



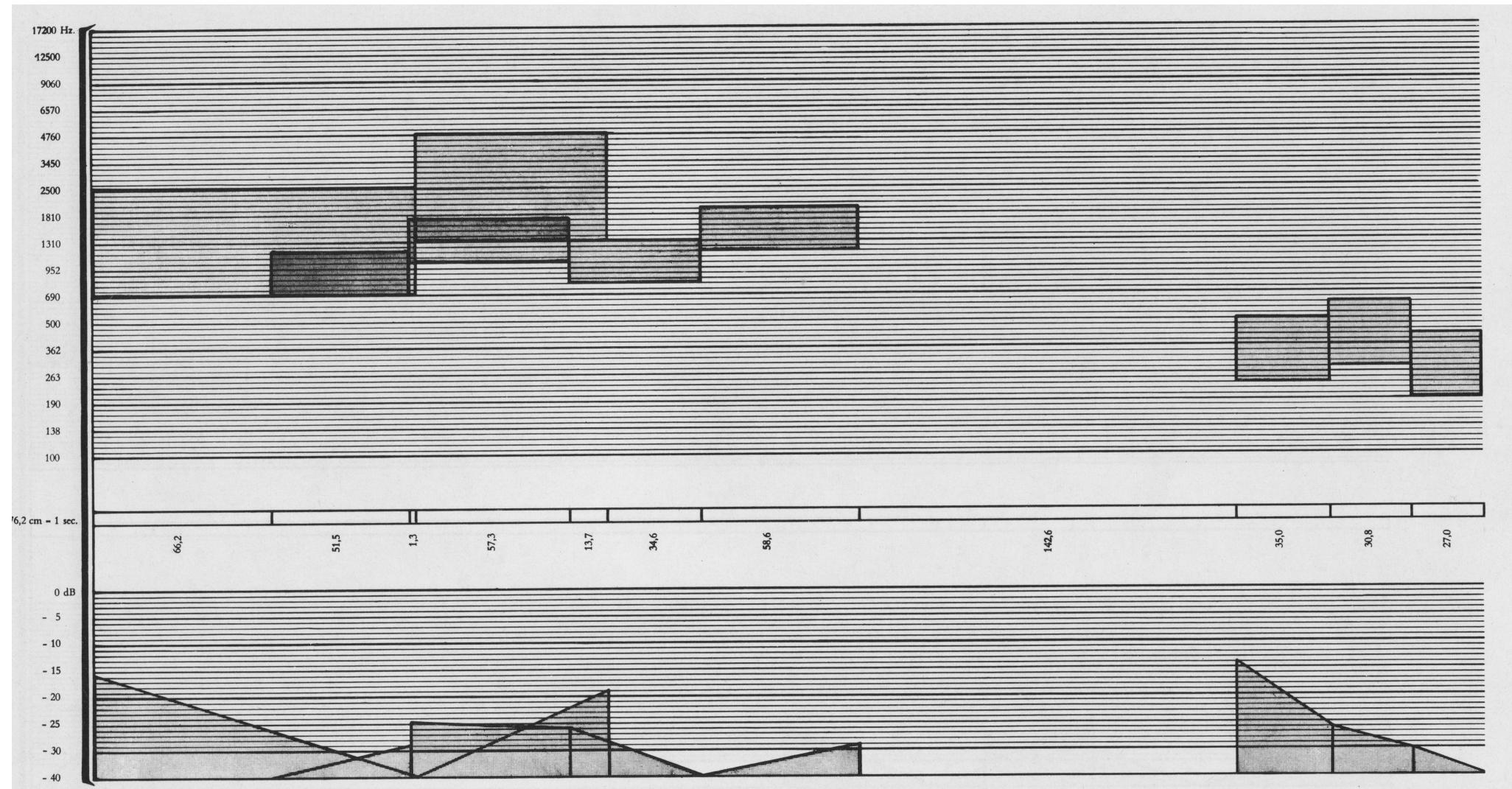
Joachim Heintz

Re-Generating Stockhausen's *Studie II* in Csound



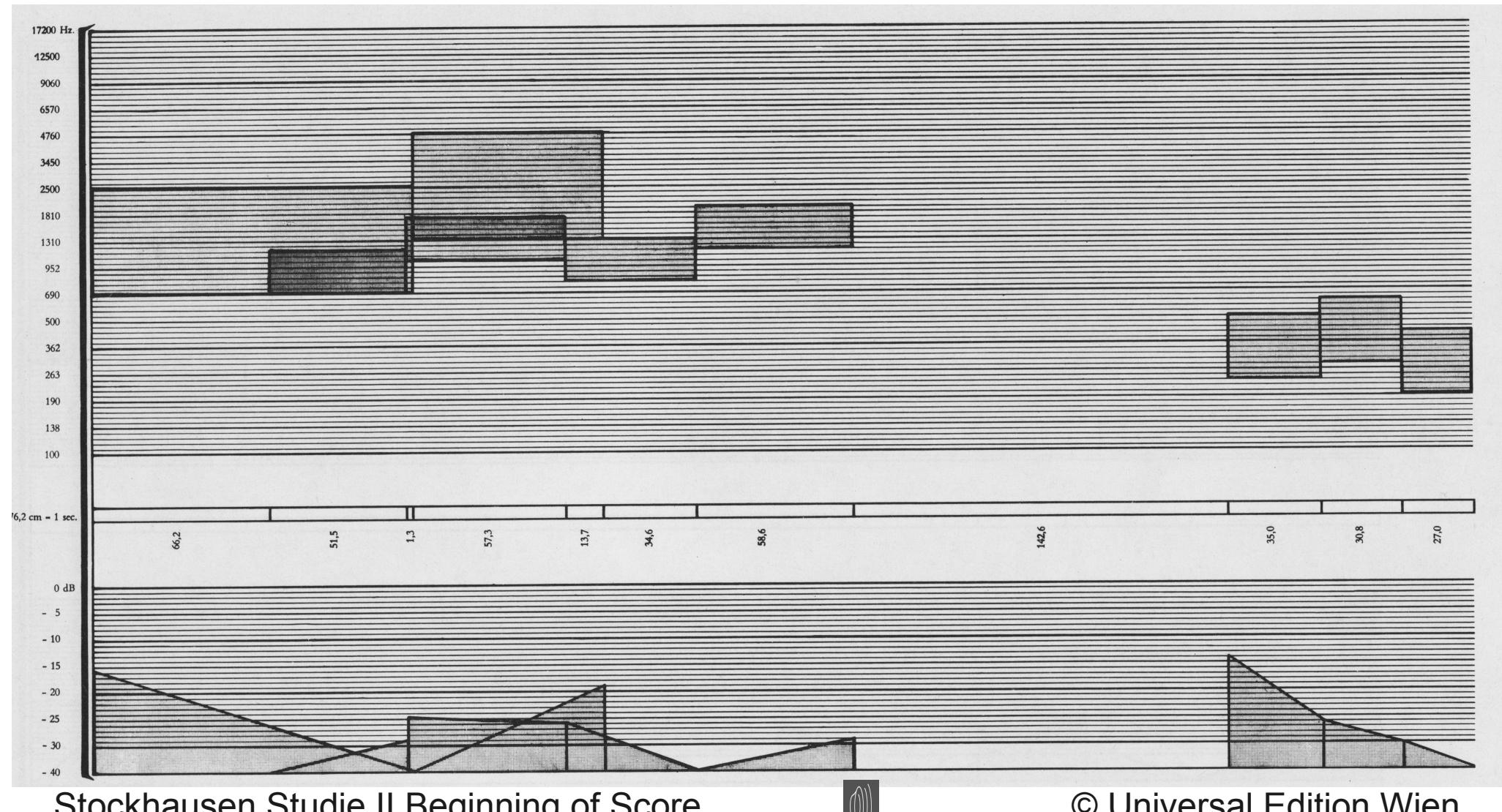
Outline

- About Stockhausen's „Studie II“
- What does Re-Generation of it mean
- Why this Re-Generation
- Show it in practice
- Problems of the Re-Generation
- What can be learned by it
