.8	7.7	7.0	6.4
			2	8.2	10.0	7.0	15.7	8.3	5.8	7.6	6.9	6.4
			3	7.7	9.3	6.9	14.4	7.7	5.5	7.4	6.7	6.2
			4	7.6	9.1	7.0	13.7	7.5	5.6	7.4	6.7	6.3
			5	7.4	8.9	7.0	13.3	7.3	5.6	7.4	6.7	6.2
			6	7.3	8.8	7.0	13.0	7.3	5.5	7.3	6.6	6.2
	Vulkan (FB)	*4-State*	*1*	8.2	10.2	6.9	15.9	8.2	5.7	7.7	7.0	6.3
			2	8.2	10.1	7.0	15.8	8.3	5.8	7.8	7.0	6.4
			3	8.0	9.7	7.1	14.8	8.0	5.8	7.8	7.0	6.5
			4	7.6	9.2	6.9	13.9	7.5	5.6	7.5	6.8	6.2
			5	7.5	9.1	6.9	13.5	7.4	5.6	7.5	6.7	6.2
			6	7.5	9.0	7.0	13.4	7.4	5.6	7.6	6.8	6.3
	Bitmask	*4-State*		8.3	10.2	6.9	15.8	8.3	5.8	7.8	7.0	6.3
	Texture			8.4	10.4	7.0	16.0	8.4	5.9	7.9	7.2	6.5
RTX 3080	*Micromap*	*4-State*	*1*	16.3	19.5	13.8	29.9	16.7	12.0	15.3	14.2	13.0
			2	16.2	19.5	13.6	30.2	16.9	12.0	15.2	14.1	12.9
			3	16.3	19.4	13.6	29.7	16.7	11.9	15.2	14.1	13.2
			4	16.2	19.2	13.5	29.6	16.6	12.0	15.2	14.1	12.9
			5	16.2	19.2	13.5	29.7	16.6	11.9	15.2	14.0	12.9
			6	16.3	19.2	13.6	29.8	16.7	12.3	15.2	14.1	13.0
	Tree	*4-State*	*1*	16.2	19.6	13.6	30.0	16.7	12.2	15.3	14.3	13.0
			2	17.1	20.6	13.6	32.4	18.1	12.3	15.5	14.5	13.2
			3	18.8	22.7	13.6	37.8	20.5	12.6	16.0	14.9	13.3
			4	24.8	30.1	13.8	54.7	27.6	14.0	18.8	17.0	14.5
			5	46.5	54.4	15.0	101.4	48.2	20.8	27.9	23.7	18.9
			6	101.1	118.2	20.7	219.4	100.4	39.3	53.4	43.2	31.7
	Vulkan (FT)	*4-State*	*1*	16.6	19.8	13.6	30.9	17.1	12.2	15.3	14.3	13.1
			2	16.5	19.5	13.6	31.0	17.1	12.0	15.1	14.1	13.1
			3	16.2	19.2	13.6	29.8	16.7	12.0	15.1	14.0	13.0
			4	16.0	18.8	13.6	29.2	16.4	12.6	15.0	14.0	13.0
			5	15.8	18.6	13.6	28.9	16.3	12.2	14.9	13.9	13.0
			6	15.8	18.5	13.6	28.8	16.3	11.8	14.8	13.8	13.4
	Vulkan (FB)	*4-State*	*1*	16.8	20.0	13.7	30.9	17.3	12.2	15.5	14.5	13.2
			2	16.7	19.8	13.6	30.9	17.2	12.2	15.4	14.4	13.2
			3	16.5	19.5	13.6	30.2	16.9	12.1	15.3	14.3	13.1
			4	16.4	19.5	13.7	30.0	16.9	12.7	15.4	14.3	13.2
			5	16.3	19.3	13.7	29.8	16.7	12.2	15.4	14.3	13.1
			6	16.3	19.2	13.6	29.8	16.7	12.4	15.3	14.3	13.1
	Bitmask	*4-State*		16.3	19.4	13.6	29.6	16.5	12.1	15.3	14.3	13.1
	Texture			16.4	19.7	13.6	30.3	16.8	12.1	15.3	14.5	13.1

Table 6. Average frametimes for all methods and camera poses in the PBRT Landscape scene [2016].

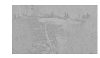
Platform	*Method*	*Mode*	*Level*					
RTX 4080	*Micromap*	*2-State*	*1*	12.7	12.9	16.3	12.4	10.7
			2	13.7	13.7	17.9	13.3	11.6
			3	14.6	14.5	19.1	14.3	12.4
			4	15.2	15.1	19.9	15.1	13.1
			5	15.6	15.7	20.6	15.7	13.6
			6	15.7	16.0	20.3	16.0	13.9
		4-State	*1*	17.0	17.2	22.8	18.3	15.0
			2	16.7	16.9	22.0	17.5	14.8
			3	16.6	16.8	21.7	17.3	14.6
			4	16.4	16.7	21.5	17.1	14.6
			5	16.2	16.7	21.6	16.9	14.4
			6	16.2	16.7	21.6	17.1	14.4
	Tree	*2-State*	*1*	12.6	12.8	16.2	12.2	10.6
			2	13.7	13.7	17.9	13.3	11.6
			3	14.8	14.6	19.2	14.4	12.6
			4	15.6	16.1	20.3	15.9	14.0
			5	17.7	22.6	23.4	21.1	19.5
			6	28.9	43.4	38.6	38.4	36.5
		4-State	*1*	17.1	17.3	22.8	18.3	15.1
			2	16.9	17.2	22.4	17.9	15.0
			3	16.9	17.7	22.5	18.0	15.2
			4	17.5	20.7	23.4	19.9	17.5
			5	23.0	32.7	29.9	29.2	27.4
			6	44.0	69.5	60.8	61.2	55.4
	Vulkan (FT)	*2-State*	*1*	11.8	12.6	15.1	11.7	10.2
			2	12.4	13.2	15.7	12.2	10.8
			3	12.8	13.6	16.3	12.6	11.1
			4	13.2	14.0	16.8	13.0	11.5
			5	13.3	14.2	17.1	13.2	11.7
			6	13.4	14.3	17.3	13.4	11.9
		4-State	*1*	16.9	17.1	22.3	18.1	14.7
			2	15.6	16.3	20.7	16.9	14.0
			3	15.0	15.8	19.7	15.9	13.3
			4	14.6	15.4	18.9	15.2	12.9
			5	14.3	15.1	18.5	14.7	12.6
			6	14.1	14.9	18.0	14.4	12.4
	Vulkan (FB)	*2-State*	*1*	11.9	12.6	15.1	11.6	10.1
			2	12.6	13.2	16.1	12.3	10.9
			3	13.1	13.7	16.9	12.8	11.3
			4	13.5	14.2	17.4	13.3	11.8
			5	13.7	14.3	17.6	13.5	11.9
			6	13.8	14.6	17.8	13.7	12.1
		4-State	*1*	17.2	17.2	22.7	18.5	14.8
			2	16.1	16.6	21.3	17.3	14.2
			3	15.5	16.1	20.4	16.2	13.6
			4	15.1	15.7	19.7	15.7	13.2
			5	14.8	15.4	19.2	15.2	12.9
			6	14.6	15.2	19.0	14.9	12.7
	Bitmask	*2-State*		17.9	16.9	23.8	18.3	14.8
		4-State		18.3	17.3	24.4	19.1	15.2
	Texture			18.3	17.4	23.9	18.9	15.3
RTX 3080	*Micromap*	*2-State*	*1*	23.9	25.1	31.1	24.4	21.5
			2	25.7	26.4	33.6	26.3	23.1
			3	27.2	27.5	35.8	28.0	24.5
			4	28.1	28.7	37.0	29.7	25.8
			5	28.8	29.4	38.2	30.7	26.6
			6	28.9	29.8	38.5	31.5	27.1
		4-State	*1*	31.4	32.1	42.5	37.0	29.9
			2	30.8	31.7	41.3	35.4	29.2
			3	30.5	31.5	40.8	34.5	28.9
			4	30.1	31.2	40.4	33.8	28.5
			5	30.2	31.0	40.3	33.6	28.3
			6	29.9	31.0	40.0	33.3	28.2
	Tree	*2-State*	*1*	24.0	25.2	31.1	24.4	21.8
			2	25.8	26.6	33.6	26.3	23.1
			3	27.4	27.9	36.0	27.9	24.7
			4	28.8	30.2	38.2	30.8	27.0
			5	32.7	39.6	42.8	38.7	35.2
			6	49.3	72.1	66.9	66.7	61.9
		4-State	*1*	31.5	32.4	42.8	36.9	29.9
			2	31.0	32.0	41.7	35.7	29.5
			3	31.1	32.7	41.7	35.4	29.6
			4	32.1	36.8	43.0	37.8	32.4
			5	40.1	55.0	53.6	52.0	47.6
			6	73.0	113.1	101.6	102.2	91.9
	Vulkan (FT)	*2-State*	*1*	24.2	25.3	31.6	24.5	21.5
			2	25.5	26.2	33.2	26.1	22.9
			3	26.8	27.3	35.1	27.7	24.1
			4	27.4	28.2	36.0	28.9	25.1
			5	27.9	28.9	36.8	29.9	26.0
			6	28.2	29.1	37.1	30.6	26.4
		4-State	*1*	31.6	32.2	42.8	37.6	29.9
			2	30.6	31.4	40.8	35.4	28.9
			3	29.9	30.8	39.8	33.9	28.0
			4	29.5	30.6	38.8	32.8	27.9
			5	29.2	30.2	38.7	32.6	27.5
			6	29.1	30.0	38.7	32.4	27.4
	Vulkan (FB)	*2-State*	*1*	24.4	25.3	32.0	24.6	21.6
			2	26.2	26.5	34.2	26.7	23.6
			3	27.7	27.8	36.5	28.5	24.7
			4	28.5	28.8	37.7	30.1	26.0
			5	29.3	29.6	38.7	31.2	26.9
			6	29.5	29.9	38.7	32.0	27.3
		4-State	*1*	32.3	32.5	43.6	37.9	30.2
			2	31.5	32.1	42.4	36.4	29.6
			3	31.0	31.7	41.5	35.2	29.2
			4	30.7	31.4	40.8	34.6	28.9
			5	30.6	31.2	40.6	34.1	28.8
			6	30.6	31.1	40.7	34.0	28.6
	Bitmask	*2-State*		32.4	31.4	44.2	37.0	29.3
		4-State		32.1	31.9	43.5	36.7	29.6
	Texture			32.2	32.2	43.8	37.5	30.0

Table 7. Frametime for micromap based methods on a per-subdivision-level basis, averaged over all camera poses in a scene.

