

Digital Design Tools

David Dalrymple

.fab

- Many representations
- One format

.fab 2.0

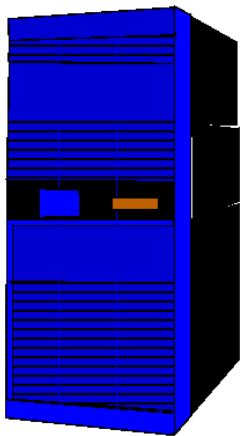
- Many functions
- One representation

Conformal Computing

- Atiny45 – small, cheap MIPS
- Put many together
- Lots of MIPS
- Roll-to-roll process
- Grid layout
- Programming a challenge

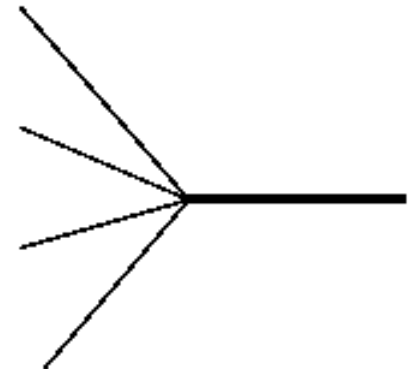
Parallelism

- Traditional Parallel Methods
- Server clusters
- Neural Networks
- Compromise



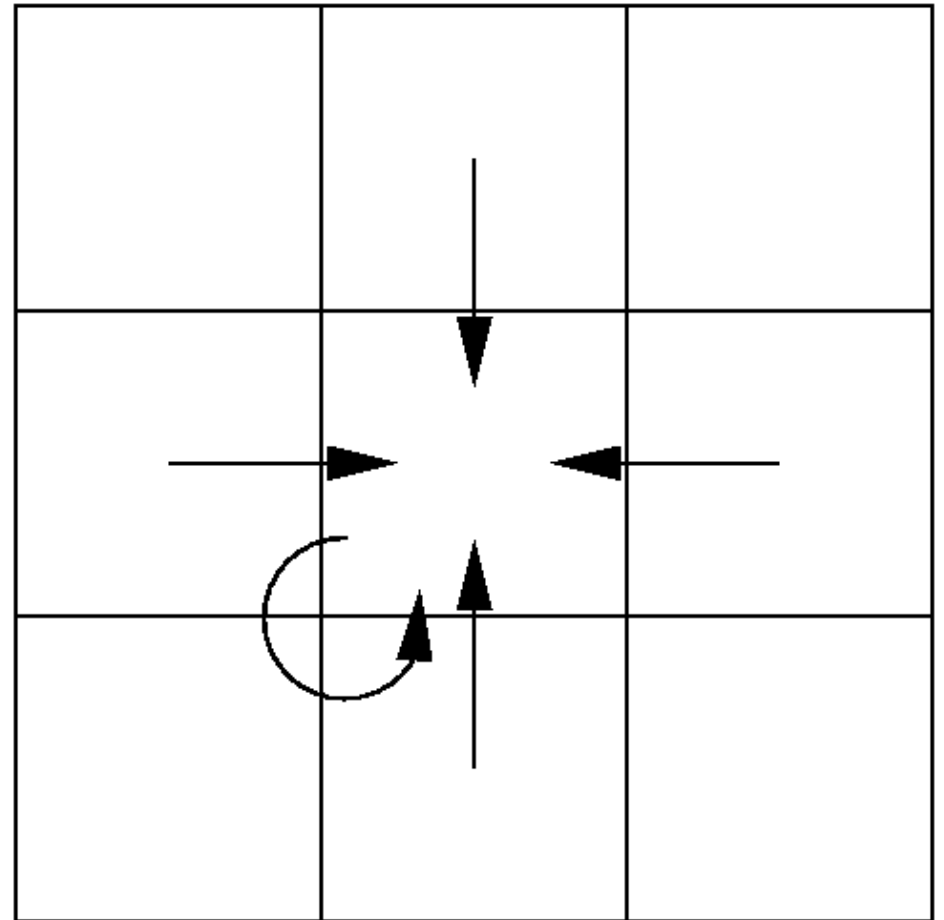
Expensive

Non-universal



Cellular Automata

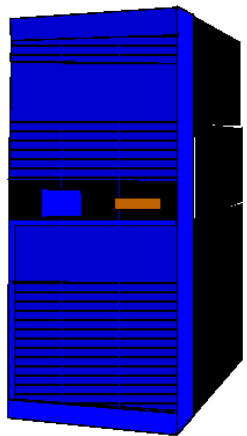
- Cell
- State (bitstring)
- Time Step
- Neighborhood
- Rule Table
- Next State