- Future improvements



Stockhausen Studie II Beginning of Score

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Stockhausen Studie II Beginning of Score



© Universal Edition Wien

What re-generation means

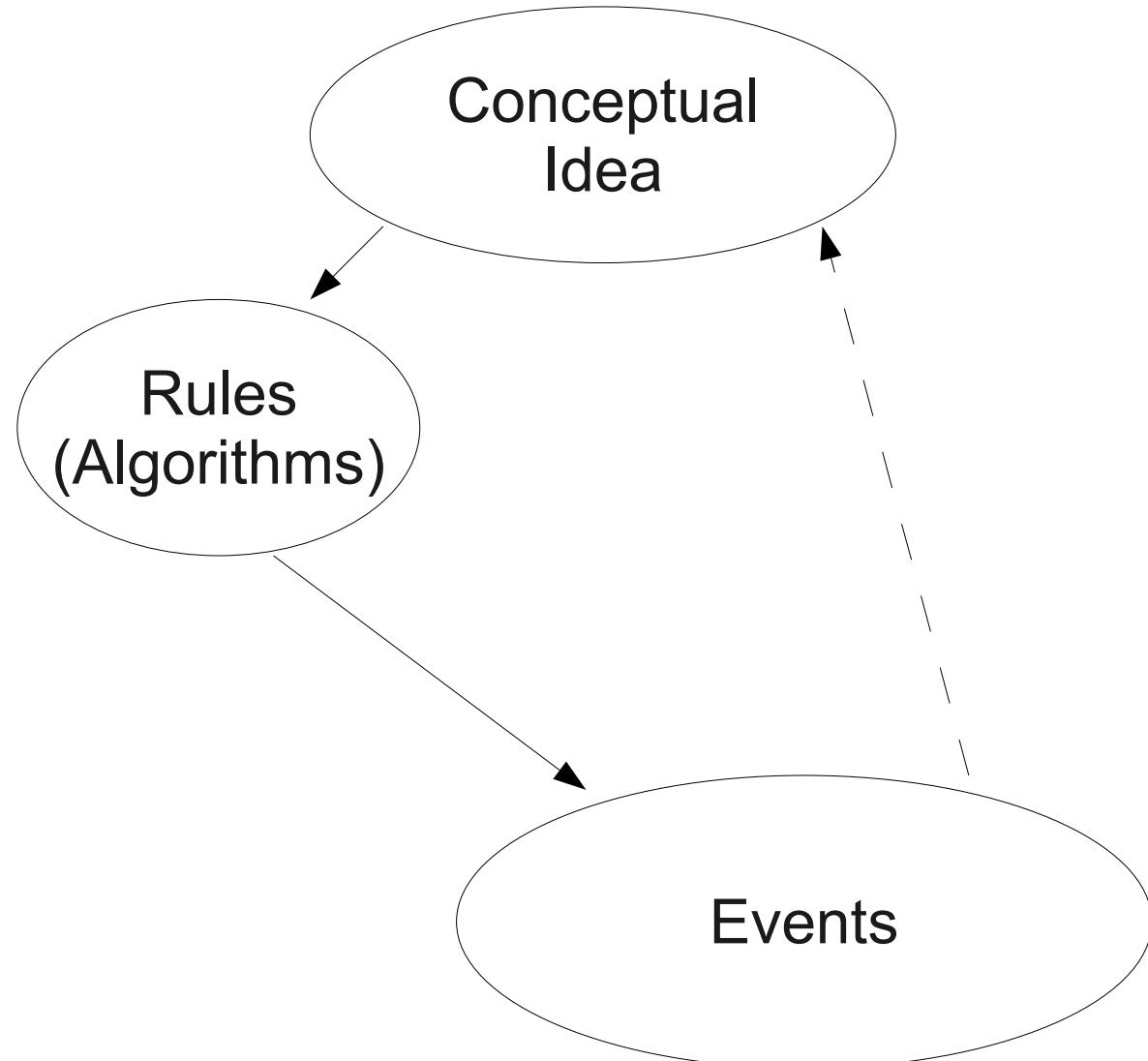
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EGK Studie I

