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Appendix A
Image Complexity, 1966-1991

The table on the following pages summarizes information about images published in the computer graphics literature between 1966 and 1991. The survey covers images published in the SIGGRAPH proceedings from 1977 to 1991, ACM Transactions on Graphics, IEEE Computer Graphics and Applications, and anthologies in the IEEE tutorial series. Also included are references cited in this thesis, graphics papers published in the Communications of the ACM, and, for earlier data, publications from other journals. Chapter 3 discusses the selection criteria. The notes below explain the interpretation of the fields in the table entries.

The data in this table come from the reference cited for each image. The table is not complete, because many of the references do not provide information for all of the table's columns. I have made only a few guesses, based on an inspection of the image or statements in the publication.

Year The year that the reference was published, unless it gives a different year of creation for the image.

Source A reference from the list included at the end of this Appendix, or a reference to a chapter of this thesis.

Picture The author's title for the image, possibly shortened, or a descriptive phrase to identify it. There is only one table entry for each distinct scene. If the reference contains more than one image of a scene, the entry describes the most complex version.

Type The first letter shows whether the image was created for production use in an actual application (P) or for computer graphics research (R). The second letter shows whether the image is a frame from an animated sequence (A) or an independent still image (S).

Objects No attempt has been made to reconcile varying definitions of ''object,'' which may mean anything from a low-level primitive to a real-world object. Therefore, it is not meaningful to compare the entries in this column except among the images from a single reference.

Primitives: total
The total includes all modeling primitives, as reported in the publication. In some cases, the numbers appear to be approximate or to include only primitives relevant to the research reported in the reference; therefore, the total may not equal the sum of the next two columns (polygons and other primitives). If the size of a model can be varied, the table reports the number of primitives used to generate the published image.

Primitives: polygons
The number of polygons in the model.

Primitives: other
The number of modeling primitives other than polygons, broken down by type, if possible. For some exclusively polygonal models, this column shows the number of edges and/or vertices in the polygons.

Codes The five entries in this column hint at the shading and rendering complexity: A (antialiasing), R (reflections), S (shadows), T (transparency), and X (texture mapping). If the code letter appears in the table, either the corresponding quality can be seen in the image or it is documented in the reference. If a dash (–) appears instead, either the corresponding quality is absent or there is not enough information to confirm its presence.

Notes Other information given in the reference, such as the source of the model, the number of light sources, or an unusually high resolution. Unless otherwise indicated, all images are approximately 512 by 512.

Year	Source	Picture	Type	Objects	Primitives			Codes	Notes
					total	polygons	other		
1966	[Suth70]	blocks	RS	40					40 blocks
1967	[Appe67]	two objects	RS	2	32	32			hidden-line
		three machine parts	RS	3	41	41			
		aircraft	RS	1	143	143			
		aircraft over carrier	RS	2	190	190			
1969	[Gali69]	convex object	RS	1	242	242	372 edges		hidden-line
		German pavilion	RS		106	106	168 vertices, 252 edges		
1970	[Bouk70]	A-frame cottage	RS		17	17	60 edges		
		torus	RS	1	225	225	900 edges		
		cubes	RS	32	160	160	640 edges		
1970	[Lout70]	building	RS			74	92 vertices, 220 edges		hidden-line
1971	[Gold71]	helicopter	RA		21		21		
1971	[McGr71]	intersection (a)	RS		14	14			hidden-line
		airplane	RS		127	127			similar to [Appe67]
		house	RS		79	79			similar to [Gali69]
1972	[Newe72]	Figure 3	RS		14	14			
		Figure 4	RS		225	225			based on [Bouk70]
		Figures 5,6	RS		140	140		––T–	
		Figure 7	RS		63	63			based on [Watk70]
		Figure 8	RS		625	625		––T–	
		Figure 9	RS		625	625		––T–	
		Figure 10	RS		720	720			
		Figure 11	RS		450	450			
		Figure 12	RS		393	393			
		Figure 13	RS		195	195			
1974	[Suth74]	Roberts' House	RS		200	200			proposed ''simple'' scene
		Harbor	RS		5,000	5,000			hypothetical ''difficult'' scene
		Big Harbor	RS		120,000	120,000			speculative ''giant'' scene
1977	[Haml77]	cone	RS			331			hidden-line
		cylinder	RS			235			
		bottle	RS			41			
		aircraft	RS			440			
1978	[Will78]	robot	R?				> 350 bicubic patches	?–STX	