Platform	*Mode*	*Method*	*Level*	*Sponza*	*Ecosys*	*New Sponza*	*San Miguel*	*Landscape*
RTX 4080	*2-State*	*Micromap*	*1*	4.5	6.8	1.0	6.7	12.7
			2	4.5	7.0	1.1	6.7	13.8
			3	4.5	7.2	1.2	7.1	14.7
			4	4.5	7.3	1.5	7.3	15.4
			5	4.6	7.4	1.8	7.4	15.9
			6	4.6	7.5	2.1	7.5	16.1
		Tree	*1*	4.4	6.8	1.0	6.7	12.6
			2	4.5	7.0	1.1	6.7	13.8
			3	4.5	7.2	1.4	7.3	14.8
			4	4.7	7.8	2.9	8.3	16.1
			5	6.0	9.3	8.6	11.2	20.7
			6	9.8	13.9	33.3	19.2	36.5
		Vulkan (FT)	*1*	4.4	7.0	0.9	6.7	12.1
			2	4.5	7.1	0.9	6.7	12.7
			3	4.5	7.1	1.0	6.7	13.0
			4	4.5	7.2	1.1	6.8	13.5
			5	4.5	7.3	1.2	6.9	13.7
			6	4.5	7.3	1.3	7.0	13.9
		Vulkan (FB)	*1*	4.4	7.0	0.9	6.6	12.1
			2	4.5	7.1	0.9	6.7	12.8
			3	4.5	7.2	1.0	6.9	13.4
			4	4.6	7.3	1.1	6.9	13.8
			5	4.6	7.4	1.3	6.9	14.0
			6	4.6	7.4	1.4	7.0	14.2
	4-State	*Micromap*	*1*	4.6	7.6	3.6	7.9	17.7
			2	4.6	7.6	3.6	7.8	17.3
			3	4.6	7.5	3.6	7.7	17.1
			4	4.6	7.5	3.4	7.7	17.0
			5	4.6	7.5	3.4	7.8	16.9
			6	4.6	7.5	3.3	7.9	16.9
		Tree	*1*	4.6	7.7	3.6	7.9	17.8
			2	4.6	7.6	3.7	8.2	17.6
			3	4.8	7.8	4.0	8.9	17.8
			4	5.4	8.6	6.3	10.5	19.6
			5	8.1	10.9	18.5	15.8	28.1
			6	16.2	15.6	68.7	29.8	56.9
		Vulkan (FT)	*1*	4.6	8.1	3.7	7.8	17.5
			2	4.6	7.8	3.5	7.8	16.4
			3	4.6	7.6	3.3	7.4	15.7
			4	4.6	7.5	3.1	7.4	15.2
			5	4.6	7.4	2.9	7.3	14.8
			6	4.6	7.4	2.7	7.3	14.5
		Vulkan (FB)	*1*	4.7	8.1	3.7	7.8	17.7
			2	4.7	7.9	3.6	7.8	16.8
			3	4.7	7.7	3.5	7.8	16.1
			4	4.6	7.6	3.2	7.4	15.6
			5	4.6	7.5	3.1	7.4	15.3
			6	4.7	7.5	2.9	7.4	15.0
RTX 3080	*2-State*	*Micromap*	*1*	7.4	12.0	1.8	13.6	24.8
			2	7.5	12.6	2.0	13.9	26.6
			3	7.6	12.9	2.3	14.2	28.2
			4	7.6	13.1	2.7	14.5	29.4
			5	7.6	13.2	3.2	14.8	30.3
			6	7.6	13.3	3.8	15.0	30.7
		Tree	*1*	7.4	12.2	1.8	13.6	24.9
			2	7.5	12.7	2.0	13.8	26.7
			3	7.6	13.0	2.6	14.4	28.3
			4	8.0	13.7	5.0	16.3	30.6
			5	9.9	16.2	14.0	21.0	37.4
			6	15.8	23.4	52.3	34.0	62.3
		Vulkan (FT)	*1*	7.5	12.8	1.9	13.6	25.0
			2	7.5	13.0	2.0	13.8	26.4
			3	7.6	13.3	2.3	14.1	27.8
			4	7.6	13.5	2.7	14.4	28.7
			5	7.6	13.5	3.1	14.7	29.5
			6	7.6	13.6	3.6	14.8	29.9
		Vulkan (FB)	*1*	7.5	12.7	1.9	13.7	25.2
			2	7.6	13.2	2.1	14.0	27.0
			3	7.6	13.5	2.4	14.3	28.5
			4	7.7	13.7	2.9	14.7	29.8
			5	7.7	13.9	3.3	14.9	30.7
			6	7.7	13.9	4.0	15.1	31.1
	4-State	*Micromap*	*1*	7.8	13.6	7.8	15.7	34.0
			2	7.8	13.5	7.8	15.6	33.2
			3	7.7	13.4	7.6	15.6	32.8
			4	7.7	13.4	7.1	15.5	32.3
			5	7.8	13.4	6.9	15.5	32.2
			6	7.7	13.4	6.6	15.6	32.0
		Tree	*1*	7.7	13.6	7.8	15.7	34.1
			2	7.8	13.6	7.9	16.2	33.5
			3	8.0	13.8	8.3	17.0	33.6
			4	9.1	15.0	11.5	19.9	36.0
			5	13.3	18.6	29.8	28.6	49.0
			6	25.5	26.3	108.6	50.4	94.3
		Vulkan (FT)	*1*	7.8	14.2	8.2	15.8	34.2
			2	7.8	14.0	7.9	15.7	32.9
			3	7.8	13.8	7.6	15.6	32.0
			4	7.8	13.8	7.1	15.6	31.5
			5	7.8	13.7	6.8	15.4	31.2
			6	7.8	13.7	6.4	15.4	31.1
		Vulkan (FB)	*1*	7.8	14.3	8.3	16.0	34.7
			2	7.8	14.1	8.0	15.9	33.9
			3	7.9	14.1	7.8	15.7	33.2
			4	7.8	14.0	7.5	15.9	32.8
			5	7.9	14.0	7.1	15.7	32.6
			6	7.8	14.0	6.8	15.7	32.5

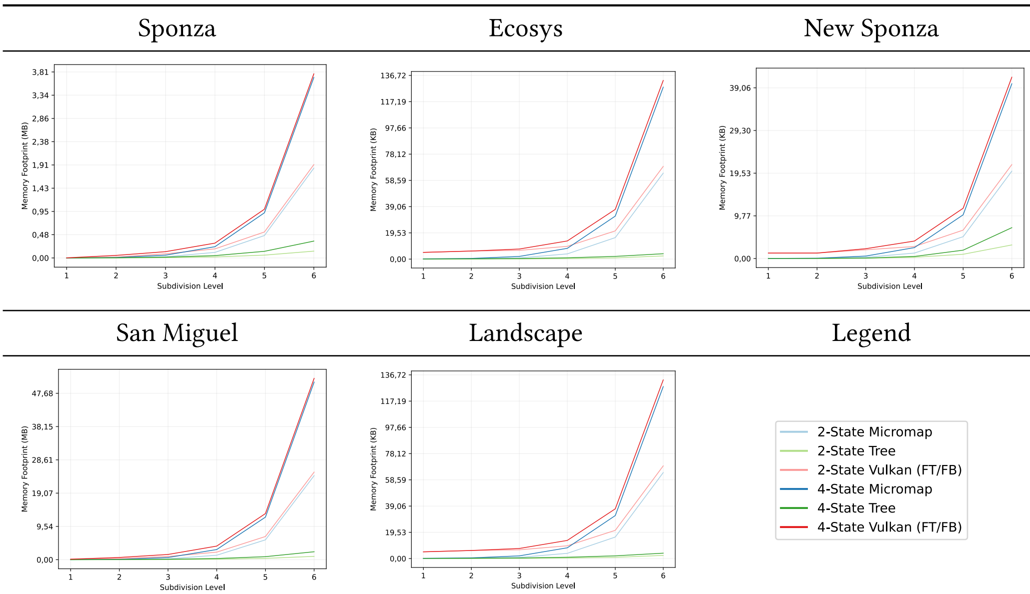


Fig. 1. Plots over how the memory footprint increases for higher subdivision levels for each scene.

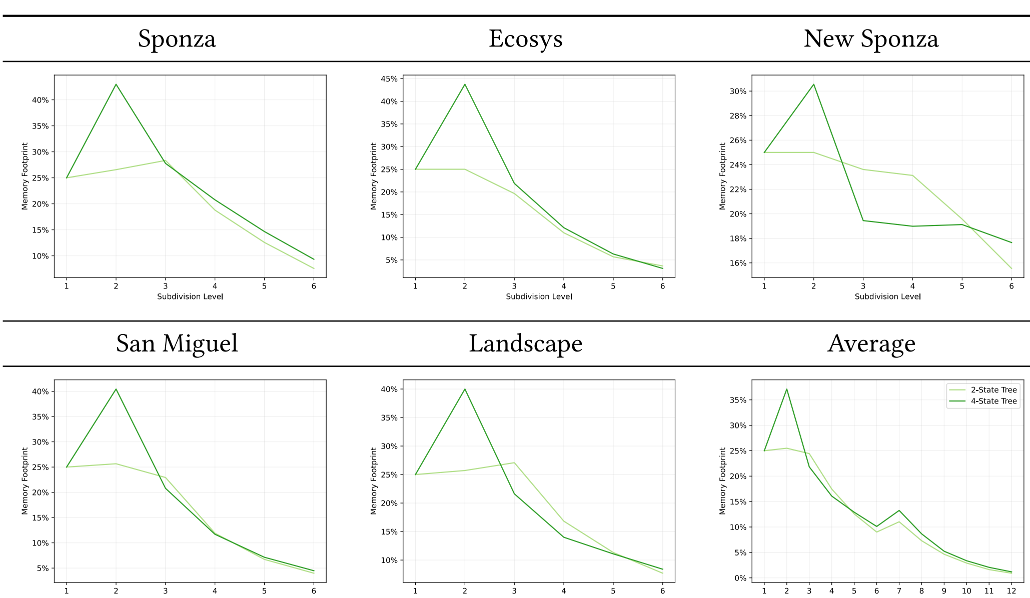


Fig. 2. Plot over how the tree compression changes for increasing subdivision levels in all scenes. Note however that data from subdivision levels over 6 comes entirely from the artificial Twig scene as seen in figure 6.

1.2 Opacity Micromap Samples

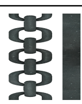
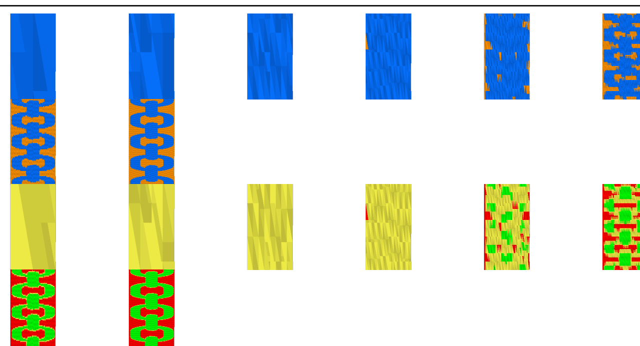
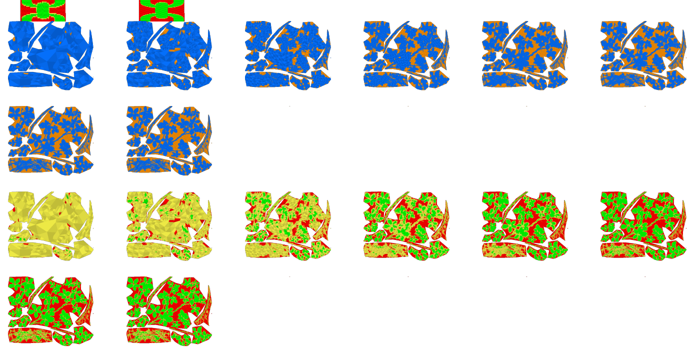
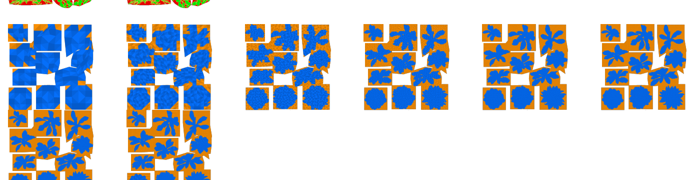
This section contains tables visualizing all micromaps used in this paper. Note that each micromap image represents *all* micromaps derived from the given texture. Further, the micromaps are constructed according to the following rules:

foreach *subtriangle* **do**
    if *All covered pixels have alpha* == 0 **then**
        subtriangle ← `fully-transparent`
    else
        subtriangle ← `fully-opaque`
    end
end

foreach *subtriangle* **do**
    if *All covered pixels have alpha* == 0 **then**
        subtriangle ← `fully-transparent`
    else if *All covered pixels have alpha* == 1 **then**
        subtriangle ← `fully-opaque`
    else if *we prefer* `unknown-opaque` **then**
        subtriangle ← `unknown-opaque`
    else
        subtriangle ← `unknown-transparent`
    end
end

Algorithm 1: Opacity micromap construction algorithm for the `2-state` (left) and the `4-state` (right) modes. Note that in this work we always prefer `unknown-opaque`.

Table 8. Opacity Micromap samples from the CryTek Sponza [2011] scene.

Texture	*Mode*	*Subdivision Levels*
	*2-State*	
	4-State	
	*2-State*	
	4-State	
	*2-State*	

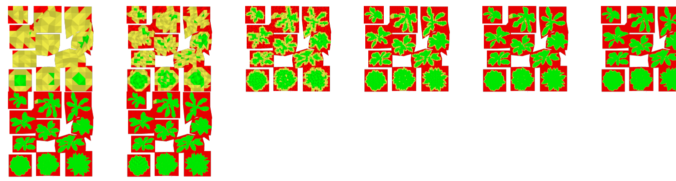
	4-State	

Table 9. Opacity Micromap samples from the Ecosys [1998] scene.

