

EXTENDED SKEW

Introduction

I previously mentioned that what many users seemed to want was not a source of random numbers, but a source of skewed random numbers. What I did not count on was the desire to have relatively large sequences of skewed, pseudo-random numbers. This immediately poses two problems. First, the DVD specification does not provide for more than 99 movies.

That establishes a maximum for the number of clips which can be selected. Of course, this number can be augmented by adding menus or other items to the total mix.

But another problem surfaces. The computer emulated in DVD players does not provide any memory for the storage of variable values other than registers. The best we seem to be able to do is keep track of the clips which have been shown by setting a bit "on" (==1) if the clip has been shown, or "off" (==0) if the clip has not been shown. Since each register contains 16 bits, the 99 movie maximum can be accommodated by using 7 registers to keep up with this. That allows for 112 clips, menus, or mixture of items to be selected.

Since the original algorithm used 3 registers (GPRM0, GPRM1, and GPRM2), a total of ten registers will be needed. Yes, if someone wants to have fewer choices, fewer registers could be used. I have taken a slightly different approach, which will allow the algorithm to be used for different numbers of choices by initializing it differently. This will be discussed in greater detail later.

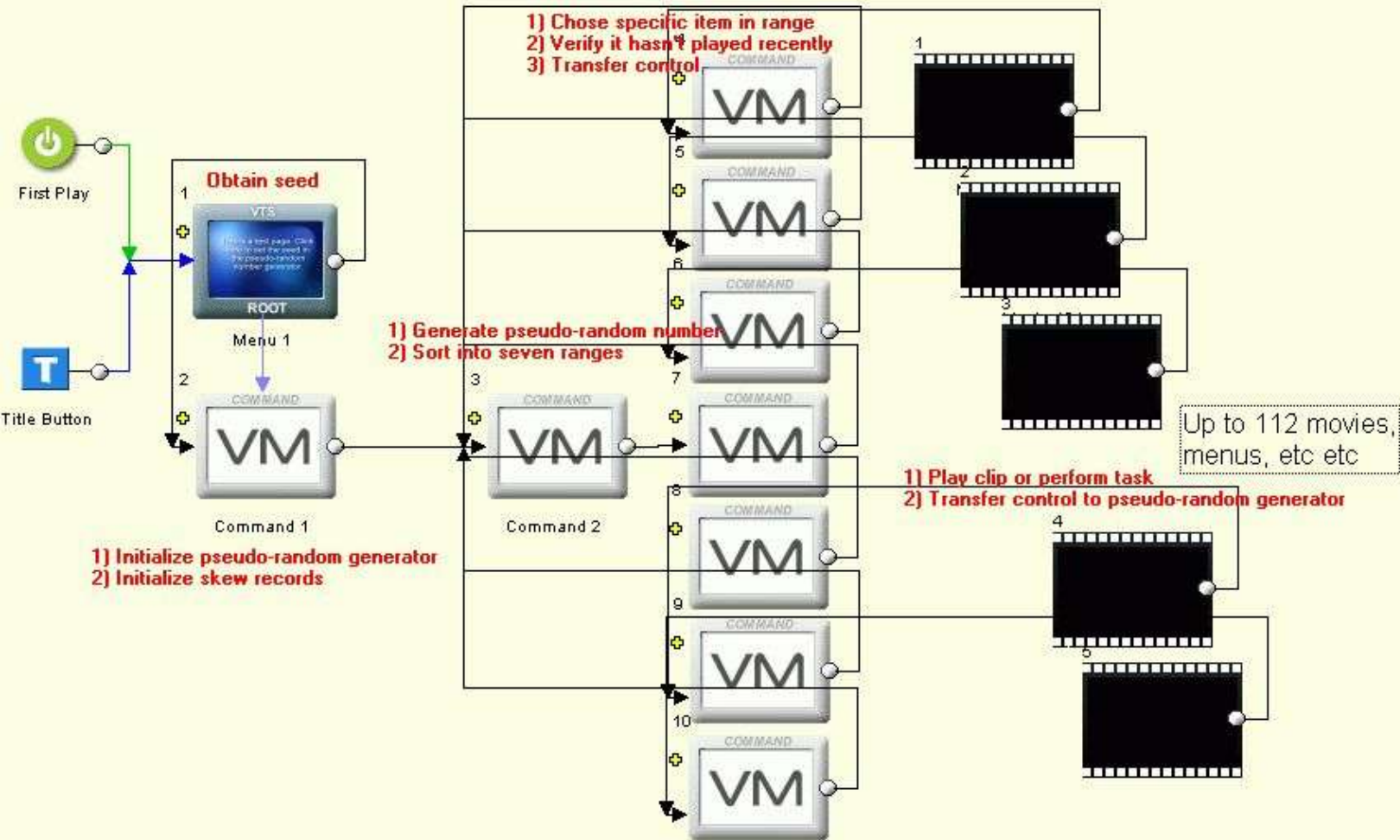
Yet another problem, which again is a limitation of the computer being simulated, is the number of instructions which can be put in any entity. This number is something less than a hundred, which is further reduced by the instructions already generated by programs such as DVD Lab (don't get me wrong, those additional instructions are necessary!) However, by the time the necessary logic is added, selecting a specific clip takes five instructions. That's in addition to generating the pseudo-random number, and checking for certain other conditions. That puts doing a skewed, pseudo-random clip selection at well over 500 instructions (I know – I coded it that way initially).