Cellular Automata

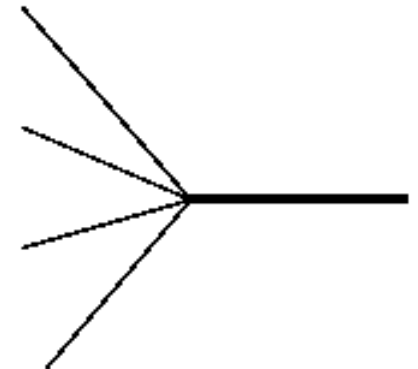
Hard to Create

Hard to Use

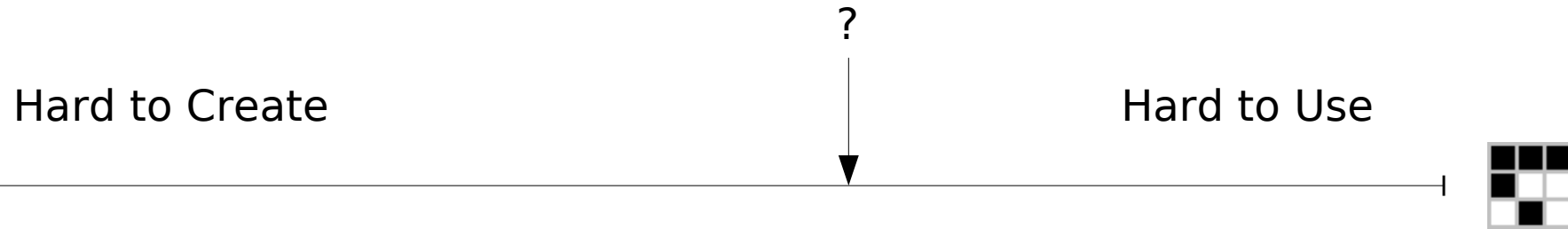


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State and Rule Table

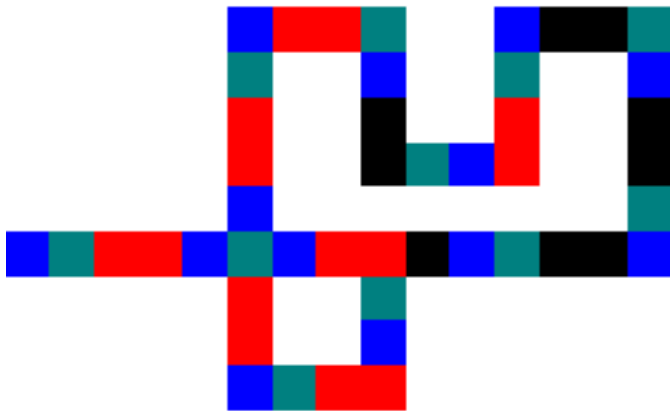


- Open Question
- Works Already!

Computation on a Lattice

- Simple, explicit rules
- Any medium
- Program = picture = computer

Easier?



VS.

```
pushl   %ebp
movl    %esp, %ebp
subl    $4, %esp
movl    8(%ebp), %eax
movl    %eax, -4(%ebp)
L1:
movl    12(%ebp), %eax
cmpb   $0, (%eax)
jne     L2
movl    8(%ebp), %edx
movl    12(%ebp), %eax
movzbl (%eax), %eax
movb   %al, (%edx)
incl   8(%ebp)
leal   12(%ebp), %eax
incl   (%eax)
jmp    L1
L2:
movl   -4(%ebp), %eax
leave
ret
```

Specialize Rules

- Circuits
- Convection Currents
- Constrained Optimization
- Next version of cam.py

GIK

- Assembled as voxels
- 3D lattice
- GIK design tool

Lattices

- Many functions
- One representation
- .fab 2.0