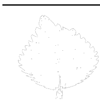
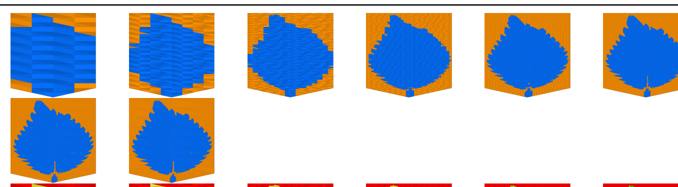
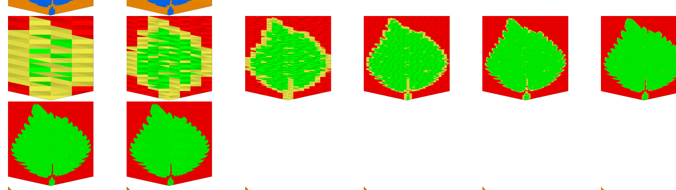
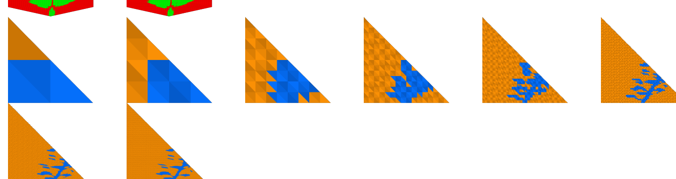
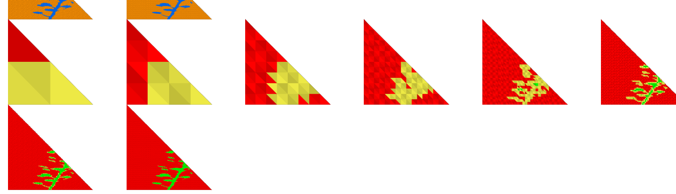
Texture	*Mode*	*Subdivision Levels*
	*2-State*	
	4-State	
	*2-State*	
	4-State	

Table 10. Opacity Micromap samples from the New Sponza [2022] scene.

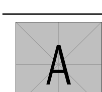
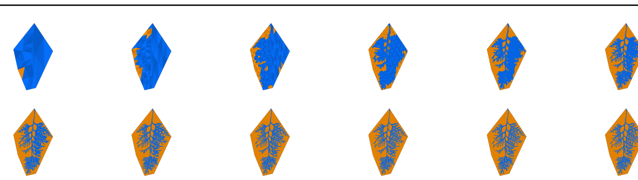
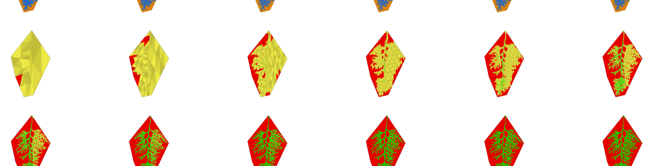
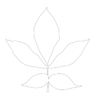
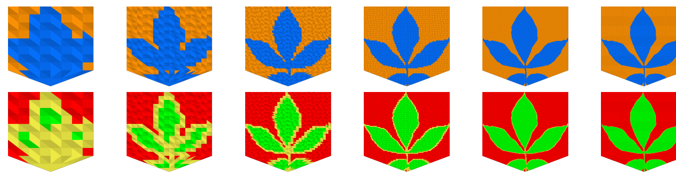
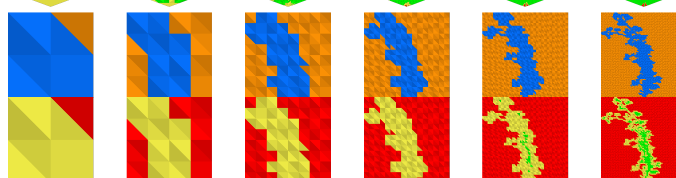
Texture	*Mode*	*Subdivision Levels*
	*2-State*	
	4-State	

Table 11. Opacity Micromap samples from the San Miguel [2010] scene.

Texture	*Mode*	*Subdivision Levels*
	*2-State*	
	4-State	
	*2-State*	
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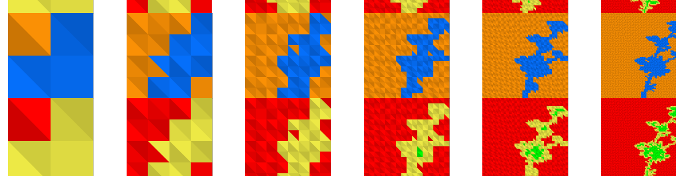
	*2-State*	
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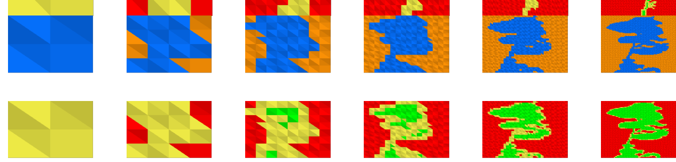
	*2-State*	
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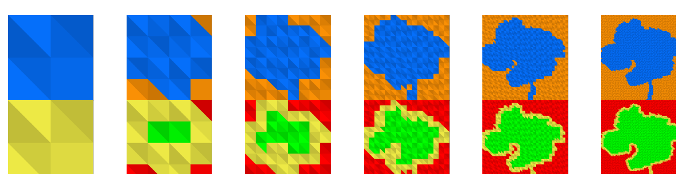
	*2-State*	
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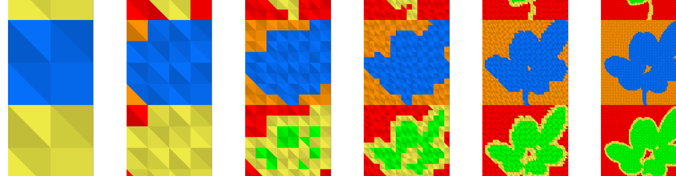
	*2-State*	
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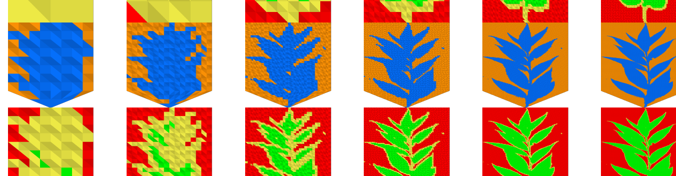
	*2-State*	
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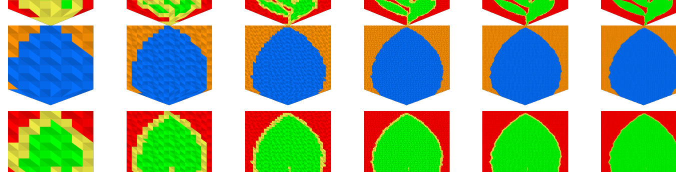
	*2-State*	
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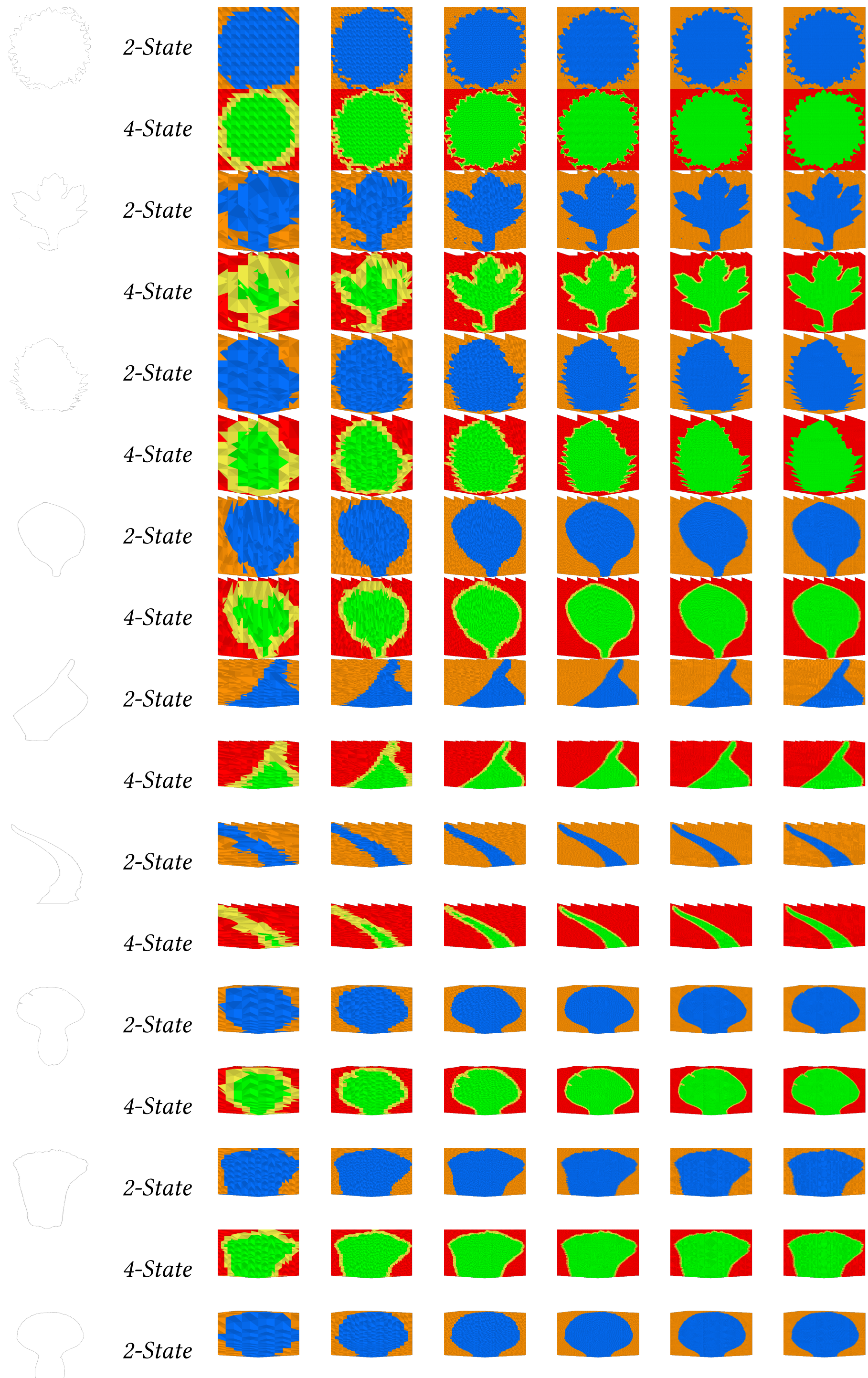