The fix was to split the code up into sections. That's a bit awkward, but it's probably necessary.

In summation, this algorithm will allow the user to adapt it for up to 112 skewed pseudo-random choices. But it will use most of the available registers in doing this, and the code is split into more sections than one might like.

Implementation

Most of the algorithm should be familiar to users of the previous algorithms. The same method is used to obtain a seed, and to generate the pseudo-random number. What's different is the process by which the algorithm keeps up with which numbers have already been generated. Here's an overview:

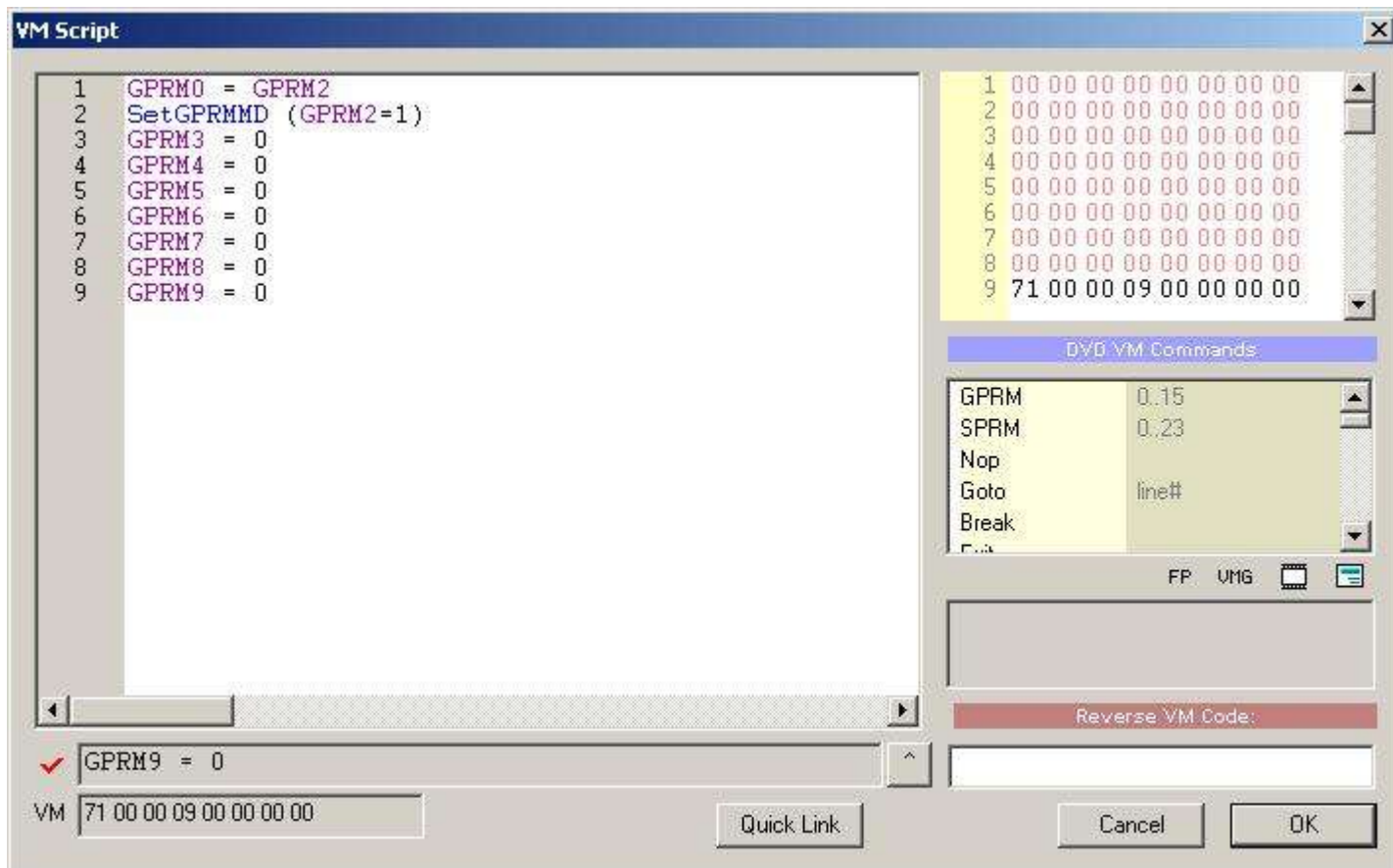
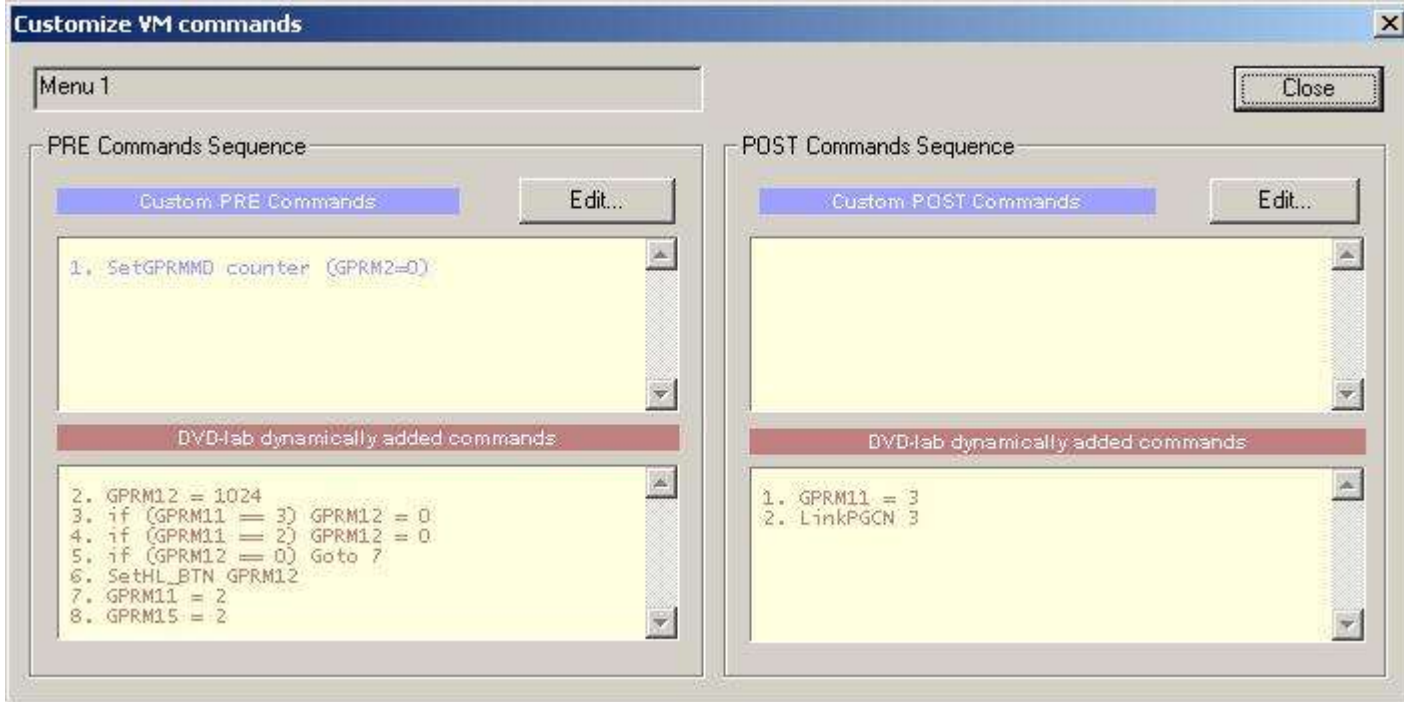


