

Lindenmayer Systems Fractals Evolved by Pfeiffer

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Research Note RN/04/13

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Abstract





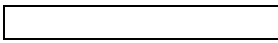




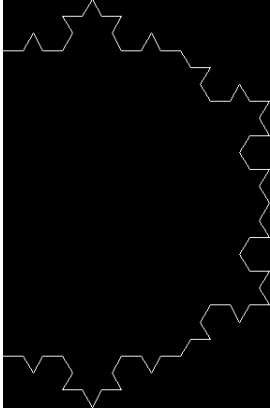


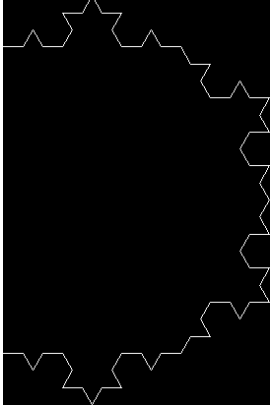
Pfeiffer <http://www.cs.ucl.ac.uk/staff/W.Langdon/pfeiffer.html> is an interactive JavaScript based system for evolving fractal patterns similar to Koch's snow flake. All patterns evolved during a two month trial period during the Autumn of 2003 are given.

This research note should be viewed as an appendix to:






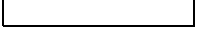

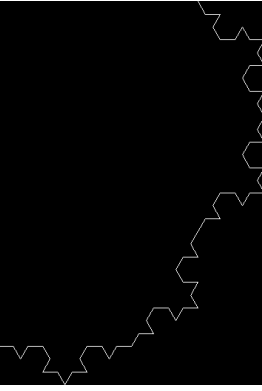






- W. B. Langdon. Global distributed evolution of L-systems fractals. In Maarten Keijzer, Una-May O'Reilly, Simon M. Lucas, Ernesto Costa, and Terence Soule, editors, *Genetic Programming, Proceedings of EuroGP'2004*, volume 3003 of *LNCS*, pages 349–358, Coimbra, Portugal, 5-7 April 2004. Springer-Verlag.
- W. B. Langdon. Global distributed evolution of Lindenmayer systems fractals. 2004. To be submitted.









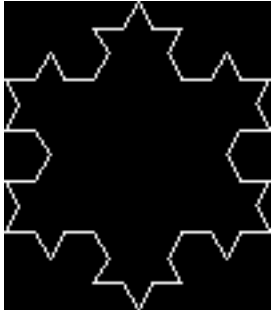





Fractal Patterns Created

Count	Image	Image		GIF num	Example Grammar						
		size	bytes		Size	Deg	It	Side	Steps	Start	Rules
170		15×14	73	4	61				48	F++F+F	('F',''-F+F-F-F+F
1		7×12	59	1	60	-72			32	+F+F+4+5	('F','F-F++F-F')
4		24×27	98	3	46				64	F+,s5tF3F5F+rc3c	
19		10×3	49	1	49	6		4	48		
4		19×22	100	4	42			10	48		('FF-)s
15		17×17	84	7	110	90		10	64	F+F+F+F	(%27F%27,%27-F+F-F-F+F+F+FF-F+F+FF+F-F-F+FF-FF+F+F-F-F-F-F+FF-F-F+F+F-F-F+%27)
1		24×27	106	1	66				80	+F+FF+F+F	('F''F-F++F-F-F'
59		47×11	77	15	48	6			48		
11		45×16	90	1	84	9			48		
11		8×7	54	2	56	-72			48		('F','F-F++F-F''
3		10×4	52	2	49				16	F+	('F','F-F++F-F')
19		15×22	84	10	64				64	F+F+F+F	('F',''-F+F-F-F-F+F
2		5×13	57	1	50	90			64	'+F+4+FFF	
1		5×5	48	1	40			2	48		
2		22×27	92	1	48	690			48		
38		28×32	140	6	50		3		192		('F','F-F++F-F')
3		2×1	43	2	39	5	0	4	3		
31		14×14	76	2	56	-72			80	+F+F+F+F+F	('F','F-F++F-F''
10		5×5	49	1	45	90			48		