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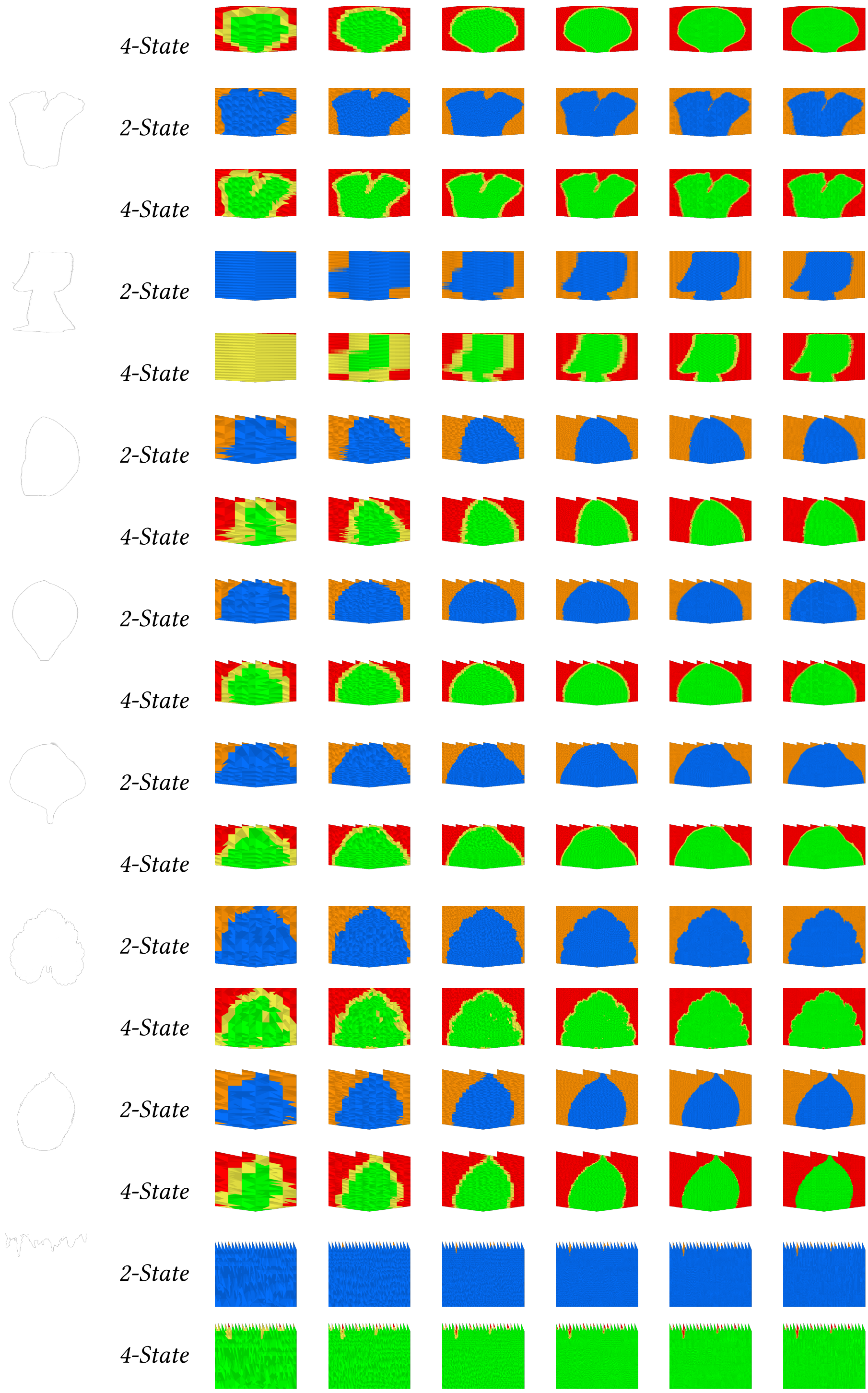
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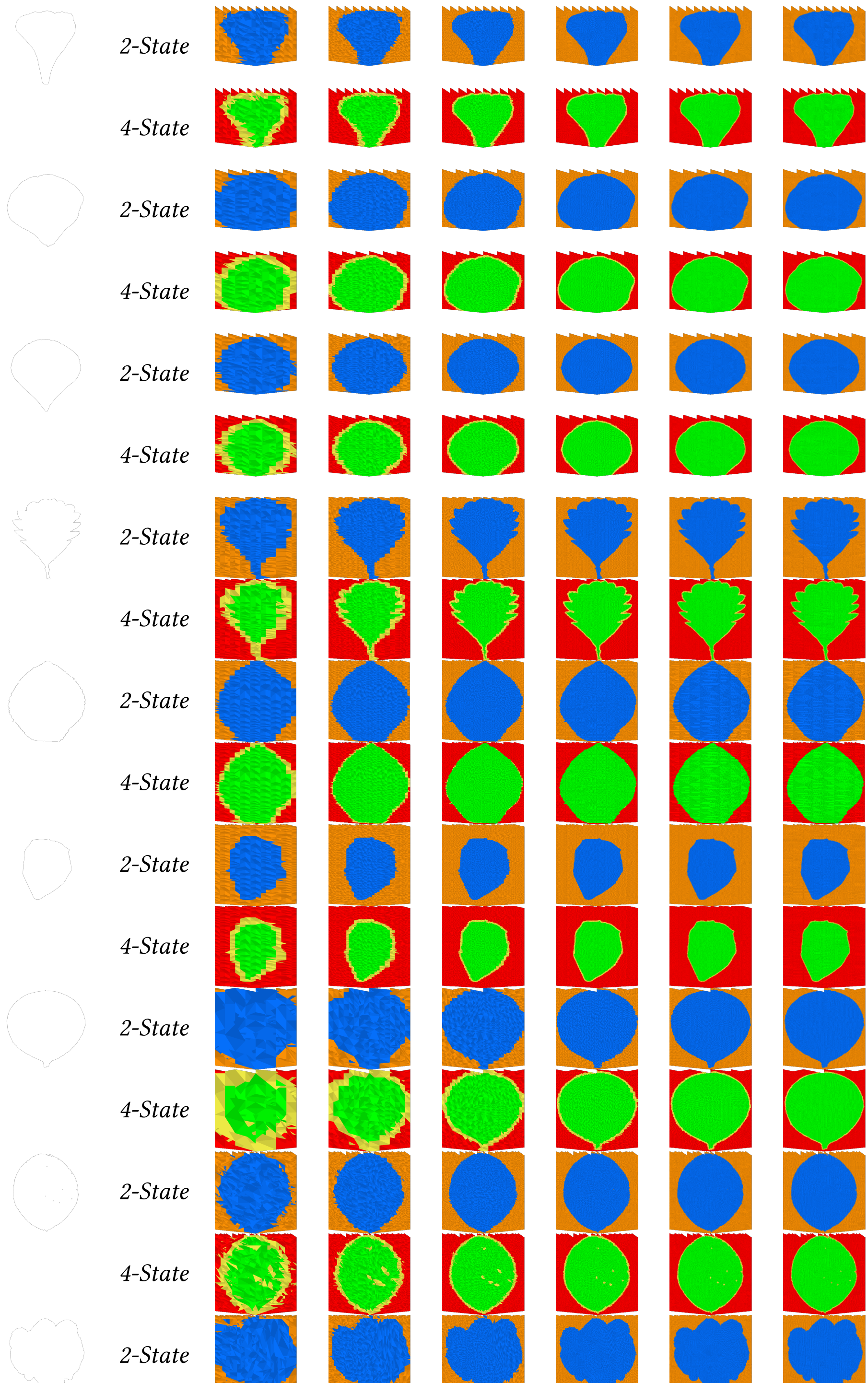
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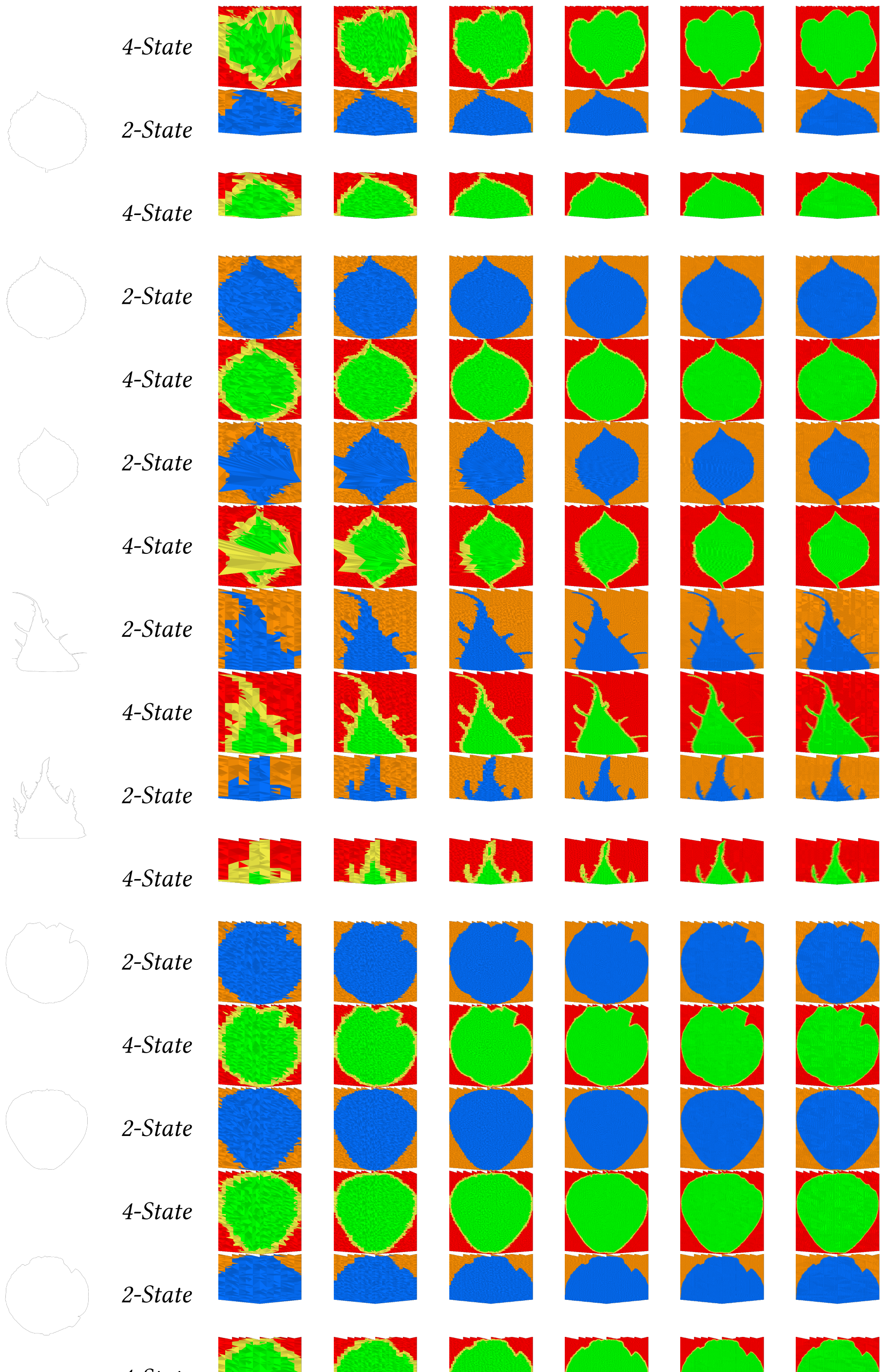
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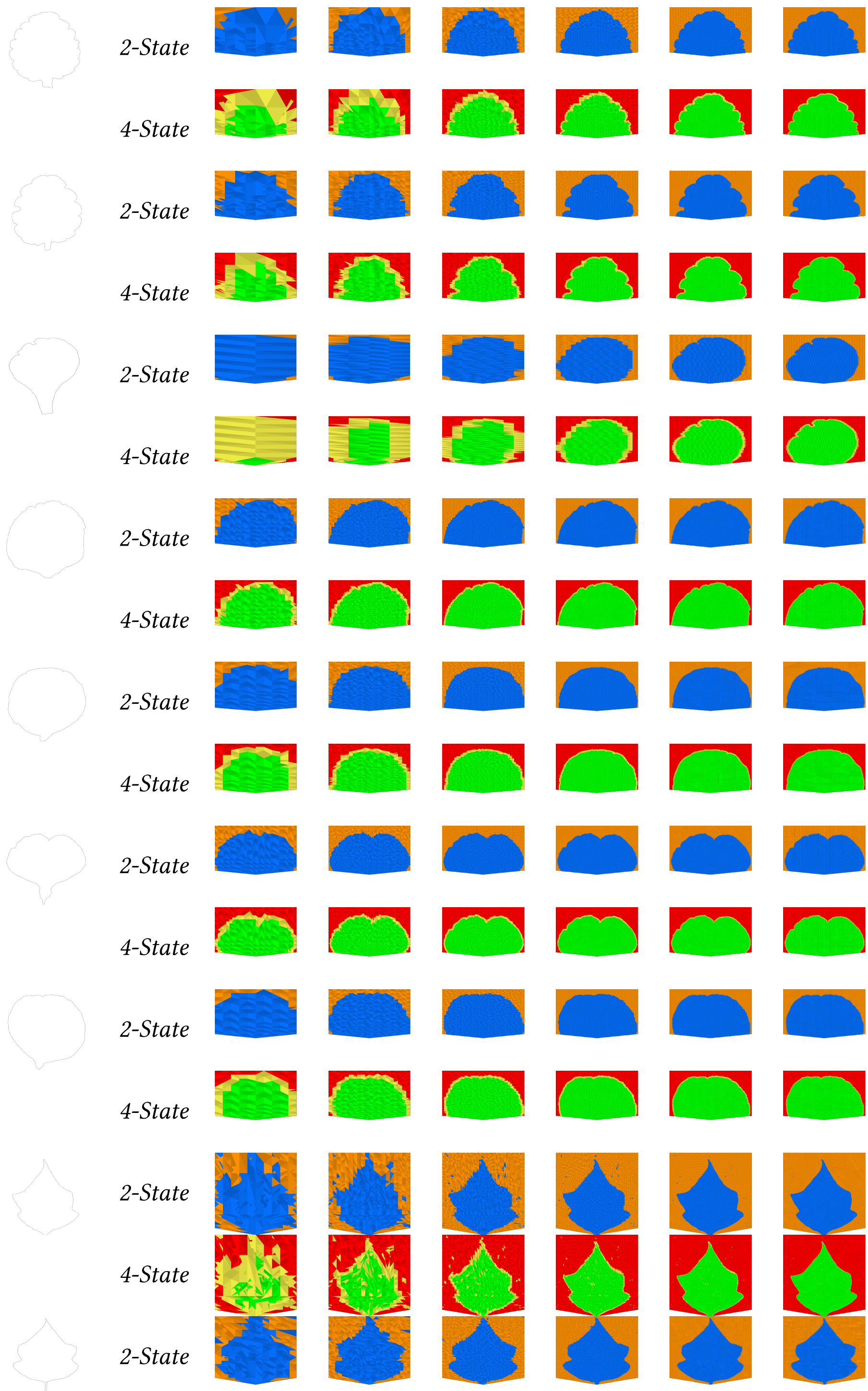