I'm going to show the code for all 112 clips. I will show branches to NOPs, which can be replaced by the actual clips you use. The simplest way to implement the code verbatim, and replace the NOPs as required. But if you wish, you can delete the portions of the code you don't need. More about this later.

Seed

The seed is obtained in the same way as for the previous algorithms.

However, when the seed is transferred to GPRM0, some additional initialization in command 1 is required for GPRM3-GPRM9, which are used to keep track of which clips have played.



Command 2 still contains the random number generator, and keeps track of whether or not all clips have been played. This is a more complex branching task, since all seven registers must be checked for an all “1’s” condition. If so, then GPRM3-GPRM9 must be reset.

This is where things begin to get messy. If the scaled pseudo-random number is not used for branching, the corresponding bit must be set at this point (and in the initialization of command 1) to “1.” Otherwise, it must be set to zero. Nasty, nasty. I strongly recommend that you make a table like the one below to keep track of which scaled pseudo random number causes which clip to play, and which bit must be set as a result.

Scaled Random Number	Pseudo-clip or object	Associated clip or object	Register tracking usage	Bit in register	Numeric Equivalent
0	TT1	TT1	GPRM3	0000000000000001	1
1	TT2	TT2	GPRM3	0000000000000010	2
2	NOP	NOP	GPRM3	0000000000000100	4
3	TT4	TT4	GPRM3	0000000000001000	8
4	TT5	TT5	GPRM3	0000000000010000	16
5	TT6	TT6	GPRM3	0000000000100000	32
6	TT7	TT7	GPRM3	0000000001000000	64
7	TT8	TT8	GPRM3	0000000010000000	128
8	TT9	TT9	GPRM3	0000000100000000	256
9	TT10	TT10	GPRM3	0000001000000000	512
10	TT11	TT11	GPRM3	0000010000000000	1024
11	NOP	NOP	GPRM3	0000100000000000	2048
12	NOP	NOP	GPRM3	0001000000000000	4096
13	NOP	NOP	GPRM3	0010000000000000	8192
14	NOP	NOP	GPRM3	0100000000000000	16384
15	NOP	NOP	GPRM3	1000000000000000	32768
16	TT12	TT12	GPRM4	0000000000000001	1
17	TT13	TT13	GPRM4	0000000000000010	2
18	TT14	TT14	GPRM4	0000000000000100	4
19	TT15	TT15	GPRM4	0000000000001000	8
20	PGCN21	PGCN21	GPRM4	0000000000010000	16
21	PGCN22	PGCN22	GPRM4	0000000000100000	32
22	PGCN23	PGCN23	GPRM4	0000000001000000	64
23	PGCN24	PGCN24	GPRM4	0000000010000000	128

24	TT16	GPRM4	0000000100000000	256
25	TT17	GPRM4	0000001000000000	512
26	TT18	GPRM4	0000010000000000	1024
27	TT19	GPRM4	0000100000000000	2048
28	TT20	GPRM4	0001000000000000	4096
29	TT21	GPRM4	0010000000000000	8192
30	TT22	GPRM4	0100000000000000	16384
31	TT23	GPRM4	1000000000000000	32768
32	TT24	GPRM5	0000000000000001	1
33	TT25	GPRM5	0000000000000010	2
34	PGCN25	GPRM5	0000000000000100	4
35	PGCN26	GPRM5	0000000000001000	8
36	PGCN27	GPRM5	0000000000010000	16
37	PGCN28	GPRM5	0000000000100000	32
38	PGCN29	GPRM5	0000000001000000	64
39	PGCN10	GPRM5	0000000010000000	128
40	TT26	GPRM5	0000000100000000	256
41	TT27	GPRM5	0000001000000000	512
42	TT28	GPRM5	0000010000000000	1024
43	TT29	GPRM5	0000100000000000	2048
44	TT30	GPRM5	0001000000000000	4096
45	TT31	GPRM5	0010000000000000	8192
46	TT32	GPRM5	0100000000000000	16384
47	TT33	GPRM5	1000000000000000	32768
48	TT34	GPRM6	0000000000000001	1
49	TT35	GPRM6	0000000000000010	2
50	TT36	GPRM6	0000000000000100	4
51	PGCN11	GPRM6	0000000000001000	8
52	PGCN12	GPRM6	0000000000010000	16
53	PGCN13	GPRM6	0000000000100000	32
54	PGCN14	GPRM6	0000000001000000	64
55	PGCN15	GPRM6	0000000010000000	128
56	TT37	GPRM6	0000000100000000	256
57	TT38	GPRM6	0000001000000000	512
58	TT39	GPRM6	0000010000000000	1024
59	TT40	GPRM6	0000100000000000	2048

60	TT41	GPRM6	0001000000000000	4096
61	TT42	GPRM6	0010000000000000	8192
62	TT43	GPRM6	0100000000000000	16384
63	TT44	GPRM6	1000000000000000	32768
64	TT45	GPRM7	0000000000000001	1
65	TT46	GPRM7	0000000000000010	2
66	TT47	GPRM7	0000000000000100	4
67	TT48	GPRM7	0000000000001000	8
68	TT49	GPRM7	0000000000010000	16
69	TT50	GPRM7	0000000000100000	32
70	TT51	GPRM7	0000000001000000	64
71	TT52	GPRM7	0000000010000000	128
72	TT53	GPRM7	0000000100000000	256
73	TT54	GPRM7	0000001000000000	512
74	TT55	GPRM7	0000010000000000	1024
75	TT56	GPRM7	0000100000000000	2048
76	TT57	GPRM7	0001000000000000	4096
77	TT58	GPRM7	0010000000000000	8192
78	TT59	GPRM7	0100000000000000	16384
79	TT60	GPRM7	1000000000000000	32768
80	TT61	GPRM8	0000000000000001	1
81	TT62	GPRM8	0000000000000010	2
82	TT63	GPRM8	0000000000000100	4
83	TT64	GPRM8	0000000000001000	8
84	TT65	GPRM8	0000000000010000	16
85	TT66	GPRM8	0000000000100000	32
86	TT67	GPRM8	0000000001000000	64
87	TT68	GPRM8	0000000010000000	128
88	TT69	GPRM8	0000000100000000	256
89	TT70	GPRM8	0000001000000000	512
90	TT71	GPRM8	0000010000000000	1024
91	TT72	GPRM8	0000100000000000	2048
92	TT73	GPRM8	0001000000000000	4096
93	TT74	GPRM8	0010000000000000	8192
94	TT75	GPRM8	0100000000000000	16384
95	TT76	GPRM8	1000000000000000	32768

