What is CellLang?

The CellLang

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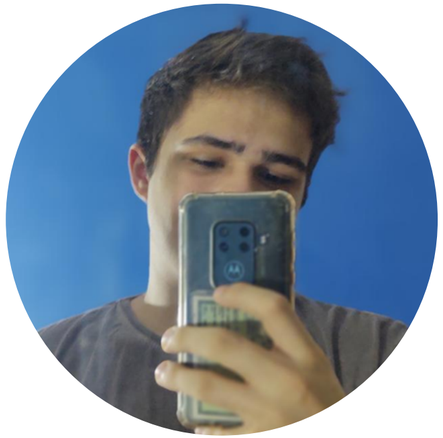

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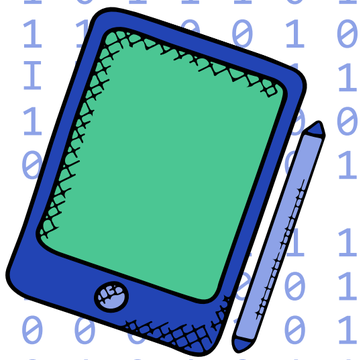
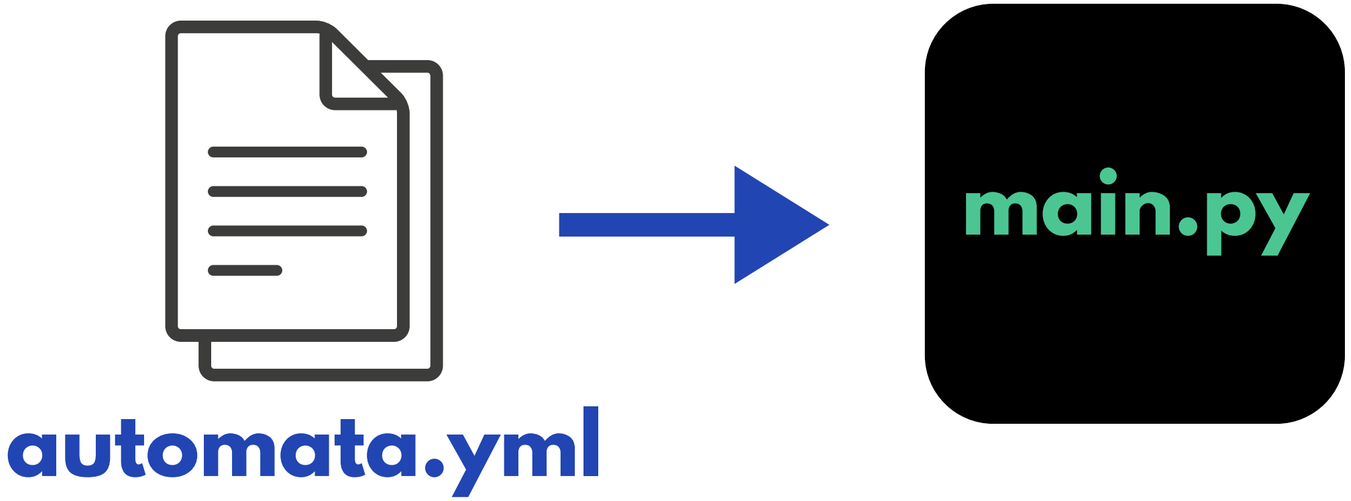