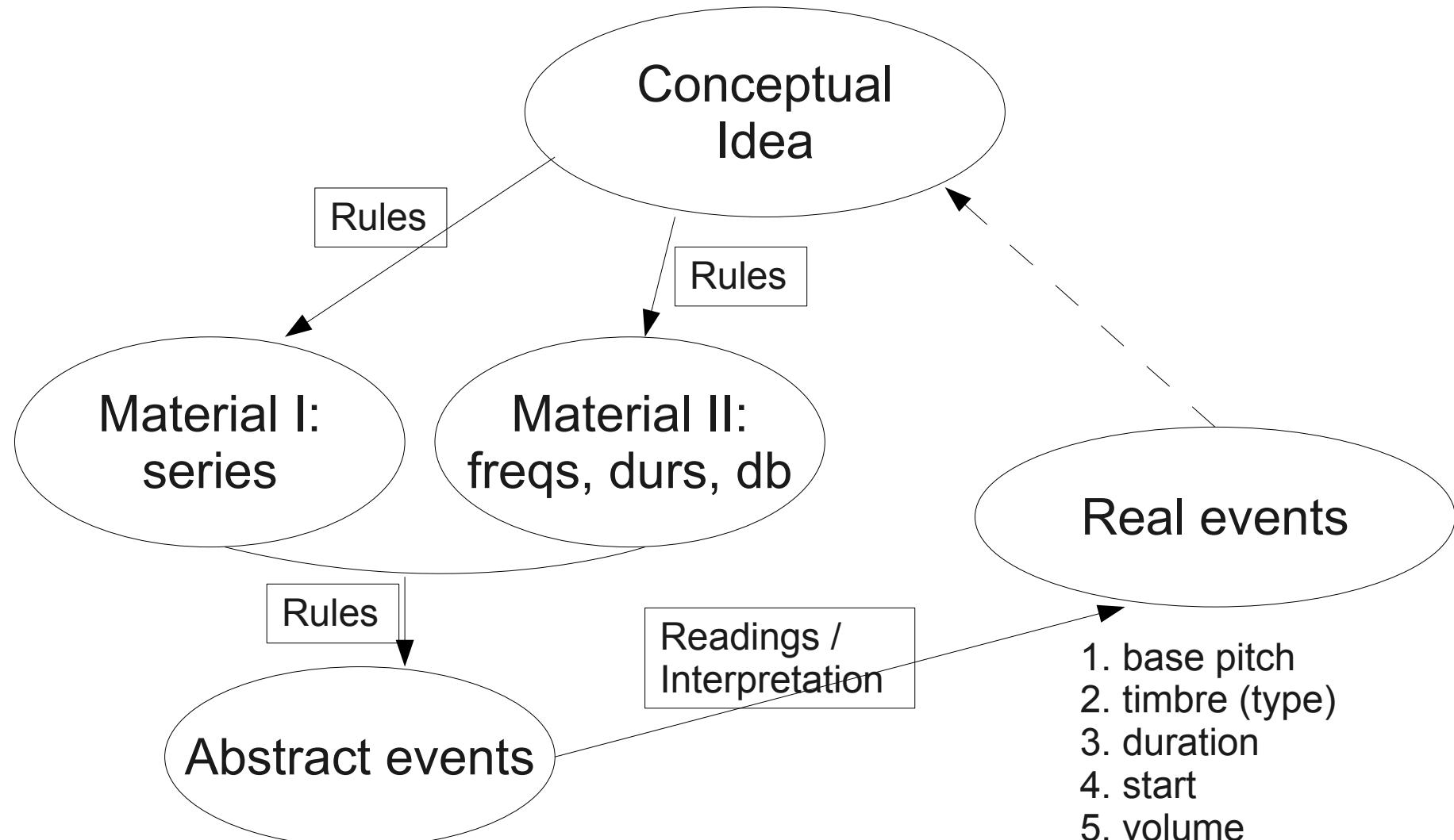
	Tonhöhen: Resultat				Zeitdauern: Resultat				Zeitabstände: Resultat				Lautstärke: Resultat							
	Tr.	F.	Br.	K.	Nr.	Tr.	F.	Br.	D.	cm	Tr.	F.	Br.	D.	cm	Tr.	F.	Br.	L.	db
S1	2	3	5	3	67	1	1	4	1	719,2	1	4	4	4	20,9	5	5	1	5	16
	3					1			3	71,1	1			1	45,3	5	2	19	1	190,1
S2	4	5	2	1	136	3	1	4		51,5	1	2	2	2	104,6	2	3	3	29	1
	4	139				2					5				71,1	1			25	1
	2	137				5					3				91,95	4			26	1
	5	140				2					3				91,95	3	29	1217	309,6	
	5	1	3	2	58	4	2	3	35		2	1	2	1	80,85	3	4	5	14	
																				1426 Pause

Stockhausen working sheet for the beginning of Studie II (top)
 © Archiv der Stockhausen-Stiftung für Musik, Kürten (www.stockhausen.org)