96	TT77	GPRM9	0000000000000001	1
97	TT78	GPRM9	0000000000000010	2
98	TT79	GPRM9	0000000000000100	4
99	TT80	GPRM9	0000000000001000	8
100	TT81	GPRM9	0000000000010000	16
101	TT82	GPRM9	0000000000100000	32
102	TT83	GPRM9	0000000001000000	64
103	TT84	GPRM9	0000000010000000	128
104	TT85	GPRM9	0000000100000000	256
105	TT86	GPRM9	0000001000000000	512
106	TT87	GPRM9	0000010000000000	1024
107	TT88	GPRM9	0000100000000000	2048
108	TT89	GPRM9	0001000000000000	4096
109	TT90	GPRM9	0010000000000000	8192
110	TT91	GPRM9	0100000000000000	16384
111	TT92	GPRM9	1000000000000000	32768

All well and good, you may say, but I don't want to use all 112 scaled pseudo-random numbers. What do I do with the those I don't use? Easy: First, preset the corresponding bit in the associated register to one. Second, insert the number of a valid clip, menu, or other object in the appropriate location in one of the commands 3 through 9.

Having a valid branch destination keeps things clean, but the clip will never play with the bit preset to "1."

In the table above, the right hand column is the numeric equivalent of the bit shown in the adjacent column. As the individual bits are set, the numeric value contained in the register will be the sum of the corresponding numbers in the right column.

Pseudo Random Generation and Initial Steering

The first check is to see if GPRM3 – GPRM9 contain all ones. If so, all clips have played. If so, all these registers are zeroed, and the selection process begins again. This happens in lines 1 through 12 of the code.

Lines 13 through 22 generate the pseudo-random number, and scale it into the range 0-111.

1	if (GPRM3 < 32767) Goto 13
2	if (GPRM4 < 32767) Goto 13
3	if (GPRM5 < 32767) Goto 13
4	if (GPRM6 < 32767) Goto 13
5	if (GPRM7 < 32767) Goto 13
6	if (GPRM8 < 32767) Goto 13
7	GPRM3 = 0
8	GPRM4 = 0
9	GPRM5 = 0
10	GPRM6 = 0
11	GPRM7 = 0
12	GPRM8 = 0
13	GPRM0 &= 2047
14	if (GPRM0 > 2046) GPRM0 = 2046
15	if (GPRM0 < 1) GPRM0 = 2046
16	GPRM1 = GPRM0
17	GPRM1 &= 17
18	if (GPRM1 == 1) GPRM0 += 2048
19	if (GPRM1 == 16) GPRM0 += 2048
20	GPRM0 /= 2
21	GPRM1 = GPRM0
22	GPRM1 %= 112
23	if (GPRM1 < 16) Goto 30
24	if (GPRM1 < 32) Goto 31
25	if (GPRM1 < 48) Goto 32
26	if (GPRM1 < 64) Goto 33
27	if (GPRM1 < 80) Goto 34
28	if (GPRM1 < 96) Goto 35
29	LinkPGCN 11
30	LinkPGCN 5
31	LinkPGCN 6
32	LinkPGCN 7
33	LinkPGCN 8
34	LinkPGCN 9
35	LinkPGCN 10

Lines 23 through 35 presort the scaled pseudo-random number into seven ranges. This is the result of the limitation on the number of lines of code which a command module can contain. I decided to have one range for each of the seven registers (GPRM3-GPRM9) used to keep track of the clips played. This kept things reasonably clean.

Final Steering and Selection

There's a lot of repetition in this area, since not only is a lot of the code repeated in each command module, the command modules are repeated 7 times. Lines 1 through 16 sort the scaled pseudo-random numbers, steering them to the correct location. Lines 16 through 80 check to see if the appropriate clip has been played, link back to command 2 (PGCN4) if it has. If not, the bit corresponding to the clip is set, and the clip plays.