Count	Image	Image		GIF					Example Grammar		
		size	bytes		num	Size	Deg	It	Side	Steps	Start
1		33×27	120	1	53				112	F++F+tF3F5F +rc34+c++'l44FrFs	
2		28×37	122	2	47		10	48	F+F+F	('F',e-F-F-	
1		10×7	57	1	47			32	rF+'++F		
1		15×14	76	1	49			64	F++'+F+4+F+F		
4		97×1	49	3	44	0	10	48		F'e,-	
6		24×14	83	2	48			64	F++F+Ft5F+r		
1		93×22	122	1	48	6	10	48		('F'e-	
1		19×20	88	1	50			80	F+F3t5F+rc34+- ++'l44FrrF15		
16		2×2	43	1	50		0	3			
1		285×438	1499	1	47		105	64	F+F+F+F		
15		11×1	44	3	47	0	4	48			
10		3×2	44	1	53	607		48			
4		271×417	1412	2	48		100	64	F+F+F+F	('F','+F++FF-	

Count	Image	Image		GIF num	Example Grammar				Start	Rules
		size	bytes		Size	Deg	It	Side		
1		28×27	115	1	49				96	F++F+F+FFF
3		24×22	94	2	48				80	F+F+F+FF
1		19×4	58	1	51				32	Fi,s5tF3 ('F','F-F++F-F')
11		20×19	91	9	67				80	+F+F+F+F+F+F ('F','F-F++F-F-F')
3		15×35	101	1	47				80	rF+'F+4tFFFt
2		15×35	102	1	67				96	F+F+F+F+rc34 +c++'l44FrF'15
1		10×17	70	1	50				48	rF+'++++4tFF+r
877		49×1	47	29	50	0			48	('F'4'+-F++F-F')
83		1×1	43	14	42	5	0		48	
3279		10×12	64	27	67				48	('F','-F'F+F-F-F+F
1		3×1	43	1	53	0	0	4	3	
2		28×17	95	1	54				80	s5tF3F5F +rc34+c++'l44FrF'15
3		13×13	68	2	101	90	10		32	F+F ('F','-F+F-F-F+F+FF- F+F+FF+F-F-FF+FF- FF+F+F-FF-F-F+FF-F- F+F+F-F+')
5		15×24	86	1	48				64	rF+'++++4tFFF
3		4×6	49	1	46			1	64	F+F+F+F
1		2×2	43	1	48	-72		4	48	
4		13×5	56	1	48	90			80	FF+4+FFF
2		20×30	103	1	53				80	F+F+FF+F

Count	Image	Image		GIF num	Example Grammar					
		size	bytes		Size	Deg	It Side	Steps	Start	Rules
8		15×9	64	1	50	90		80	F+F+tFFF	
249		10×3	49	31	32	5	4	48		
1		15×12	67	1	50			32	F+F	
1		24×14	88	1	56			80	FF+'F+4 +F+F	
1		19×19	90	1	52			80	F++F+F +4F+F	('F','F-F++F-F')
2		65×1	48	1	55	0		64	rF+'++ +4tFFF	
111		39×1	46	5	54	0	4	48		
1		361×521	1653	1	48		100	64	F+FF+F	('F','-+F++FF-
15		3×2	44	1	60	0		3	F++F+F	
2		38×9	70	1	52	6	4	48		
110		28×42	140	23	65		10	64	F+F+F+F	('F','-F++F -F-F+F+F
2		8×9	58	1	52	60	4	48		
2		19×25	96	1	49			80	F++F++ 4tFFF	
3		19×20	81	1	50			48	F+,s5tF 3t5F+r	

Count	Image	Image		GIF	Example Grammar						
		size	bytes		num	Size	Deg	It	Side	Steps	Start
3		24×35	118	2	47					96	FF+'F+ 4tFFF2
153		3×4	46	8	51	60		44		48	
9		10×20	74	4	66					48	F++FF+ 4+itt
21		24×17	98	2	51					96	F++F++F 3t5F+rc34+c ++'l44FrF'15
154		48×9	74	27	49	5				48	
2		38×8	69	1	51	5		4		48	
24		82×94	491	1	46			4		768	
2		37×17	105	1	66					96	FtF3F5F+r c34+c++' l44FrF'15
2		100×116	497	1	60				55	48	
8		28×27	113	4	58			10		48	F++F+F ('F','-F+F-F+F
9		4×2	45	2	24	5	0			3	
2		15×17	81	2	51					64	F++F++F ('F', 'F-F++F- 3t5F+rcsc F')
3		2×2	44	1	49	607	0			3	
4		10×12	65	1	46					48	F++F+++F
5653			373643	307	≈339115						