Simplified model for a programmable ('algorithmic') composition



Base model for the (re-) generation of Studie II





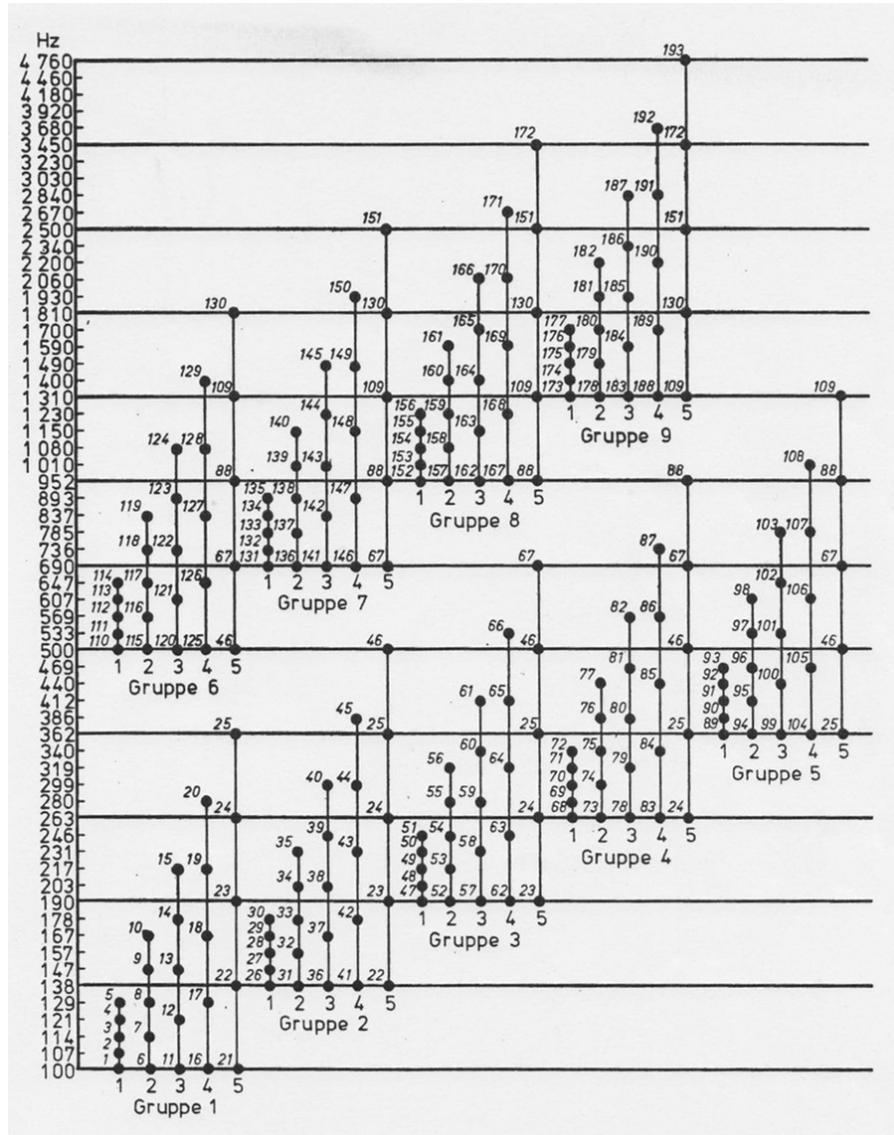
Material I: series / number squares

3 5 1 4 2

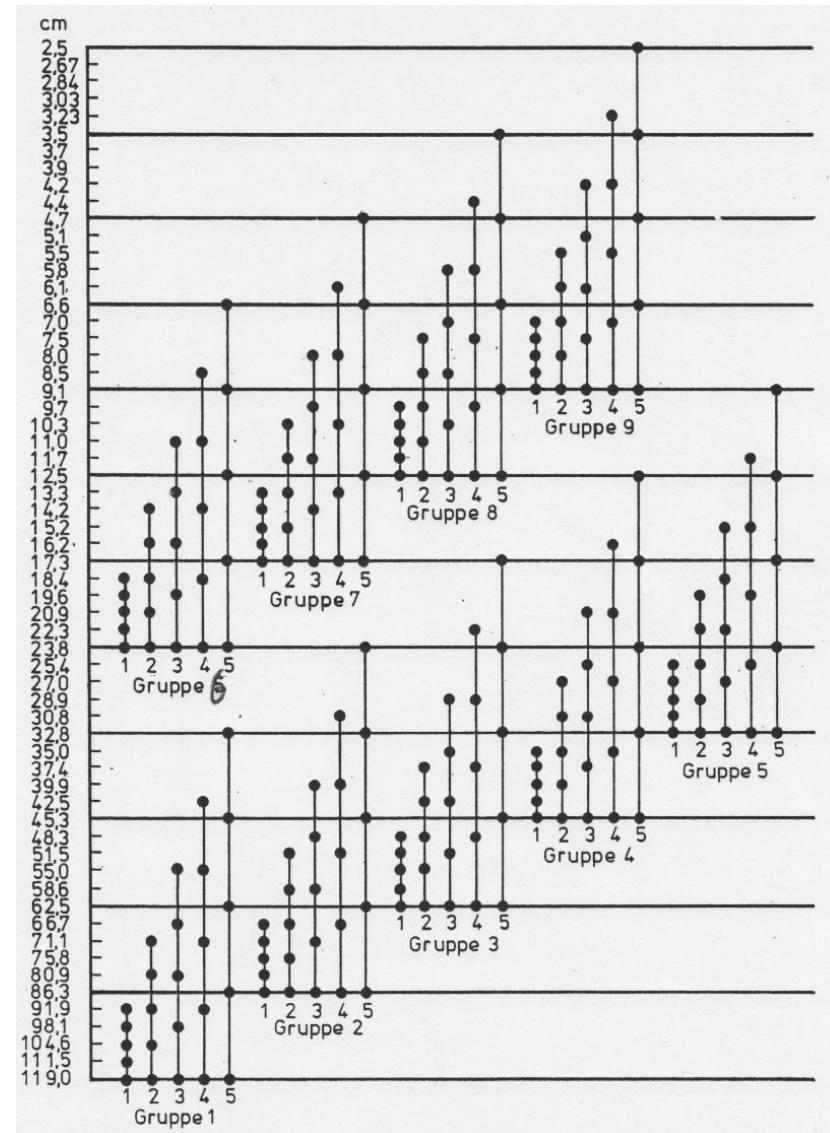


3 5 1 4 2	5 2 3 1 4	1 3 4 2 5	4 1 2 5 3	2 4 5 3 1
5 2 3 1 4	3 5 2 1 4	2 3 4 5 1	3 2 5 4 1	2 3 1 4 5
1 3 4 2 5	4 3 5 2 1	3 5 4 2 1	5 1 3 4 2	2 3 4 5 1
4 1 2 5 3	2 5 3 4 1	5 2 1 4 3	2 1 5 4 3	2 1 4 3 5
2 4 5 3 1	1 3 5 4 2	4 3 5 2 1	1 4 5 2 3	2 1 5 4 3
3 1 5 2 4	1 4 3 5 2	5 3 2 4 1	2 5 4 1 3	4 2 1 3 5
1 4 3 5 2	3 1 4 5 2	4 3 2 1 5	3 4 1 2 5	4 3 5 2 1
5 3 2 4 1	2 3 1 4 5	3 1 2 4 5	1 5 3 2 4	4 3 2 1 5
2 5 4 1 3	4 1 3 2 5	1 4 5 2 3	4 5 1 2 3	4 5 2 3 1
4 2 1 3 5	5 3 1 2 4	2 3 1 4 5	5 2 1 4 3	4 5 1 2 3