The code for scaled pseudo-random numbers 0-15 is shown below:

1	GPRM2 = GPRM3
2	if (GPRM1 < 1) Goto 21
3	if (GPRM1 < 2) Goto 25
4	if (GPRM1 < 3) Goto 29
5	if (GPRM1 < 4) Goto 33
6	if (GPRM1 < 5) Goto 37
7	if (GPRM1 < 6) Goto 41
8	if (GPRM1 < 7) Goto 45
9	if (GPRM1 < 8) Goto 49
10	if (GPRM1 < 9) Goto 53
11	if (GPRM1 < 10) Goto 57
12	if (GPRM1 < 11) Goto 61
13	if (GPRM1 < 12) Goto 65
14	if (GPRM1 < 13) Goto 69
15	if (GPRM1 < 14) Goto 73
16	if (GPRM1 < 15) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM3 += 32768
20	JumpVTS_TT 1
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM3 += 1
24	JumpVTS_TT 2
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM3 += 2
28	JumpVTS_TT 3
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4

31	GPRM3 += 4
32	JumpVTS_ TT 4
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM3 += 8
36	JumpVTS_ TT 5
37	GPRM2 &= 16
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM3 += 16
40	JumpVTS_ TT 6
41	GPRM2 &= 32
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM3 += 32
44	JumpVTS_ TT 7
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM3 += 64
48	JumpVTS_ TT 8
49	GPRM2 &= 128
50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM3 += 128
52	JumpVTS_ TT 9
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM3 += 256
56	JumpVTS_ TT 10
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM3 += 512
60	JumpVTS_ TT 11
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM3 += 1024
64	JumpVTS_ TT 12
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM3 += 2048
68	JumpVTS_ TT 13
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM3 += 4096
72	JumpVTS_ TT 14
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM3 += 8192
76	JumpVTS_ TT 15
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM3 += 16384
80	JumpVTS_ TT 16

And, for the range 16-31:

1	GPRM2 = GPRM4
2	if (GPRM1 < 17) Goto 21
3	if (GPRM1 < 18) Goto 25
4	if (GPRM1 < 19) Goto 29
5	if (GPRM1 < 20) Goto 33
6	if (GPRM1 < 21) Goto 37
7	if (GPRM1 < 22) Goto 41
8	if (GPRM1 < 23) Goto 45
9	if (GPRM1 < 24) Goto 49
10	if (GPRM1 < 25) Goto 53
11	if (GPRM1 < 26) Goto 57
12	if (GPRM1 < 27) Goto 61
13	if (GPRM1 < 28) Goto 65
14	if (GPRM1 < 29) Goto 69
15	if (GPRM1 < 30) Goto 73
16	if (GPRM1 < 31) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM4 += 32768
20	JumpVTS_TT 32
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM4 += 1
24	JumpVTS_TT 17
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM4 += 2
28	JumpVTS_TT 18
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4
31	GPRM4 += 4
32	JumpVTS_TT 19
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM4 += 8
36	JumpVTS_TT 20
37	GPRM2 &= 16
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM4 += 16
40	JumpVTS_TT 21
41	GPRM2 &= 32
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM4 += 32
44	JumpVTS_TT 22
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM4 += 64
48	JumpVTS_TT 23
49	GPRM2 &= 128

50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM4 += 128
52	JumpVTS_TT 24
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM4 += 256
56	JumpVTS_TT 25
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM4 += 512
60	JumpVTS_TT 26
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM4 += 1024
64	JumpVTS_TT 27
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM4 += 2048
68	JumpVTS_TT 28
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM4 += 4096
72	JumpVTS_TT 29
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM4 += 8192
76	JumpVTS_TT 30
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM4 += 16384
80	JumpVTS TT 31

For 32-47:

1	GPRM2 = GPRM5
2	if (GPRM1 < 33) Goto 21
3	if (GPRM1 < 34) Goto 25
4	if (GPRM1 < 35) Goto 29
5	if (GPRM1 < 36) Goto 33
6	if (GPRM1 < 37) Goto 37
7	if (GPRM1 < 38) Goto 41
8	if (GPRM1 < 39) Goto 45
9	if (GPRM1 < 40) Goto 49
10	if (GPRM1 < 41) Goto 53
11	if (GPRM1 < 42) Goto 57
12	if (GPRM1 < 43) Goto 61
13	if (GPRM1 < 44) Goto 65
14	if (GPRM1 < 45) Goto 69
15	if (GPRM1 < 46) Goto 73
16	if (GPRM1 < 48) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM5 += 32768
20	JumpVTS_TT 48
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM5 += 1
24	JumpVTS_TT 33
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM5 += 2
28	JumpVTS_TT 34
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4
31	GPRM9 += 4
32	JumpVTS_TT 35
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM5 += 8
36	JumpVTS_TT 36
37	GPRM2 &= 16
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM5 += 16
40	JumpVTS_TT 37
41	GPRM2 &= 32
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM5 += 32
44	JumpVTS_TT 38
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM5 += 64
48	JumpVTS_TT 39
49	GPRM2 &= 128