Year	Source	Picture	Type	Objects	Primitives			Codes	Notes
					total	polygons	other		
1979	[Csur79]	tribbles	R?		500,000	500,000			
		Burley, Idaho	R?		25,000	25,000			
		Beldar's hat	R?		12,000	12,000			
		cocklebur	R?		46,000	46,000			
1980	[Blin80]	teapot	RS		28		28 bicubic patches		
1981	[Crow81]	test scene	RS			24,568			
1982	[Whit82]	bottles and glasses	RS			23,554	70,661 edges	—–STX	no antialiasing
		room scene	RS			32,000	44,000 edges		
		logo	RS			12,492	19,450 edges		
		fractal terrain	RS			18,188	28,421 edges		
		30-sided torus	RS			1,800	2,760 edges		
1982	[Crow82]	banana	RS		256	256			
		Easter egg	RS		3,552	3,552			
		George (skeleton)	RS		19,666	19,666			
1983	[Kaji83]	fractal surface	RS		262,144	262,144		–RS––	no antialiasing
1984	[Wegh84]	Pencils	RS	38	1806	1806		RS––	1 light or 3 lights
		Polygons	RS	21	1983	1980	3 spheres	–S––	3 lights
		Camera	RS	39	1393	1392	1 sphere	–S––	1 light
		Office Scene	RS	63	2109	2101	8 spheres	RST–	5 lights
		Pool Room	RS	38	853	835	13 spheres, 5 cylinders	RST–	5 lights
1984	Chap. 3	Andre	RA		91		74 spheres, 13 cylinders	A–––X	
1984	[Brow84]	Gunstar	PA			648,000			3000x5000 pixel resolution
		Starfighter	PA			250,000			average frame from film
1984	[Glas84]	checkerboard/balls	RS	53				RS––	
		spirals	RS	401	401		401 spheres	–S––	
		recursive pyramid	RS	1,025	1,025	1,025		–S––	
		geodesic cube	RS	1,536	1,536			–S––	
		sinc function	RS				3,656 spheres	RS––	
1985	[Whel85]	House	RS			178			
		Caltech	RS			990			
		VW	RS			1,072			Sutherland's model, Univ. of Utah
		X-Wing	RS			1,407			
		Frame1100	RS			8,089			
		Fractal64	RS			65,030			
1985	[Reev85]	stained glass knight	PA	82	1403		1403 bicubic patches	AR–TX	82 pieces of glass, 23 light sources