Material II: tables for possible frequencies, durations, intensities



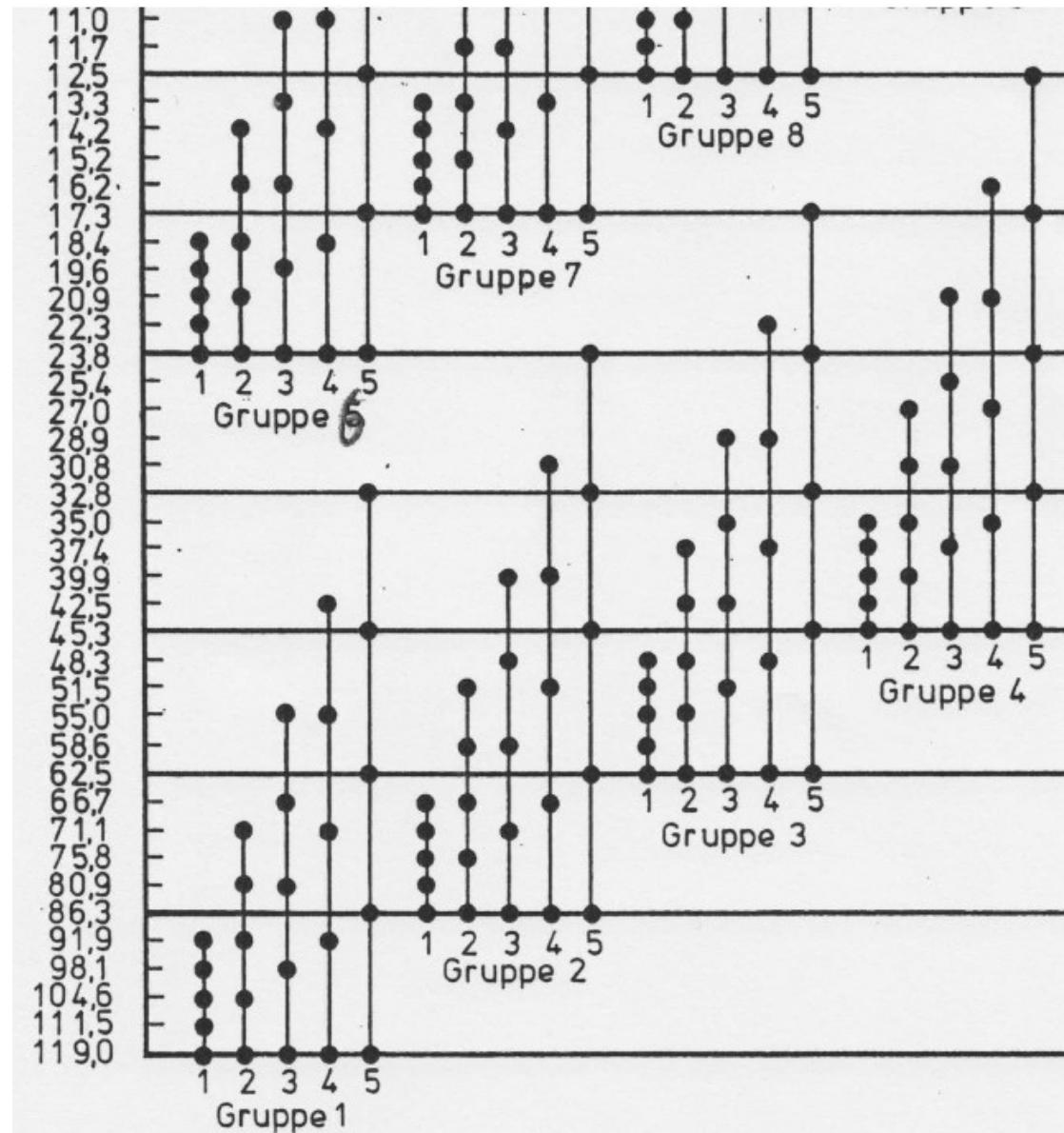
Re-Generating Studie II in Csound

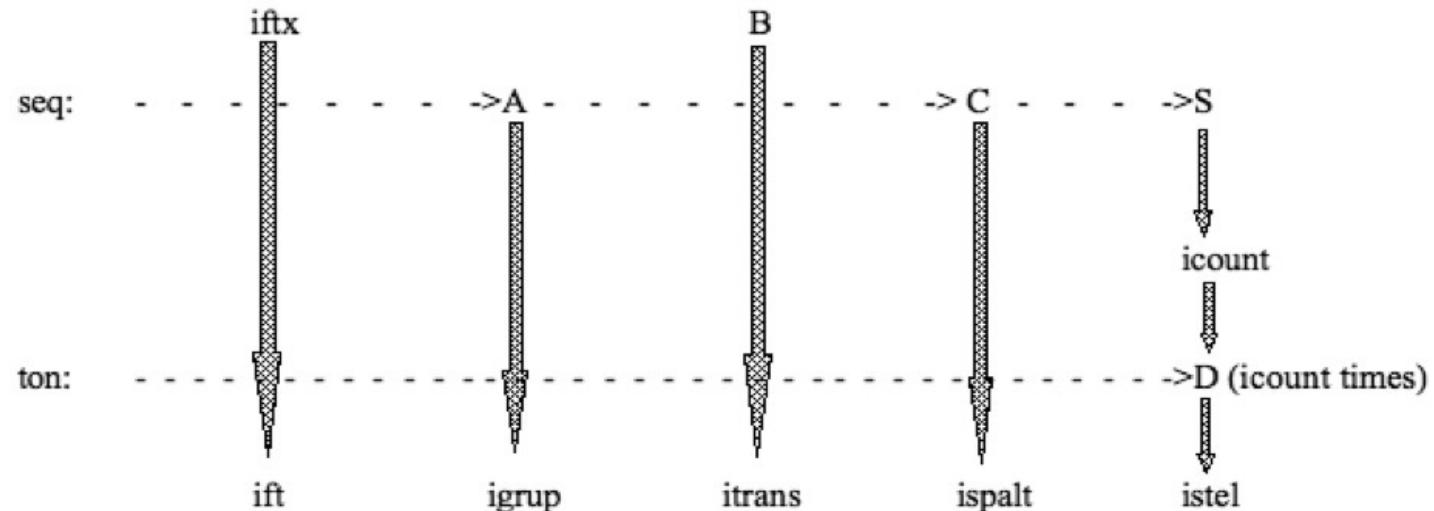




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h:	Resultat	Zeitdauern:	Resultat	Zeitdau
K.	Knr.	Tr. F. Br. D.	cum	Tr. F. B.
3	67	1 1 4 1	119,2	4
5	109	1 3	71,1	4
1	136	3 1 4	51,5	1
4	139	2	58,6	
2	137	5	48,3	
5	140	2	58,6	
2	58	4 2 3	35	2
3	59	4	30,8	
1	57	5	27,05	
4	60	1	45,3	
1	57	3	35	