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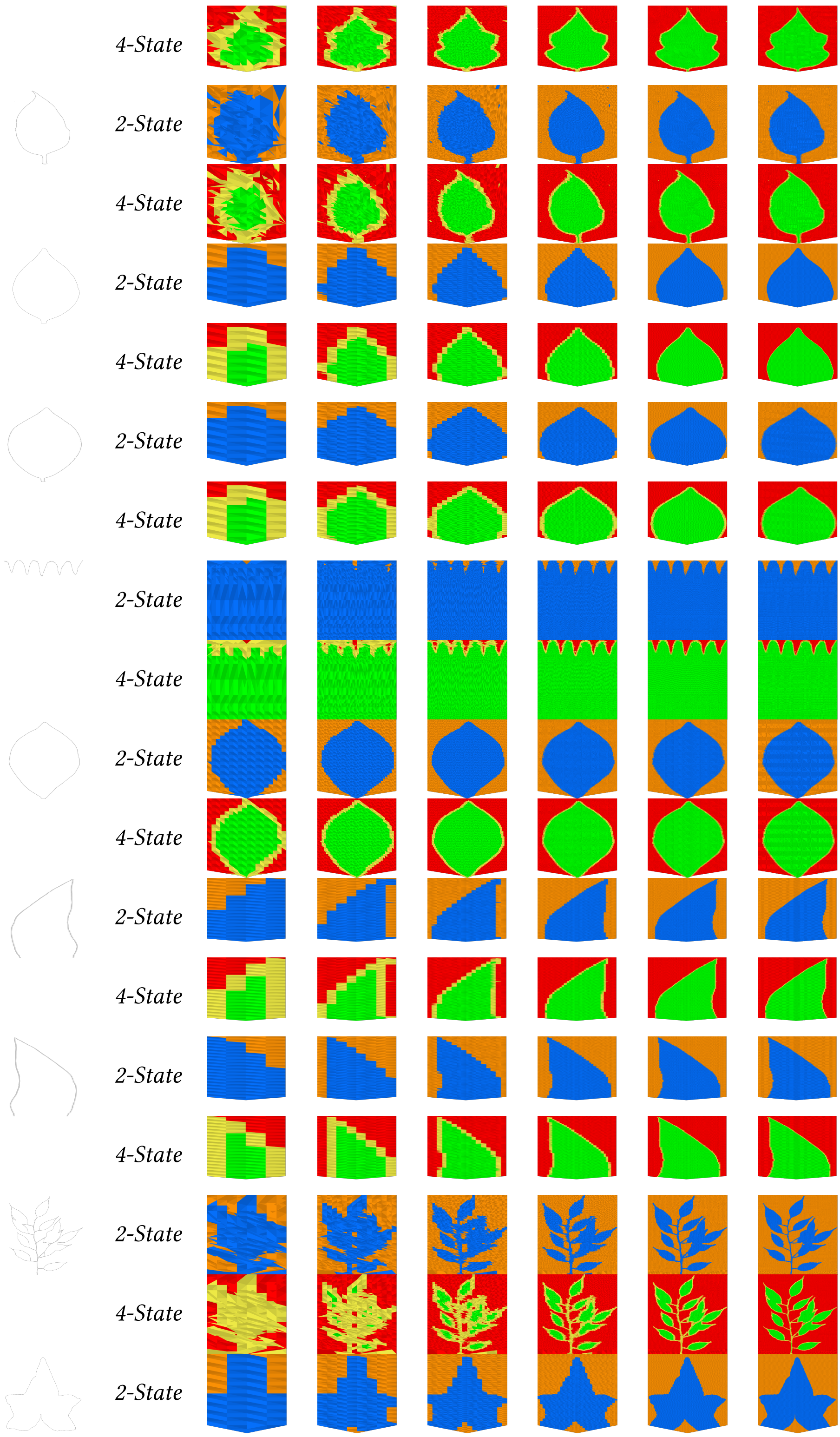
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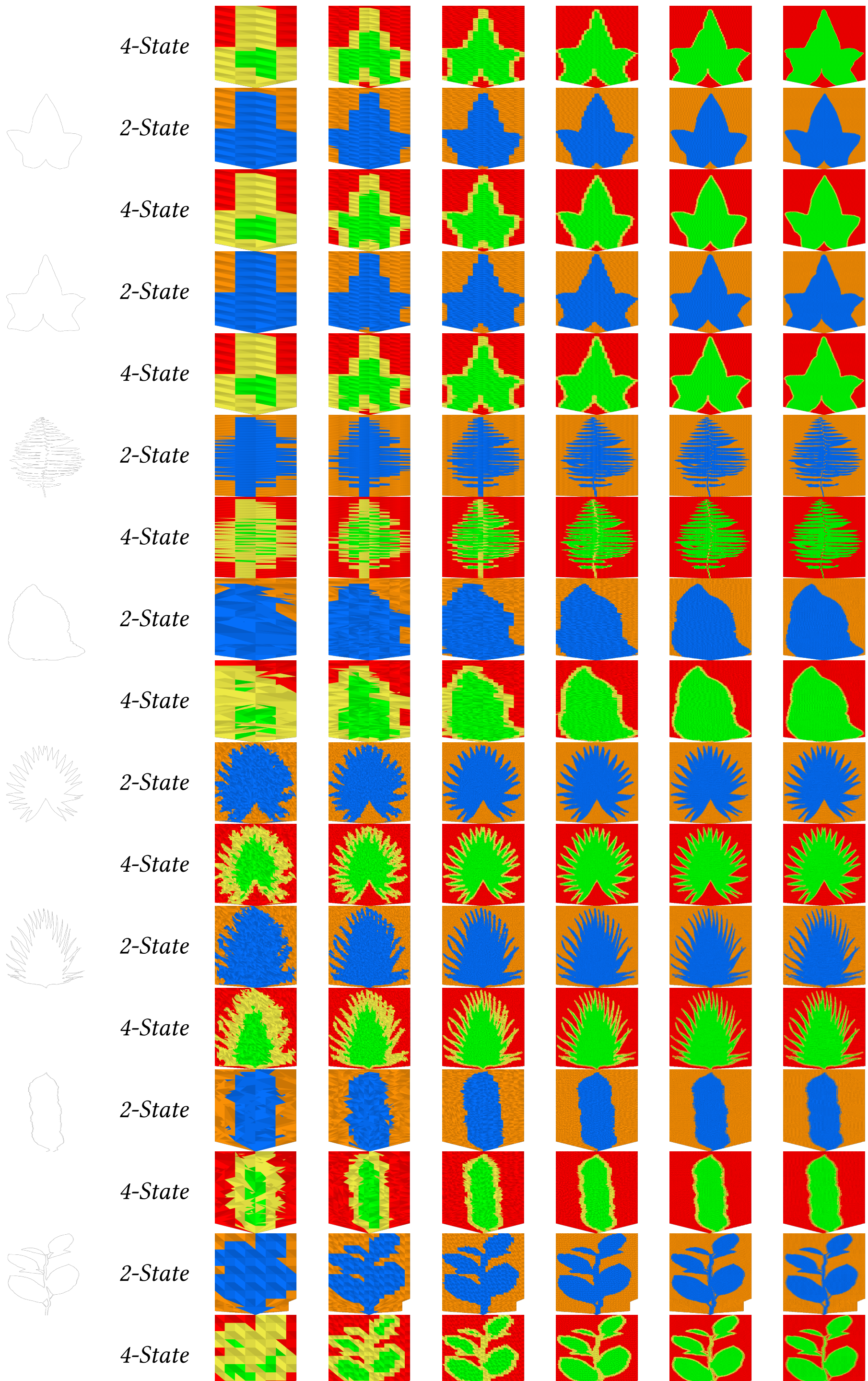
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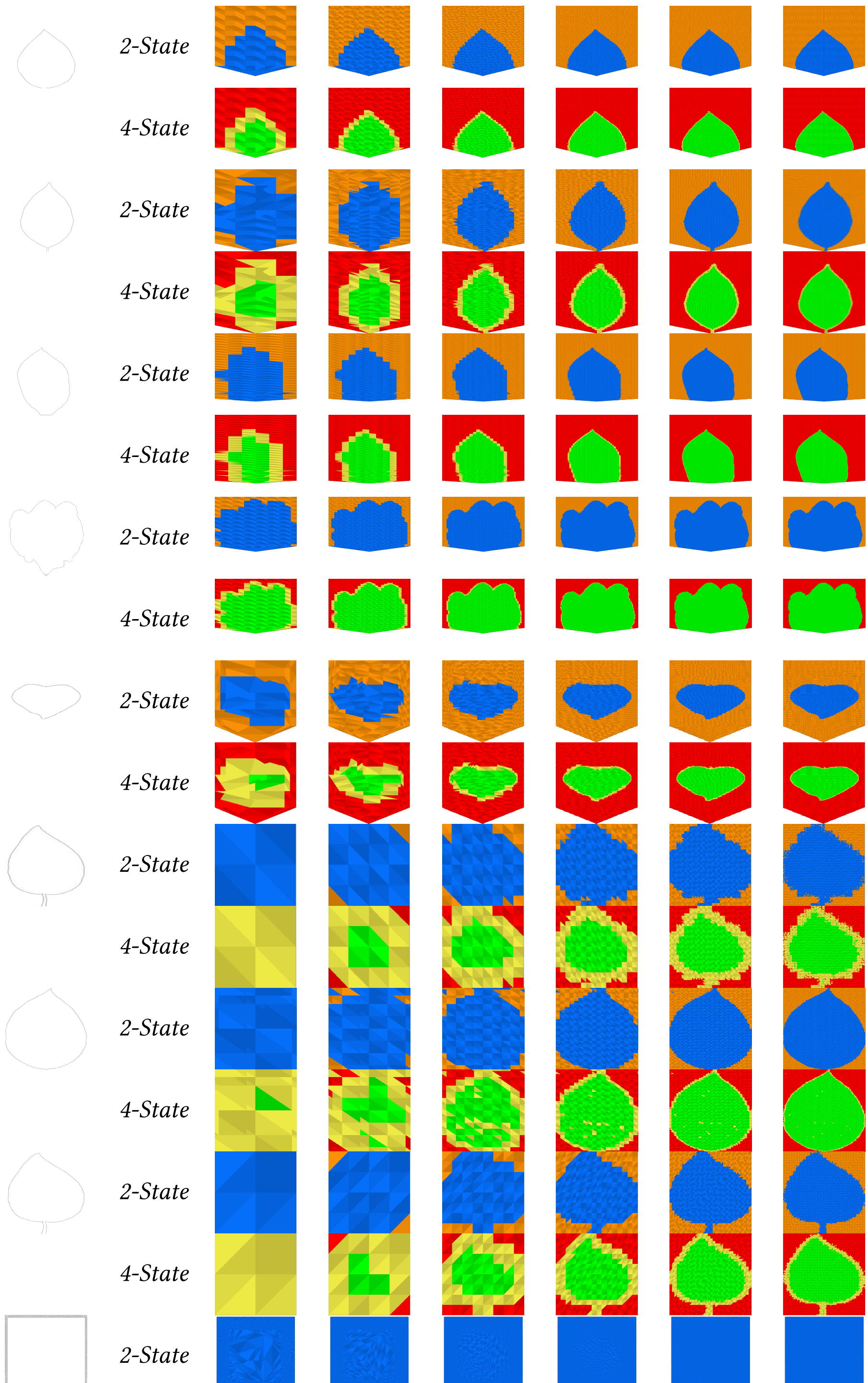