50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM5 += 128
52	JumpVTS_TT 40
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM5 += 256
56	JumpVTS_TT 41
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM5 += 512
60	JumpVTS_TT 42
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM5 += 1024
64	JumpVTS_TT 43
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM5 += 2048
68	JumpVTS_TT 44
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM5 += 4096
72	JumpVTS_TT 45
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM5 += 8192
76	JumpVTS_TT 46
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM5 += 16384
80	JumpVTS TT 47

For 48-63:

1	GPRM2 = GPRM6
2	if (GPRM1 < 49) Goto 21
3	if (GPRM1 < 50) Goto 25
4	if (GPRM1 < 51) Goto 29
5	if (GPRM1 < 52) Goto 33
6	if (GPRM1 < 53) Goto 37
7	if (GPRM1 < 54) Goto 41
8	if (GPRM1 < 55) Goto 45
9	if (GPRM1 < 56) Goto 49
10	if (GPRM1 < 57) Goto 53
11	if (GPRM1 < 58) Goto 57
12	if (GPRM1 < 59) Goto 61
13	if (GPRM1 < 60) Goto 65
14	if (GPRM1 < 61) Goto 69
15	if (GPRM1 < 62) Goto 73
16	if (GPRM1 < 63) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM6 += 32768
20	JumpVTS_TT 64
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM6 += 1
24	JumpVTS_TT 49
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM6 += 2
28	JumpVTS_TT 50
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4
31	GPRM6 += 4
32	JumpVTS_TT 51
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM6 += 8
36	JumpVTS_TT 52
37	GPRM2 &= 62
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM6 += 16
40	JumpVTS_TT 53
41	GPRM2 &= 63
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM6 += 32
44	JumpVTS_TT 54
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM6 += 64
48	JumpVTS_TT 55

49	GPRM2 &= 128
50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM6 += 128
52	JumpVTS_TT 56
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM6 += 256
56	JumpVTS_TT 57
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM6 += 512
60	JumpVTS_TT 58
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM6 += 1024
64	JumpVTS_TT 59
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM6 += 2048
68	JumpVTS_TT 60
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM6 += 4096
72	JumpVTS_TT 61
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM6 += 8192
76	JumpVTS_TT 62
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM6 += 16384
80	JumpVTS_TT 63

For 64-79:

1	GPRM2 = GPRM7
2	if (GPRM1 < 65) Goto 21
3	if (GPRM1 < 66) Goto 25
4	if (GPRM1 < 67) Goto 29
5	if (GPRM1 < 68) Goto 33
6	if (GPRM1 < 69) Goto 37
7	if (GPRM1 < 70) Goto 41
8	if (GPRM1 < 71) Goto 45
9	if (GPRM1 < 72) Goto 49
10	if (GPRM1 < 73) Goto 53
11	if (GPRM1 < 74) Goto 57
12	if (GPRM1 < 75) Goto 61
13	if (GPRM1 < 76) Goto 65
14	if (GPRM1 < 77) Goto 69
15	if (GPRM1 < 78) Goto 73
16	if (GPRM1 < 79) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM7 += 32768
20	JumpVTS_TT 80
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM7 += 1
24	JumpVTS_TT 65
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM7 += 2
28	JumpVTS_TT 66
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4
31	GPRM7 += 4
32	JumpVTS_TT 67
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM7 += 8
36	JumpVTS_TT 68
37	GPRM2 &= 16
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM7 += 16
40	JumpVTS_TT 69
41	GPRM2 &= 32
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM7 += 32
44	JumpVTS_TT 70
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM7 += 64
48	JumpVTS_TT 71

49	GPRM2 &= 128
50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM7 += 128
52	JumpVTS_TT 72
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM7 += 256
56	JumpVTS_TT 73
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM7 += 512
60	JumpVTS_TT 74
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM7 += 1024
64	JumpVTS_TT 75
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM7 += 2048
68	JumpVTS_TT 76
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM7 += 4096
72	JumpVTS_TT 77
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM7 += 8192
76	JumpVTS_TT 1
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM7 += 16384
80	JumpVTS_TT 79

For 80-95:

1	GPRM2 = GPRM8
2	if (GPRM1 < 81) Goto 21
3	if (GPRM1 < 82) Goto 25
4	if (GPRM1 < 83) Goto 29
5	if (GPRM1 < 84) Goto 33
6	if (GPRM1 < 85) Goto 37
7	if (GPRM1 < 86) Goto 41
8	if (GPRM1 < 87) Goto 45
9	if (GPRM1 < 88) Goto 49
10	if (GPRM1 < 89) Goto 53
11	if (GPRM1 < 90) Goto 57
12	if (GPRM1 < 91) Goto 61
13	if (GPRM1 < 92) Goto 65
14	if (GPRM1 < 93) Goto 69
15	if (GPRM1 < 94) Goto 73
16	if (GPRM1 < 95) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM8 += 32768
20	JumpVTS_TT 30
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM8 += 1
24	JumpVTS_TT 81
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM8 += 2
28	JumpVTS_TT 82
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4
31	GPRM8 += 4
32	JumpVTS_TT 83
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM8 += 8
36	JumpVTS_TT 84
37	GPRM2 &= 16
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM8 += 16
40	JumpVTS_TT 85
41	GPRM2 &= 32
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM8 += 32
44	JumpVTS_TT 86
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM8 += 64
48	JumpVTS_TT 87

