
Contents

Preface	iii
1 Computational models of music cognition	1
1.1 Introduction	1
1.2 Motivations and methods	1
1.3 Cognitive science	3
1.4 Music cognition	4
1.4.1 Representations	4
1.4.2 Algorithms	6
1.5 Examples	6
1.5.1 Grouping	7
1.5.2 Expectation	10
1.5.3 Key finding	13
1.6 Summary	15
1.7 Exercises	16
2 Interactive sound using Pure Data	17
2.1 Introduction	17
2.2 Equipment requirements	17
2.3 The Fundamentals of sound	17
2.3.1 Amplitude	18
2.3.2 Frequency	18
2.3.3 Phase	19
2.3.4 Musical sounds	19
2.4 Sound, music and computers	20
2.4.1 Sampling frequency	21
2.4.2 Aliasing	21
2.5 MIDI – Musical Instrument Digital Interface	22
2.6 Using Pure Data	22
2.6.1 Testing your system	23
2.6.2 Getting started	24
2.6.3 Edit mode	24
2.6.4 Number boxes	24
2.6.5 Messages	25
2.6.6 Objects	25
2.6.7 Storing and counting numbers	26
2.6.8 Using keyboard events	28
2.6.9 Getting MIDI events	29
2.6.10 Signal objects	29
2.6.11 Playing back sounds from disk	30
2.6.12 Lists and arrays	31
2.7 Sound synthesis	35
2.7.1 Oscillators and waveforms	36
2.7.2 Amplitude	37
2.7.3 Adding signals together	38
2.7.4 Multiplying signals together	42
2.7.5 Frequency modulation	44

2.7.6	Playing back sampled sound with line	47
2.7.7	Enveloping	48
2.7.8	Using the VCF object	49
3	Algorithmic composition: swarm music	51
3.1	Introduction	51
3.2	Swarms, music and improvisation	53
3.3	Project: MIDI synthesiser	55
3.3.1	Simple MIDI synthesiser	56
3.4	Rules of swarming	57
3.5	Project: vector maths	59
3.5.1	Simple vector maths	60
3.6	Project: particle animation	61
3.6.1	Particle applet	62
3.6.2	Particle	63
3.7	Project: swarm animation	63
3.7.1	Simple swarm	64
3.7.2	Simple swarm applet	65
3.8	Project: swarm music	66
3.9	Swarm music as a live algorithm	66
3.10	Project: interacting with swarm music	68
4	Understanding musical interaction	69
4.1	Introduction	69
4.2	Sound, music, score	70
4.3	Rhythm, beat and metre	71
4.3.1	Beat	71
4.3.2	Metre	72
4.4	Pitch and key	74
4.5	Musical grammar and style	75
4.5.1	Grammar	75
4.5.2	Style	76
4.6	Musical discourse	76
4.7	Exercises	77
4.8	Further reading	78
5	Music information retrieval	81
5.1	Introduction	81
5.2	Genre classification	82
5.3	Recommender systems	84
5.4	Musical document retrieval	85
5.4.1	Music identification	86
5.4.2	Content-based similarity search	88
5.5	Segmentation	89
5.6	Transcription	90
5.7	Summary and learning outcomes	91
A	Sample examination paper	93