3	112	2 5 5	23,8	5
4	113	4	32,85	
3	111	2	62,5	
5	87	5 3 1	32,85	3
4	144	2 3 5	39,85	3
1	101	2	24	





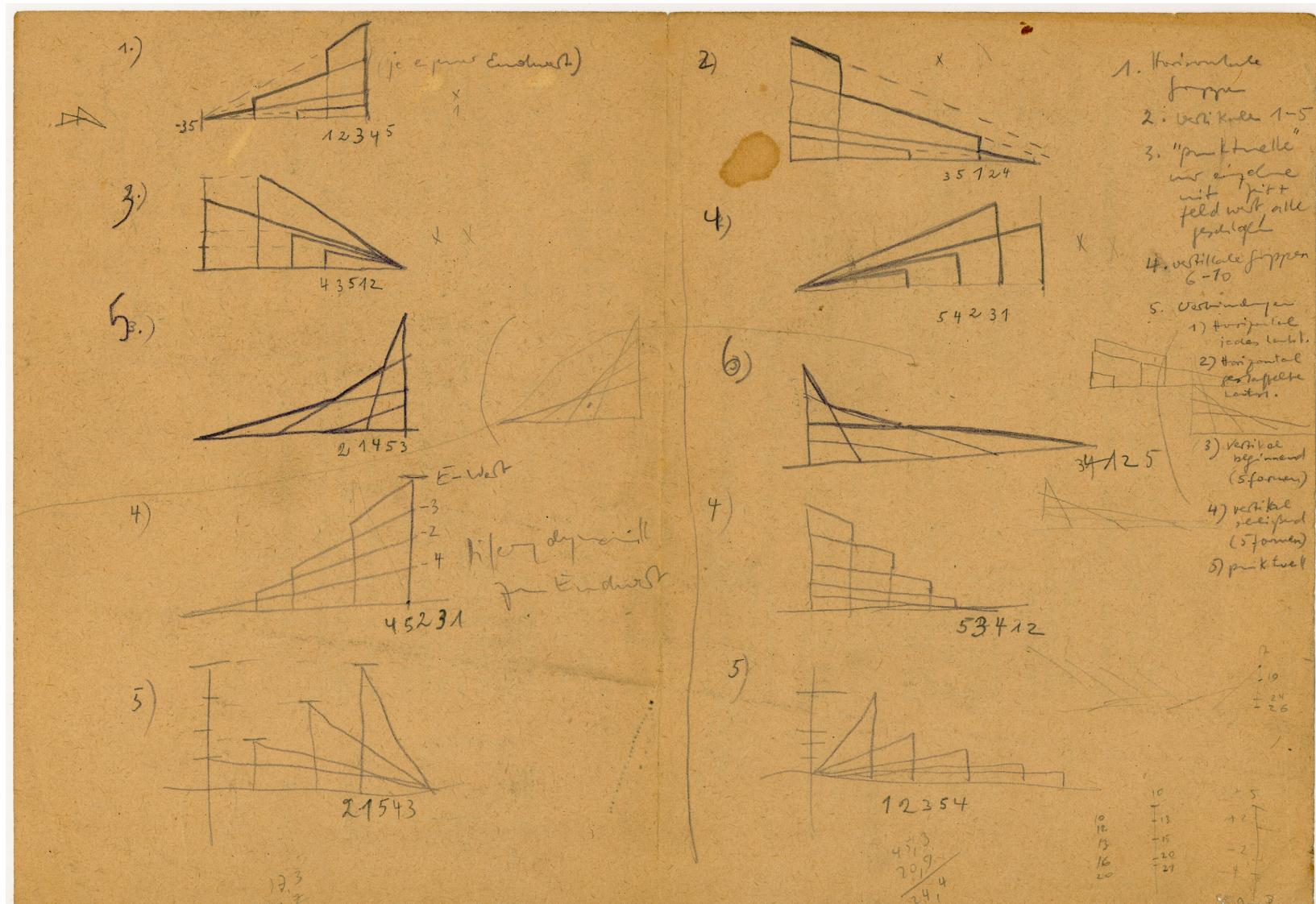
In Csound Code:

```

indxcount      =          0
indxtonabs    =          0
seq:
icount        tab_i      indxcount, iftcount
igrup         tab_i      indxcount, iftgrup
ispalt        tab_i      indxcount, iftspalt
indxton       =
ton:
istel         tab_i      indxtonabs, iftstel
ival          SS2_ValsAusGTSS
tabw_i
indxtonabs   =
loop_lt
loop_lt