49	GPRM2 &= 128
50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM8 += 128
52	JumpVTS_TT 88
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM8 += 256
56	JumpVTS_TT 89
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM8 += 512
60	JumpVTS_TT 20
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM8 += 1024
64	JumpVTS_TT 21
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM8 += 2048
68	JumpVTS_TT 19
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM8 += 4096
72	JumpVTS_TT 23
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM8 += 8192
76	JumpVTS_TT 24
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM8 += 16384
80	JumpVTS_TT 25

For 96 - 111

1	GPRM2 = GPRM9
2	if (GPRM1 < 97) Goto 21
3	if (GPRM1 < 98) Goto 25
4	if (GPRM1 < 99) Goto 29
5	if (GPRM1 < 100) Goto 33
6	if (GPRM1 < 101) Goto 37
7	if (GPRM1 < 102) Goto 41
8	if (GPRM1 < 103) Goto 45
9	if (GPRM1 < 104) Goto 49
10	if (GPRM1 < 105) Goto 53
11	if (GPRM1 < 106) Goto 57
12	if (GPRM1 < 107) Goto 61
13	if (GPRM1 < 108) Goto 65
14	if (GPRM1 < 109) Goto 69
15	if (GPRM1 < 110) Goto 73
16	if (GPRM1 < 111) Goto 77
17	GPRM2 &= 32767
18	if (GPRM2 > 0) LinkPGCN 4
19	GPRM9 += 32768
20	JumpVTS_TT 1
21	GPRM2 &= 1
22	if (GPRM2 > 0) LinkPGCN 4
23	GPRM9 += 1
24	JumpVTS_TT 1
25	GPRM2 &= 2
26	if (GPRM2 > 0) LinkPGCN 4
27	GPRM9 += 2
28	JumpVTS_TT 2
29	GPRM2 &= 4
30	if (GPRM2 > 0) LinkPGCN 4
31	GPRM9 += 4
32	JumpVTS_TT 3
33	GPRM2 &= 8
34	if (GPRM2 > 0) LinkPGCN 4
35	GPRM9 += 8
36	JumpVTS_TT 1
37	GPRM2 &= 16
38	if (GPRM2 > 0) LinkPGCN 4
39	GPRM9 += 16
40	JumpVTS_TT 2
41	GPRM2 &= 32
42	if (GPRM2 > 0) LinkPGCN 4
43	GPRM9 += 32
44	JumpVTS_TT 3
45	GPRM2 &= 64
46	if (GPRM2 > 0) LinkPGCN 4
47	GPRM9 += 64
48	JumpVTS_TT 4

49	GPRM2 &= 128
50	if (GPRM2 > 0) LinkPGCN 4
51	GPRM9 += 128
52	JumpVTS_TT 5
53	GPRM2 &= 256
54	if (GPRM2 > 0) LinkPGCN 4
55	GPRM9 += 256
56	JumpVTS_TT 6
57	GPRM2 &= 512
58	if (GPRM2 > 0) LinkPGCN 4
59	GPRM9 += 512
60	JumpVTS_TT 7
61	GPRM2 &= 1024
62	if (GPRM2 > 0) LinkPGCN 4
63	GPRM9 += 1024
64	JumpVTS_TT 8
65	GPRM2 &= 2048
66	if (GPRM2 > 0) LinkPGCN 4
67	GPRM9 += 2048
68	JumpVTS_TT 9
69	GPRM2 &= 4096
70	if (GPRM2 > 0) LinkPGCN 4
71	GPRM9 += 4096
72	JumpVTS_TT 10
73	GPRM2 &= 8192
74	if (GPRM2 > 0) LinkPGCN 4
75	GPRM9 += 8192
76	JumpVTS_TT 11
77	GPRM2 &= 16384
78	if (GPRM2 > 0) LinkPGCN 4
79	GPRM9 += 16384
80	JumpVTS_TT 12

...and there you have it! Please understand that this algorithm was developed as an exercise on my part. I have no requirement or interest at the present time in this level of randomness. :-) You should understand that the “JumpVTS_TT something-or-other” are for demonstration purposes only. You would need to replace the corresponding branch points for your purposes.

If enough interest exists, I will add a example on tailoring the algorithm for a smaller number of selections.