Cellular Automaton Tool (CAT)

User Manual

Gesellschaft für Mathematik und Datenverarbeitung

Postfach 13 16

D - 53731 Sankt Augustin

Cellular Automaton Tool User Manual

Gesellschaft für Mathematik und Datenverarbeitung

Postfach 13 16

D - 53731 Sankt Augustin

Cellular Automaton Tool

Version 3.11.94

User Manual

Author:

Georg Jünger

(C) Copyright 1993, 1994 by GMD, Sankt Augustin

Table of Contents

µ1. Introduction 4

µ2. Quick Tour through CAT 5
2.1 Starting CAT 5
2.2 Loading and Compiling a Program 6
2.3 Executing and Controlling a Program 7
2.4 Editing a Program 9
2.5 Printing 10
2.6 Window Handling 11
2.7 Changing Properties and Appearance of the Cell Matrix 11
2.8 Using the Online Help System 14
2.9 Leaving CAT 15

µ3. Complete Overview of Windows, Menus, Buttons and Boxes 16
3.1 Windows 16
3.1.1. CAT Main Window 16
3.1.2. STATE Window 17
3.1.3. RECIPE Window 18
3.1.4. LIST Window 18
3.1.5. Plane Window (Starring .CAS File) 19
3.1.6. Palette Window (Starring .CAP File) 19
3.2 Menues 20
3.2.1. 'File' 20
3.2.2. 'Edit' 20
3.2.3. 'Search' 21
3.2.4. 'Window' 21
3.2.5. '?' (Help) 21
3.2.6. Menu Accessible via State Control Button 22
3.2.7. Menu Accessible via Palette Control Button 22
3.2.8. Menu Accessible via Menu Button 23
3.2.9. Local Menu Accessible via Right Mouse Key 23
3.2.10. Local Menu Accessible via Shift / Right Mouse Key 23
3.3 Buttons and Labels 24
3.3.1. Buttons and Labels Contained in the Main Window 24
3.3.2. Buttons and Labels Contained in the STATE Window 24
3.4 Dialog Boxes 25
3.4.1. 'Colors' Dialog Box 25
3.4.2. 'Assign Value' Dialog Box 26
3.4.3. 'Initialize States' Dialog Box 26
3.4.4. 'Initialize Palette' Dialog Box 27

4. CARP Instructions Reference Guide 28
µ
% 28
* 29
+ 29
- 29
:= 30
< 30
<= 30
<> 31
= 31
> 31
>= 32
AND 32
Any8Sum 32
BarrelForm 33
Beep 33
BEGIN ... END 34
Brake 34
Comments in a CARP program 34

Colors 35
CONST 35
DelBrushes 36
DIV 36
EVENT 36
Expressions 37
FOR ... TO ...BY ... DO ... OD 37
GetX 38
GetY 38
Identifiers 39
IF .. THEN .. ELSE .. FI 39
INV 39
MOD 40
MooreSum 40
NeumannSum 41
NOT 41
OddCell 42
OR 42
PARALLEL DO 42
ParallelMethod 43
PillowForm 43
PipeForm 44
PlClipActive 44
PlClipAll 44
PlClipXY 45
PlFillRandom 45
PlFillUni 45
PlFillUpStairs 46
PROC 46
Random 47
Randomize 47
RECIPE 48
REF 48
RePaint 49
REPEAT .. UNTIL 49
RGBBrush 50
RGBPalette 51
RingForm 51
Self 52
SetLattice 53
SheetForm 53
SHL 53
ShowCell 54
ShowKind 54
ShowPlane 55
SHR 55
Statement 56
VAR 57
WHILE ... DO ... OD 57
WinClipActive 57
WinClipXY 58
WinClipAll 58
WrDCaps 58
WRITE 59
WrMCaps 59
WrPPars 60
XOR 60
XYBound 61
XYSize 61
YSize 62
Zet 62

µAppendix A: Hardware and Software Requirements 63
Appendix B: Installation of CAT 63
Appendix C: Troubleshooting 63
Appendix D: Known Bugs 63
Appendix E: Runtime Message List 64

Appendix F: Compiler Error Message List 65

1. Introduction

The Cellular Automaton Tool (CAT) is a tool to build and visualize cellular automatons in an easy-to-use way. Its pascal-like language CARP (**C**ellul**ar** Automaton **P**rogramming Language) is a means to build cellular automatons of your own or to transfer samples from the literature[1].

As most intuitive approaches to a cellular automaton, CAT uses the so-called "STATE" window to show the state of each cell of a cellular automaton by a certain color. In most cases, changes of the model may easily be noticed by recognizing uprising patterns or changing colors. Apart from a representation in colors, the state of all cells can also be expressed in decimal or hexadecimal figures.

The high-level programming interface and the visualization capabilities of CAT should make it attractive to learn about the fascinating world of such models of the real world. Equally important, CAT may be taken as a tool to learn about the parallel computing paradigm. Each cell is then taken as a processor that works concurrently with all other cell processors.

Both beginners and experts in the field of cellular automatons should start with the "Quick Tour" and execute some sample programs. Later on, experts might continue with the CARP language description. He or she will soon grasp the power and facilities of this language. Beginners should continue by changing some sample programs. Then they may enhance the complexity of their programs and the set of used CARP instructions step by step.

1Introductions to the theory of cellular automatatons are T. Toffoli and N. Margolus; Cellular Automata Machines, London (MIT Press) 1988 and S. Wolfram, Universality and Complexity in Cellular Automata. In: Physica 10D (1984).