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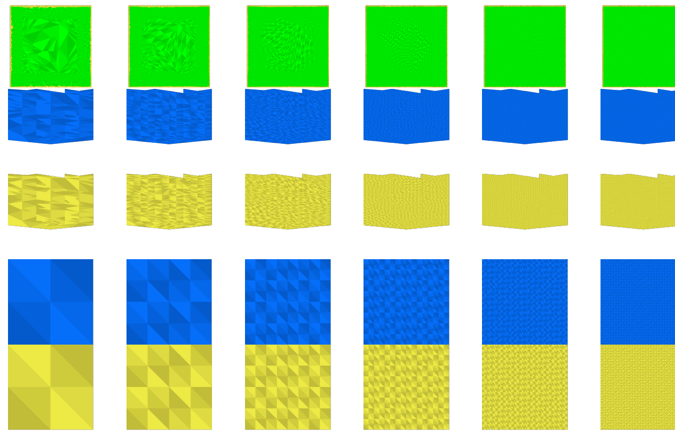
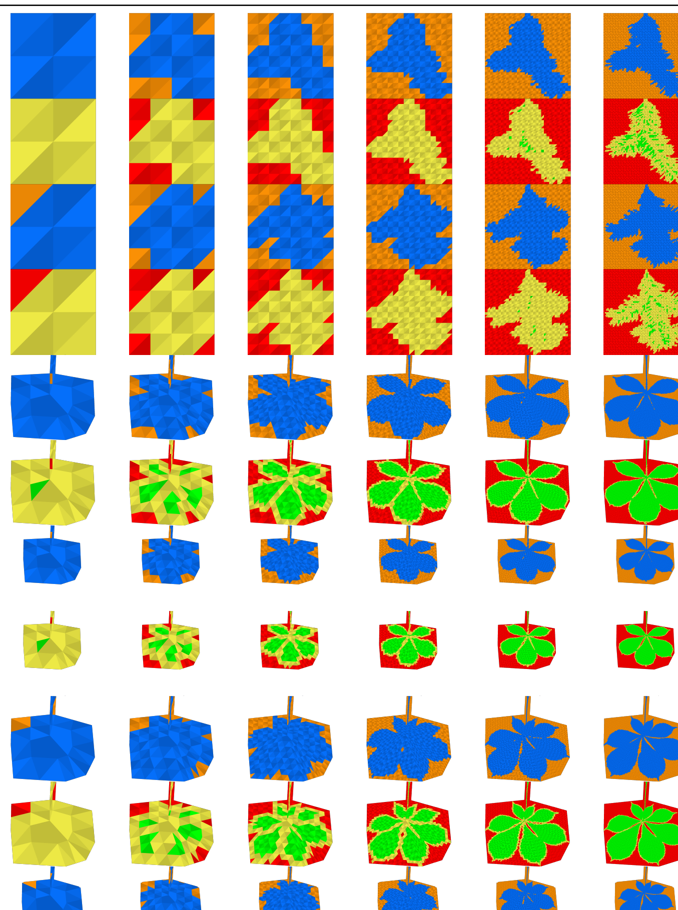
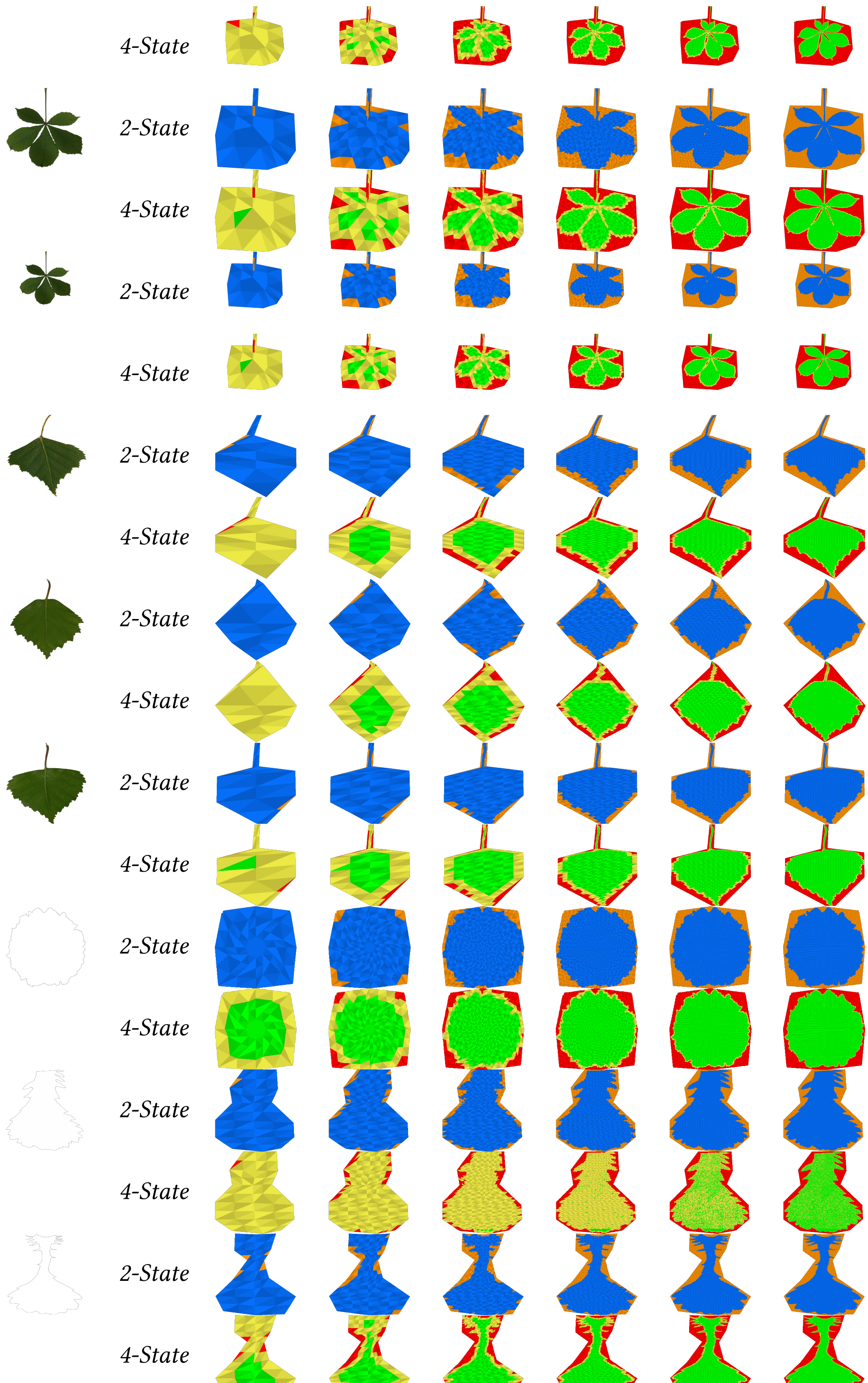
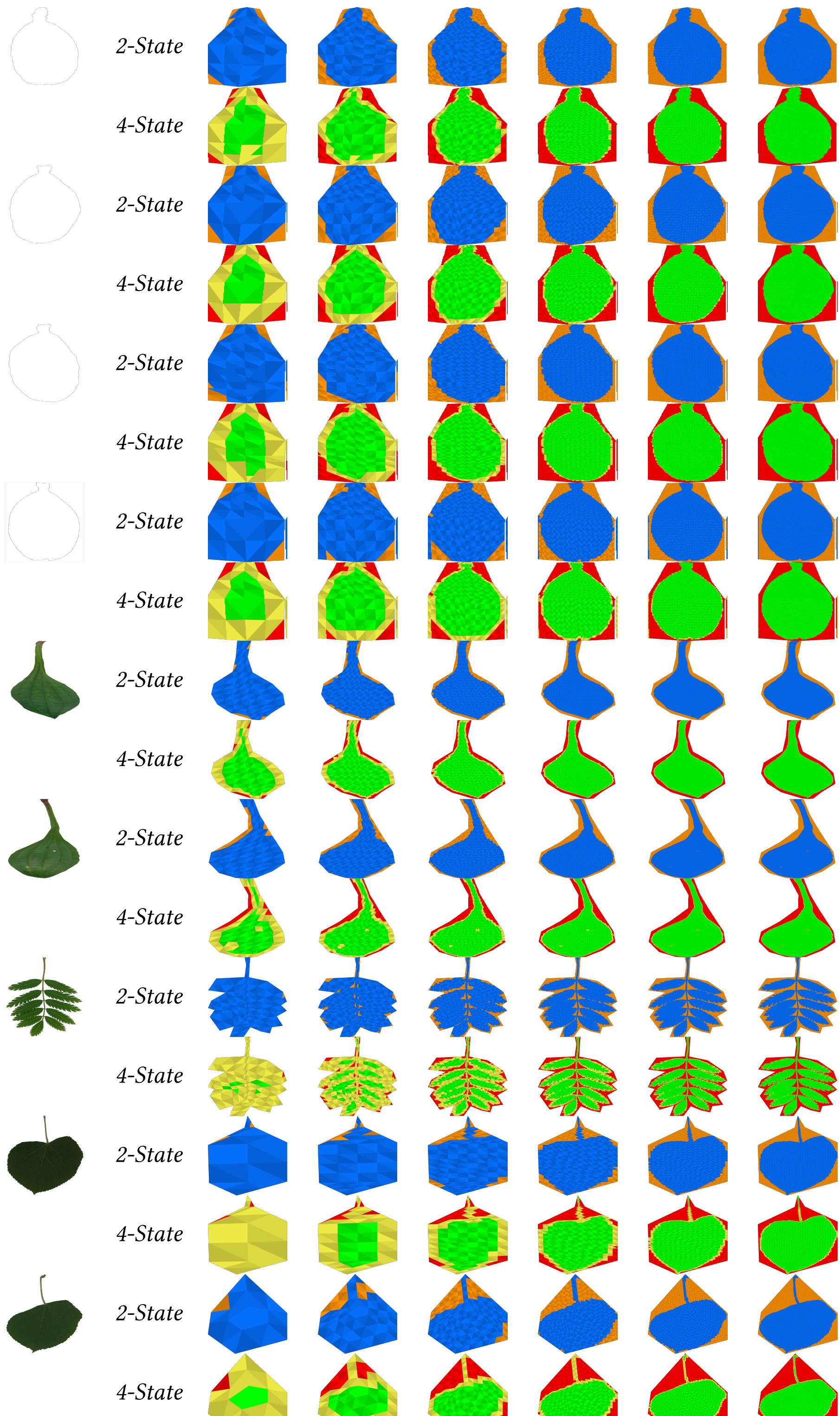
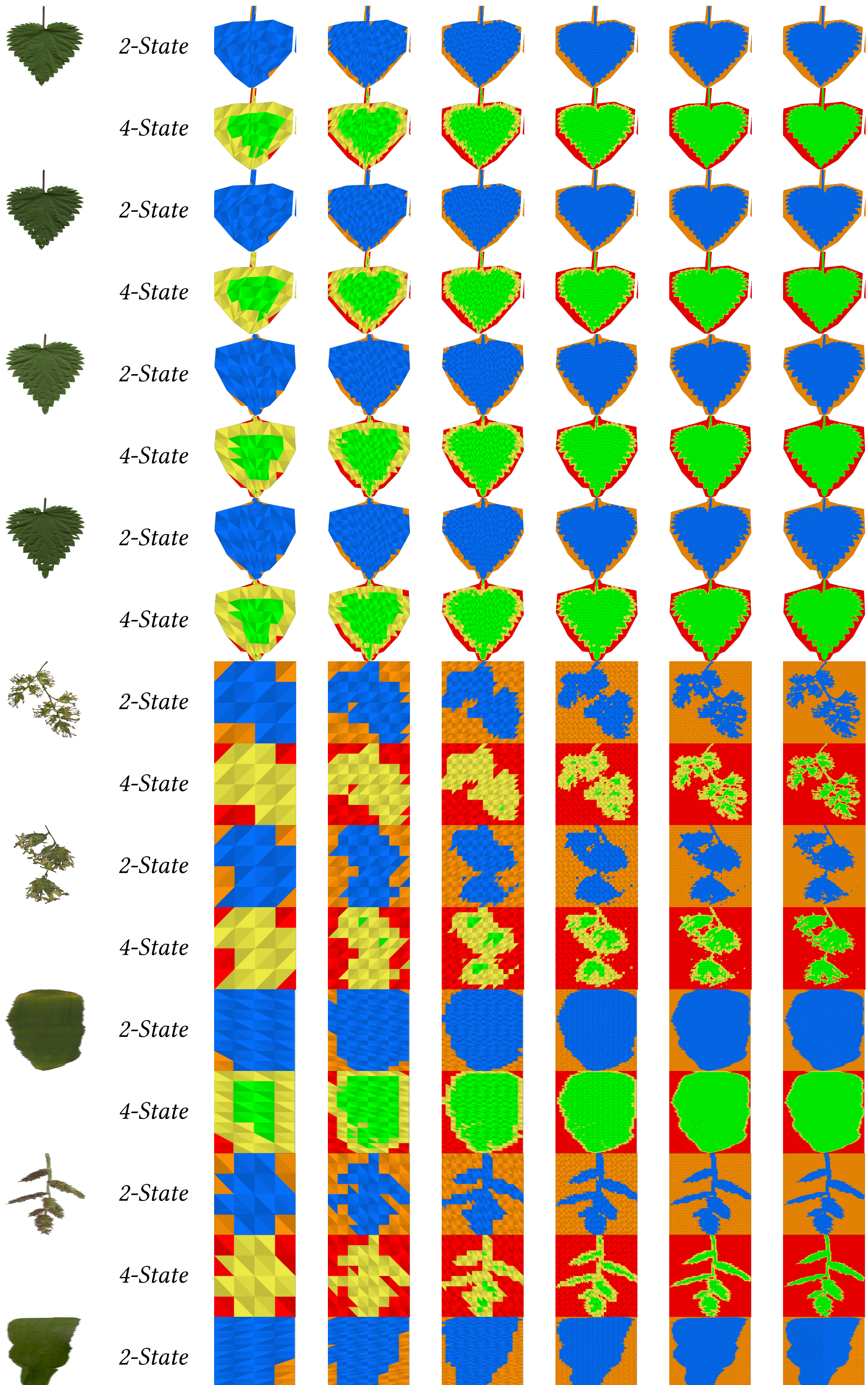
Texture	Mode	Subdivision Levels
	*4-State*	
	2-State	
	4-State	
	2-State	
	4-State	