```

indxtonabs, iftbas, igrup, itrans, ispalt, istel
ival, indxtonabs, iftout
indxtonabs + 1
indxton, 1, icount, ton
indxcount, 1, ftlen(iftcount), seq



Stockhausen early sketch for envelopes. © Archiv der Stockhausen Stiftung



Small errors („Versehen“) listed in the work of Heinz Silberhorn (Die Reihentechnik in Stockhausens Studie II, 1980)

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Dauern in Teil I

Seite der Partitur	Struktur	Gruppe	Transpositions- interval	transponierte Gruppe	Spalte	Stelle	Dauer in cm	Zeiteinheit von - bis		
									1	2
									1	2
1	A	R3:1	1	1	1	R4:4	R3:1	119,0	1 - 3	
			1	1	1	4	3	71,0	4 - 5	
			3	1	3	1	4	51,5	2	
			3	1	3	1	2	58,6	3 - 4	
			3	1	3	1	5	48,3	5 - 6	
			3	1	3	1	2	58,6	7	
			4	1	4	2	3	35,0	9	
			4	1	4	2	4	30,8	10	
			4	1	4	2	5	27,0	11	
			4	1	4	2	1	45,3	1	
			4	1	4	2	3	35,0	2	
2			2	1	2	5	5	22,8	4	
			2	1	2	5	4	32,8	5	
			2	1	2	5	2	62,5	62,1	6 - 8
			5	1	5	3	1	22,8	7	
	B		2	1	2	3	5	39,8	9	
			2	1	2	3	2	71,1	10	
3			3	1	3	2	1	62,5	1	
			3	1	3	2	4	42,5	2	
			3	1	3	2	3	48,3	3 - 4	
			4	1	4	5	4	17,2	4 - 5	
			5	1	5	4	3	19,6	7	
			5	1	5	4	5	11,7	8	
			5	1	5	4	2	25,4	9	
			5	1	5	4	1	32,8	10	
			1	1	1	1	R4:4	98,1	12	
			1	1	1	1	1	119,0	13	
4			1	1	1	1	2	111,5	1	
			1	1	1	1	5	91,9	2	
			1	1	1	1	3	104,6	3	

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	1	2	3	4	5	6	7	8	9
C	3	1	3	5	3	32,8	4		
	3	1	3	5	2	45,3	5 - 7		
	5	1	5	1	5	25,4	6		
	5	1	5	1	4	27,0	7 - 8		
5	1	5	1	1	1	32,8	9		
	4	1	4	3	5	20,9	2		
	4	1	4	3	1	45,3	3		
	4	1	4	3	3	30,8	4		
	4	1	4	3	4	25,4	5		
	2	1	2	4	2	66,7	7		
	2	1	2	4	2	66,8	8		
	2	1	2	4	1	86,1	9 - 10		
	2	1	2	4	5	30,8	11 - 12		
	2	1	2	4	4	35,8	9 - 15		
	1	1	1	2	3	92,0	131,0	5,6	
						10	1		
D	5	1	5	2	1			5,5	
	5	1	5	2	4	22,3	13		
6	2	1	2	1	5	66,7	3 - 4		
	1	1	1	5	2	86,3	4 - 5		
	1	1	1	5	3	62,5	6 - 9		
	1	1	1	5	2	86,2	12 - 14		
	1	1	1	5	45	45,3	329	13	
	4	1	4	4	5	16,2	7		
	4	1	4	4	3	27,0	8		
	4	1	4	4	1	45,3	9 - 10		
	3	1	3	3	2	51,5	12 - 13		
	3	1	3	3	3	42,3	14 - 15		
	3	1	3	3	1	62,6	16		
	3	1	3	3	4	35,0	17		
7	3	1	3	3	5	28,9	1		
E	4	1	4	1	2	42,3	3		
	4	1	4	1	3	39,8	4		
	3	1	3	4	4	28,9	6 - 8		
	5	1	5	5	5	9,1	7		
	5	1	5	5	1	32,9	8 - 9		
	5	1	5	5	2	23,8	10		
	5	1	5	5	1	32,8	11		
	5	1	5	5	4	12,5	12		
8	2	1	2	2	3	66,7	14		
	2	1	2	2	5	51,5	1		
	2	1	2	2	2	75,8	2		
	2	1	2	2	1	86,2	3 - 4		
	1	1	1	3	5	55,0	4 - 5		
	1	1	1	3	4	66,7	6		
	1	1	1	3	3	80,8	7 - 11		