Year	Source	Picture	Type	Objects	Primitives			Codes	Notes
					total	polygons	other		
1986	[Bish86]	chessmen	RS			14620			2048x2048 pixels
1986	[Four86]	beach at sunset	RA				92,724 bicubic patches	AR—X	2048x1228 pixel resolution
		wave refraction	RS				85,680 bicubic patches	R—X	
1986	[Fuji86]	DNA	RS	7011	7011		7011	—S—	antialiased
		CG Tokyo 85	RS		10584			A–S—	
		RX-7	RS			46,000		RS—	antialiased(?)
1986	[Berg86]	bench	RA		697			A–S—	shadow polygons excluded;
		Tony de Peltrie	RA			4211		A–S—	16 samples/pixel
		shoes	RA			1141		A–S—	
		Montreal	RS			8854		A–S—	
1986	[Hain86]	chessboard	RS	132	4944	4944			4 lights
		cards	RS	41	3286	3286			5 lights
		highchair	RS	33	6712	6702	2 cylinders, 8 quadrics		3 lights
		gazebo	RS	80	3222	3222			8 lights
		tree	RS	768	773	6	256 spheres, 511 quadrics	—T–	
		kitchen	RS	224	1413	1298	76 cylinders, 35 quadrics, 4 spheres		5 lights
1986	[Joy86]	shiny spheres	RS	61	76		60 spheres, 16 patches	–RS—	
		lamp	RS		310		310	ARST–	4 lights
1986	[Kay86]	trees	RA		110,000			ARS—	all antialiased
		pyramid**4	RS		1024	1024		A–S—	based on [Glas84]
		pyramid**5	RS		4096	4096		A–S—	
		superquadric	RS	402	2402	2400	2	ARS—	2 lights
		tree branches	RS	2	1272	1	1271	A–S—	
		tree leaves	RS	2	7456	6185	1271	A–S—	
1987	[Arvo87]	pyramid**4	RS		1024	1024			
		pyramid**10	RS		4.2×10^6	4.2×10^6			from [Kay86]
		tree leaves	RS		7455			–S—	from [Kay86]
		tree branches	RS		1272			–S—	from [Kay86]
		grove	RS	64	477,121			–S—	
		teapot	RS		1824			RS—	
		platonic solids	RS		1405			RS–X	
1987	[Dyer87]	skull1	RS	1		2034		A———	
		skull2,3,4	RS	5		10420		A———	up to 3 lights

Year	Source	Picture	Type	Objects	Primitives			Codes	Notes
					total	polygons	other		
1987	Chap. 3	bike shop window	RA		9050		see Table 3.3(a)	ARSTX	7 lights
	[Ostb87]	night in bike store	R	A		16,783		ARSTX	19 texture channels, 1024x788
1987	[Snyd87]	graphics lab	RS				100 intermediate triangles	A–S–X	diffuse shadows from 3 sources
		teapot museum piece	RS				10,000 intermediate triangles	ARS––	
		reflective bristles	RS				15,000 intermediate triangles	A–S––	
		Statue of Liberty	RS				100,000 intermediate triangles	A–S––	
		brass ornament	RS				100,000 intermediate triangles	ARSTX	
		flowers, grass, clovers	RS				200,000 intermediate triangles	A–S––	
		glass museum piece	RS				400,000 intermediate triangles	ARST–	
		grass and trees	RS				2×10^{9} intermediate triangles	A–S––	
		field of grass	RS				4×10^{11} intermediate triangles	A–S––	
1987	[Hain87]	balls	RS		7382	1	7381 spheres	RS––	3 lights
		gears	RS	64	9345	9345		RST–	54 multiple-edge, concave polygons
		mountain	RS	5	8196	8192	4 spheres	RST–	
		rings	RS	141	8401	1	4200 spheres, 4200 cylinders	RS––	3 lights
		tetra	RS	1	4096	4096		–S––	based on [Glas84, Kay86]
		tree	RS		8191	1	4095 cones, 4095 spheres	–S––	7 lights
1989	[Potm89]	station	RS			17,000			
		tea room	RS			50,000		A–ST–	area light source, 16 samples/pixel
		museum room	RS			2,000		––––X	13 texture maps, 4Mb texture data
1990	[Mund90]	convertible	?S			20,000		–RST	triangles; 20 lights
1990	[Bara90]	falling jack	RA			97	6 curved surfaces	–RSTX	rigid body dynamics
		falling dice	RA			89	102 curved surfaces	–RST–	
1990	[Max90]	chromatin fiber	RA				14,050 cone spheres	A––––	motion blur
		branching grape root	RA				13,000 cone spheres	A––TX	motion blur, 2048x1500
		torus	RS	1			24 cone spheres	A––––	
		Christmas tree	RS				1770 cone spheres, 1000 spheres	A––TX	
1990	[Sale90]	simple scene	RS				500 spheres	A–STX	
1990	[Gree91b]	printing press	RS			320,000		–RS–X	
1991	[Gree91a]	workstation	RS	2600	21,600	20,000	1600 quadric surfaces	ARSTX	9 samples/pixel, 1280x1024 pixels

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