Table 12. Opacity Micromap samples from the Landscape [2016] scene.

Texture	*Mode*	*Subdivision Levels*
	*2-State*	
	4-State	
	2-State	
	4-State	
	2-State	
	4-State	
	2-State	
	4-State	
	2-State	
	4-State	
	2-State	


4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State


2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State


2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
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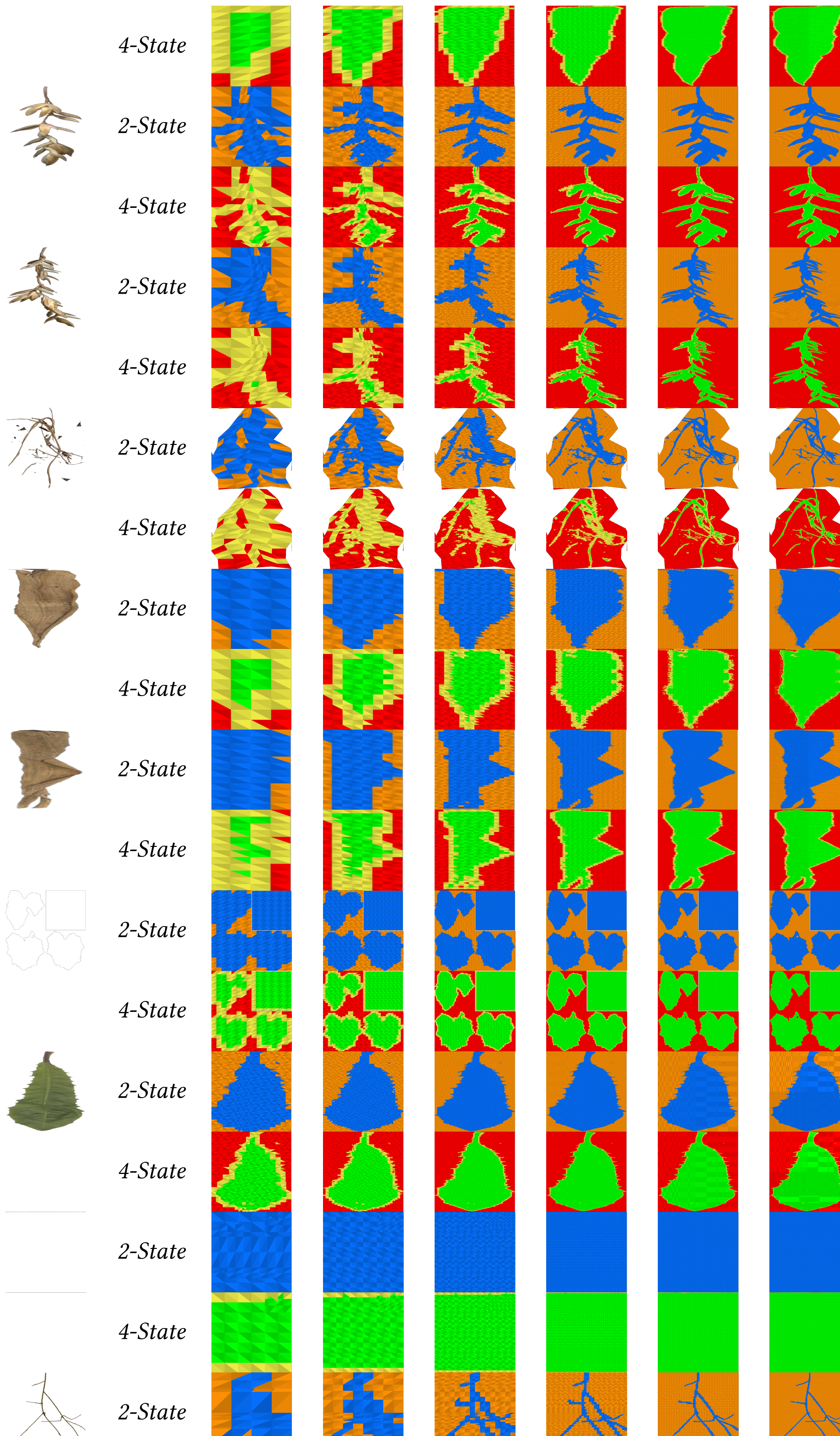
4-State
2-State
4-State
2-State


4-State
2-State
4-State
2-State
4-State
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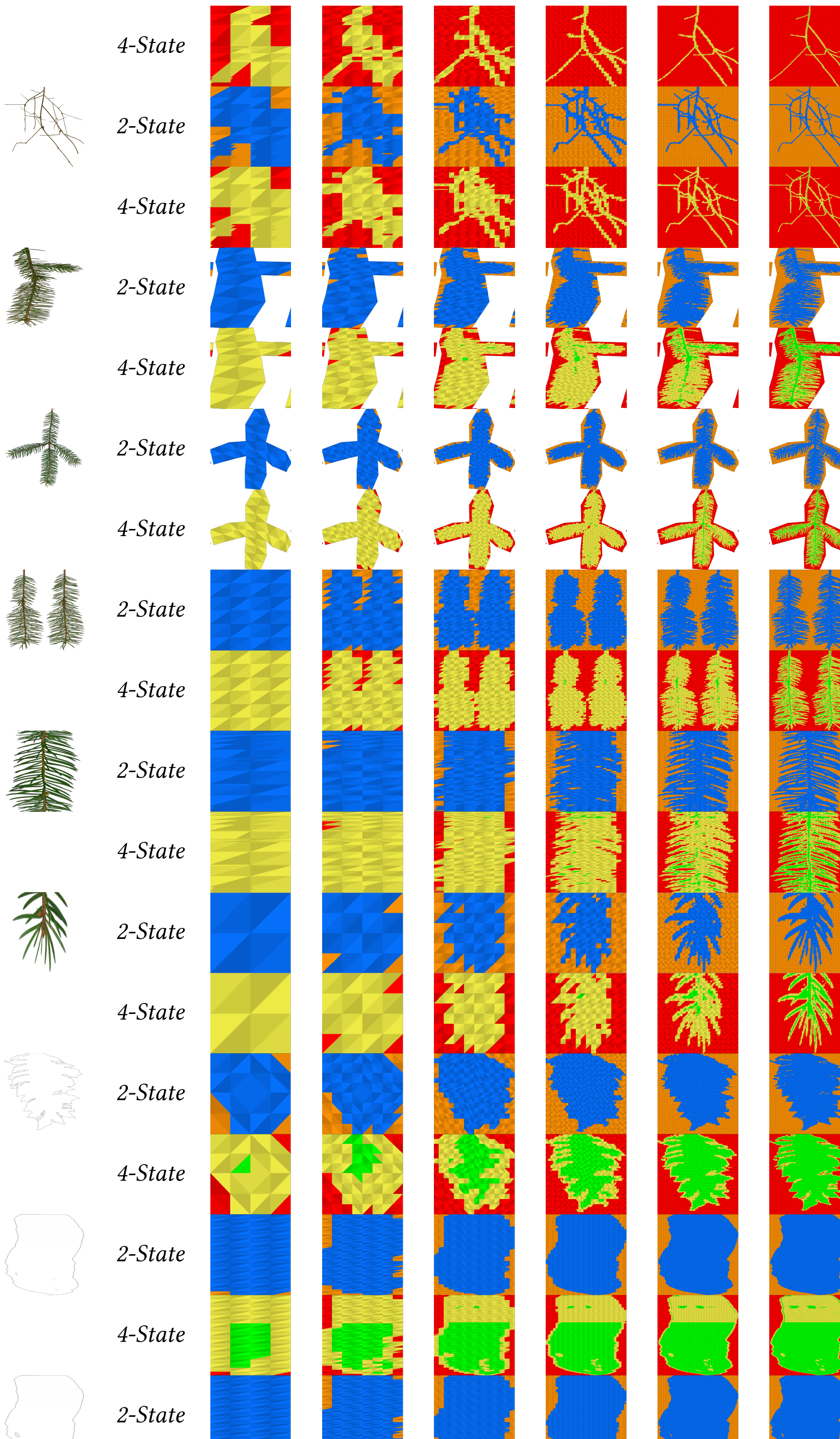
2-State