Stockhausen working sheet for part five of Studie II
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1	2	1	1	110	M	3	3	1	32,9	50	3	15	3	17,3	1	13	2	8	
5	1	4	5	6	108	2	2	3	4	18,4	2	3	12	22,3	4	2	4	19	
2	2	2	4	2	4	1	3	2,9			4	19,6			1	10	2	1	
1	14	3	3	64	4	2	2	27			5	18,4	3	7	17	17	1	1	
7	1	16	1	1	16	5	5	15,2			3	20,9	wechselt	5	12	12	17	(+5d)	
4	4	86	v	3	3	3	22	3		1	23,8	wie Takt	3	24	5	5	5	5	
2	3	1	3	91	v	5	4	5	3	9,1	-	5	4	2	9,7	1	4	3	13
5	5	135	v	2	5	2	12	5			3	7,4	5	2	4	7			
3	4	2	2	95	v	1	4	5	1	9,7	-	1	3	1	45,3	2	5	10	8
1	1	73	v	4	4	4	10	3			4	25,4	5	0	4	20	9	v	
4	4	139	v	3	7	7	12	5			5	20,9	4	1	0	10			
2	5	4	88	v	2	4	3	4	5	8,5	-	4	5	2	12,5	5	3	5	11
4	5	3	3	143	v	1	2	1	45	3	-	2	2	3	25,4	3	7	15	12
5	5	182	v	3	3	3	35				-	4	22,3	5	17	3	17	13	
2	2	121	v	4	4	4	30	8			-	5	18,6	0	1	4	23	14	
7	99	v	3	7	2	39	9				-	1	32,9	1	2	11	15		
3	2	58	v	2	5	2	23	8			-	5	3	2	10,3	3	2	92	16
5	5	124	v	3	3	7	32	9			-	1	12,5	2	1	15	17		
3	80	v	5	9							-	4	7	5	17	18			
5	3	2	4	118	v	4	3	2	4	16,2	-	2	1	3	28,9	2	3	24	19
1	52	v	4	3	3	3	18	4			-	5	25,4	5	16	3	16	20	
24	74	v	2	1	23	8				-	-	2	30,8	1	0	1	0	21	
3	96	v	4	4	4	16	1			-	-	1	32,8	2	4	8	22		
5	140	v	5	14	21	1	14,2			-	-	4	8	5	18	23			
2	4	5	4	130	v	2	1	3	4	11	-	5	14	2	21	21	24		
2	2	46	v	3	3	3	30	8			-	3	14,2	3	23	23	25		
1	5	4	1	104	v	2	2	4	16,2		-	1	5	3	23,8	4	4	19	26
4	7	1	3	49	v	5	4	4	5,8		-	4	2	5	10,3	7	5	25	27
4	77	v	5	5	5	5	4,4			-	-	1	17,3	5	15	15	18		
2	27	v	3	3	7	5				-	-	4	11,2	3	15	15	29		
5	93	v	1	1	12,5					-	-	2	15,1	1	1	+5	30		
4	3	5	2	25	v	1	2	1	2	30,8	-	1	2	5	27	5	2	22	31
3	67	v	3	3	28	18				-	-	2	39,9	3	21	21	32		
4	109	v	1	1	32	9				-	-	3	3,5	1	15	15	33		
5	151	v	4	4	27	1	1	45,3			-	-	4	14	4	14	34		
3	5	1	7	89	v	1	5	3	3	5,1	-	3	3	4	13,3	1	3	5	23
3	133	v	2	2	19	6				-	-	1	23,8	2	3	3	36		
5	177	v	3	3	16	21				-	-	3	16,2	3	8	8	37		
5	4	3	4	144	v	4	4	4	8,9		-	4	1	4	14,2	3	4	4	18
2	100	v	3	3	5	6,1				-	-	2	16,2	5	9	9	39		

Stockhausen working sheet for part three of Studie II
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Three ways of working in Studie II

Applying the base
rules (part 1)

	Tonhöhen:				Resultat,	Zeitdauer			
	6	Tr.	F.	Br.	K.	Wnr.	Tr.	F.	Br.
<i>S₁</i>	2	3	5	3	3	67	1	1	4
					5	109			
	4	5	2	1	1	136		3	1
					4	139			
			2	1	137				
				5	140				
<i>S₂</i>	5	1	3	2	58		4	2	
				3	59				
			1	57					
			4	60					
			1	57					
<i>S₃</i>	3	4	1	3	112		2	5	
			4	113					
			3	111					
	1	2	4	5	87		5	3	
	2	5	3	4	144	v	2	3	

Re-Generating Studie II in Csound

Changing some rules, but
they remain rules (part 3)

1	2	1	1	110	M	3	3
5	1	4	5	5/5 108	2	2	3
			2	2 42			
			3	3 64	4		
			1	1 16	2		
			4	4 86	3		
1	14						
2	3	1	3	91	5	45	
			5	135	4		
3	4	2	2	95	4	51	
			1	73	3		
			4	139	3		
1	2	5	4	88	4	34	
4	5	3	3	143	3	12	
			5	182	3		
			2	121	2		
			7	99	3		
3	2	3	2	58	3	25	
			5	124	3		
			3	80	3		
5	3	2	4	118	2	32	

Breaking the program-
mability by spontaneous
decisions (part 5)

-17	✓
-13	
-12	
-10	5
21	
11	v
13	
21	
22	
25	
21	24
25	23
16	
13	
9	11
23	
15	
3	117,9
20	20
25	25
5	5

-12: Dynamik gleichmäßig
 -10: Tr. f. fix, Tonh. f. fix
 21: Tonh. wert variat
 11: wert. w. variant
 13: var. Th. var.
 13: lauf. var. relat.
 21: lauf.
 22: Tonh. variant
 25: lauf. i. dy. nicht variant
 21: 24
 25: 23
 16: vertikal
 13: Tonh. var.
 9: 11/32,3
 23: vertikal
 15: Tonh. variant, lauf. ind.
 3: 117,9/156,2
 20: Punkttrall
 25: 159
 5: vertikal



Links

QuteCsound:

<http://sourceforge.net/projects/qutecsound>

(Re-Generation: Examples → Music)

Version without widgets (english and german):

www.joachimheintz.de

(→ Software)