4-State
2-State
4-State
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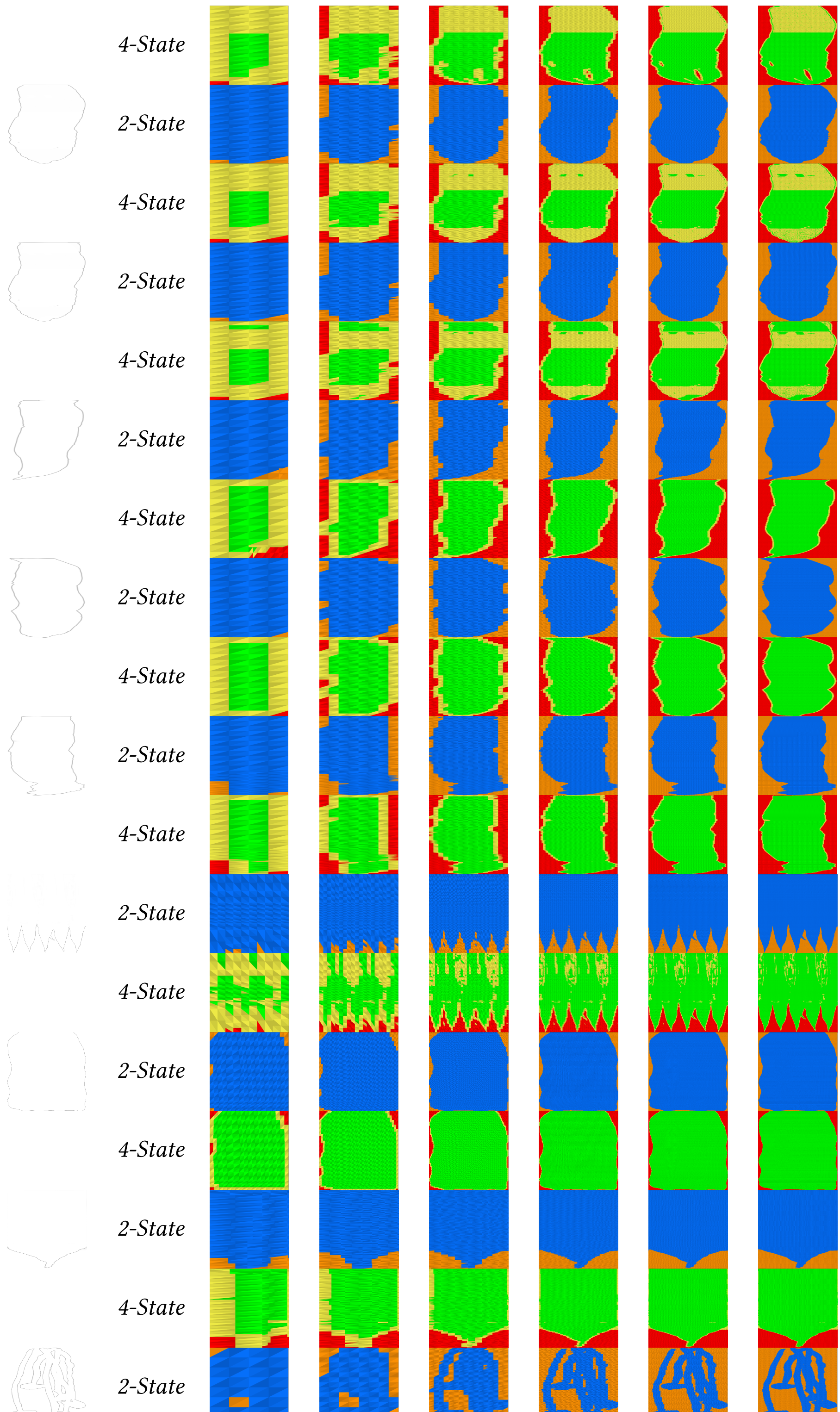
2-State
4-State
2-State
4-State
2-State


4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
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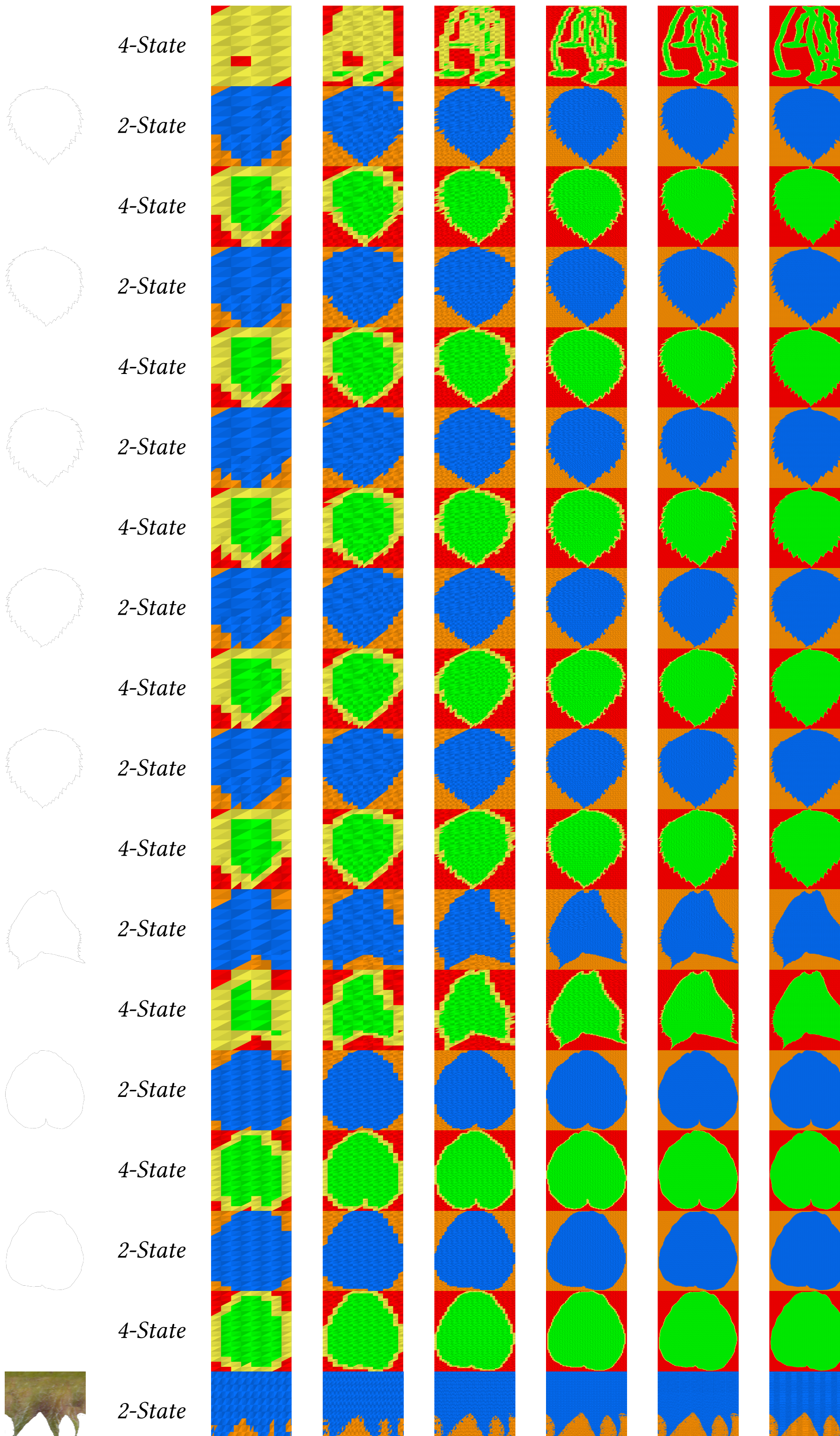
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State


4-State
2-State
4-State
2-State
4-State
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4-State
2-State
4-State
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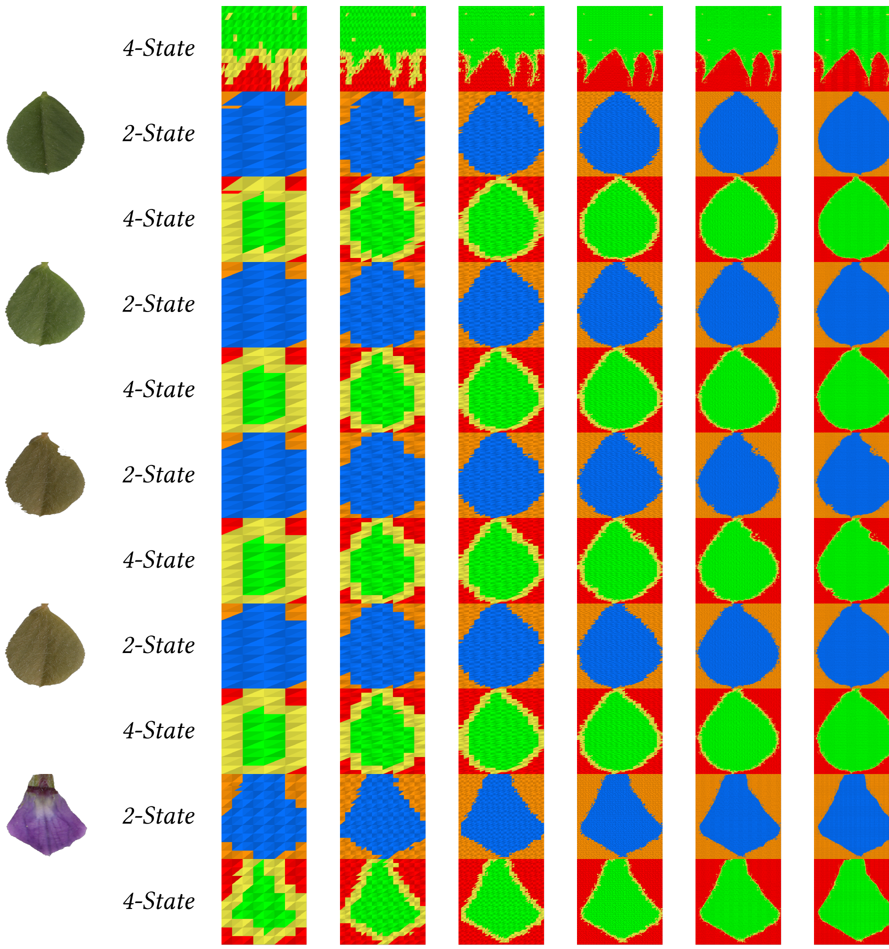
4-State
2-State


4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State
2-State
4-State

1.3 UV Unwrapping Samples

This section contains tables visualizing the texture coordinate unwrapping for all alpha mask textures in the scene. Note that the unwrapping is not entirely accurate as the visualization framework currently does not perform triangle clipping and wrapping at the image edges.

Table 13. Texture coordinate unwrapping samples from the CryTek Sponza [2011] scene.

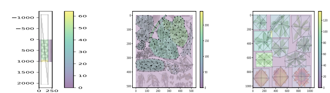


Table 14. Texture coordinate unwrapping samples from the Ecosys [1998] scene.

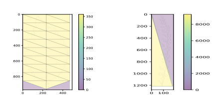


Table 15. Texture coordinate unwrapping samples from the New Sponza [2022] scene.

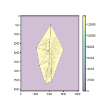
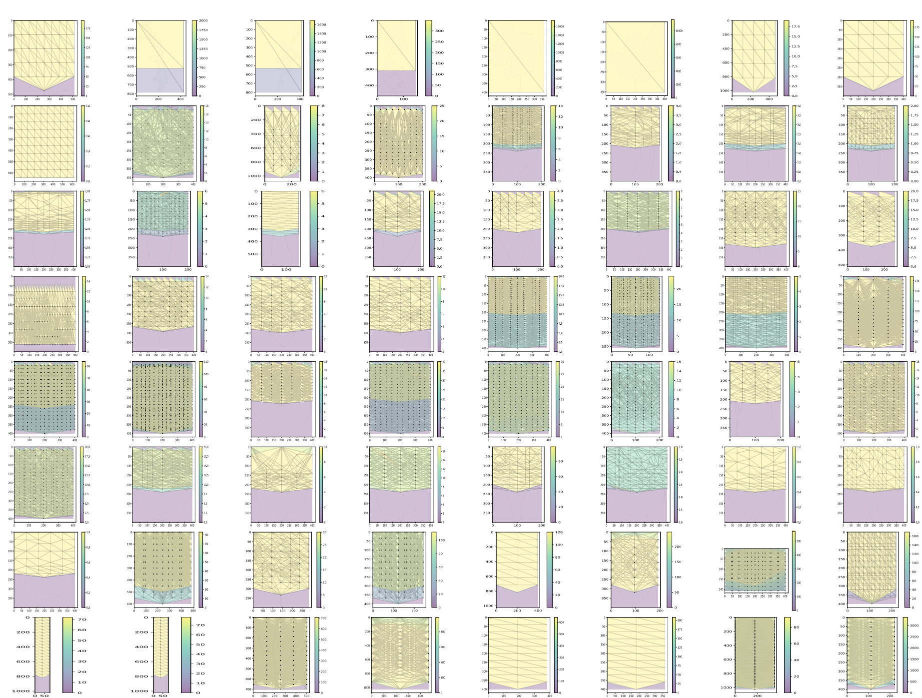


Table 16. Texture coordinate unwrapping samples from the San Miguel [2010] scene.



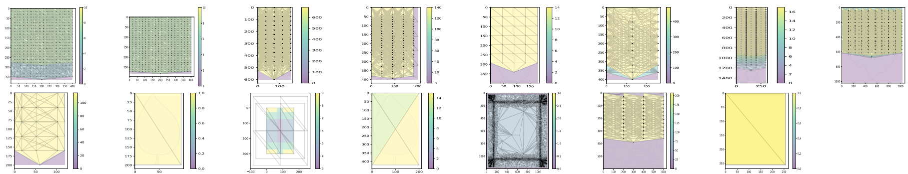


Table 17. Texture coordinate unwrapping samples from the Landscape [2016] scene.