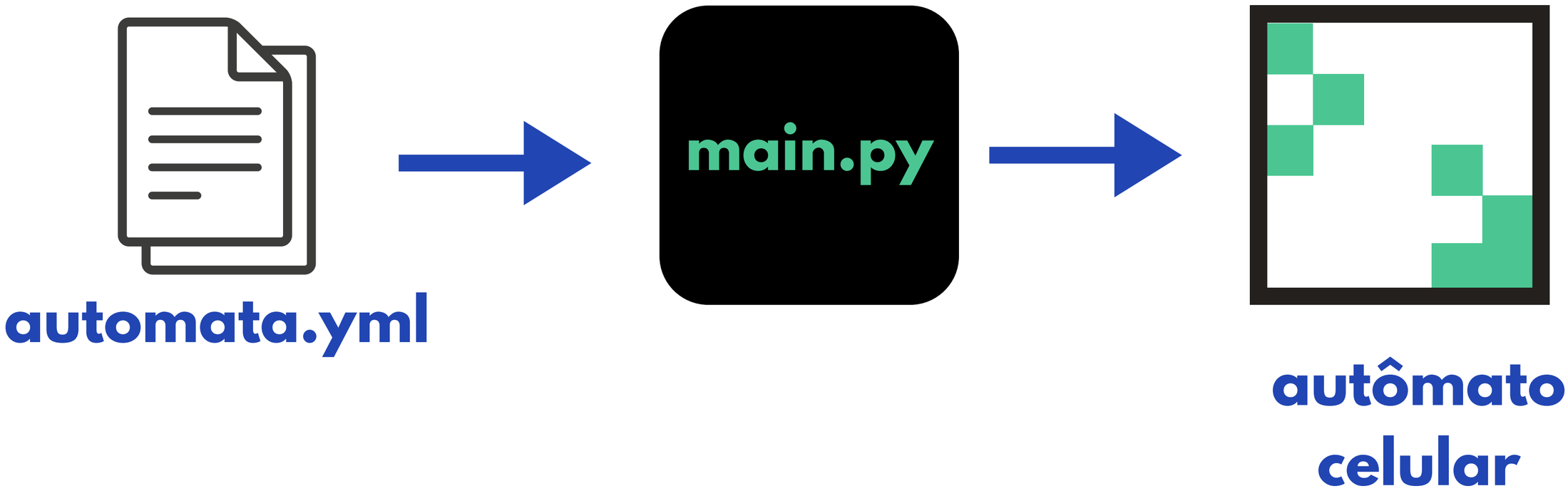
Linguagem de Alto Nível

→

Linguagem de Alto Nível

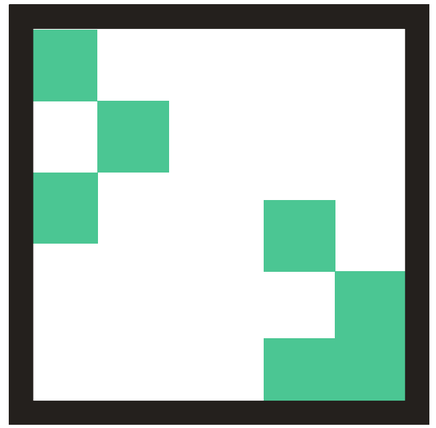
automata.yml


automata.yml
main.py


automata.yml
main.py
autômato
celular

automata.yaml

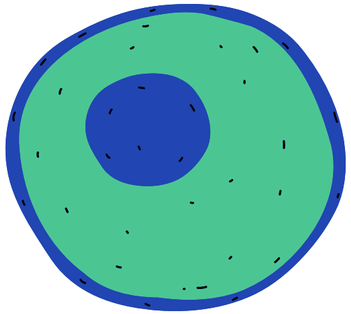
main.py



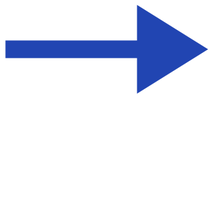
Feio, difícil

autômato celular

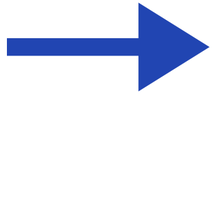
```yaml
grid:
  width: 1920
  height: 1080
functions:
  aggressive_growth:
    type: gaussian
    mu: 0.14
    sigma: 0.06
    amplitude: 2.5
    baseline: -1.2
  stable_growth:
    type: gaussian
    mu: 0.11
    sigma: 0.08
    amplitude: 2.0
    baseline: -1.0
  cautious_growth:
    type: gaussian
    mu: 0.09
    sigma: 0.10
    amplitude: 1.8
    baseline: -0.9
  oscillating_growth:
    type: gaussian
    mu: 0.13
    sigma: 0.05
    amplitude: 2.2
    baseline: -1.1
  expansive_growth:
    type: gaussian
    mu: 0.15
    sigma: 0.12
    amplitude: 1.5
    baseline: -0.8
kernels:
  tight_inner:
    type: ring
    outer_diameter: 17
    inner_diameter: 11
    gaussian_sigma: 0.9
    gaussian_kernel_size: 11
  medium_ring:
    type: ring
    outer_diameter: 27
    inner_diameter: 19
    gaussian_sigma: 1.3
    gaussian_kernel_size: 15
  large_outer:
    type: ring
    outer_diameter: 53
    inner_diameter: 43
    gaussian_sigma: 1.5
    gaussian_kernel_size: 17
  xl_outer:
    type: ring
    outer_diameter: 71
    inner_diameter: 59
    gaussian_sigma: 1.8
    gaussian_kernel_size: 19
  small_disk:
    type: disk
    radius: 8
    gaussian_sigma: 0.7
    gaussian_kernel_size: 7
  medium_disk:
    type: disk
    radius: 15
    gaussian_sigma: 1.1
    gaussian_kernel_size: 11
  large_disk:
    type: disk
    radius: 25
    gaussian_sigma: 1.6
    gaussian_kernel_size: 15
lifeforms:
  apex:
    color: "#FF1744"
    initial_state: random_sparse
    rules:
      apex: # Self-organization
        dt: 0.04
        kernel:
          type: composite
          operation: subtract
          left:
            ref: tight_inner
          right:
            type: composite
            operation: divide
            left:
              ref: medium_ring
            right: 1.8
        func:
          ref: aggressive_growth
        weight: 1.0
      orbax: # Attracted to prey
        dt: 0.025
        kernel:
          ref: large_disk
        func:
          type: linear
          slope: 1.8
          intercept: -0.3
        weight: 0.6
      dt: 0.02
      kernel:
        ref: medium_disk
      func:
        type: linear
        slope: -2.0
        intercept: 0.0
      weight: -0.5
    pulse:
      dt: 0.015
      kernel:
        ref: small_disk
      func:
        type: linear
        slope: 0.8
        intercept: -0.1
      weight: 0.25
    orbax:
      color: "#2979FF"
      initial_state: random
      rules:
        orbax:
          dt: 0.045
          kernel:
            type: composite
            operation: add
            left:
              type: composite
              operation: subtract
              left:
                ref: medium_ring

            inner_diameter: 28
            gaussian_sigma: 1.0
            gaussian_kernel_size: 13
          func:
            type: composite
            operation: divide
            left:
              ref: large_outer
            right: 2.5
          right:
            type: composite
            operation: multiply
            left:
              ref: small_disk
            right: 0.3
          func:
            ref: cautious_growth
          weight: 1.0
        apex: # Strong repulsion
          dt: 0.03
          kernel:
            ref: large_disk
          func:
            type: linear
            slope: -3.0
            intercept: 0.0
          weight: -0.8
        wanderer:
          dt: 0.01
          kernel:
            ref: medium_disk
          func:
            type: linear
            slope: 0.5
            intercept: -0.05
          weight: 0.2

        # Wave-maker - creates expanding patte
        pulse:
          color: "#FF6D00" # Bright orange
          initial_state: centered_blob
          rules:
            wanderer: # Slightly i
              dt: 0.01
              kernel:
                ref: small_disk
              func:
                type: linear
                slope: 0.4
                intercept: -0.1
              weight: 0.15

            # Environmental spre
            substrate:
              color: "#FDD835" # Bri
              initial_state: random_
              rules:
                substrate: # Slow spre
                  dt: 0.03
                  kernel:
                    type: composite
                    operation: add
                    left:
                      ref: medium_disk
                    right:
                      type: composite
                      operation: multiply
                      left:
                        ref: large_disk
                      right: -0.4
                  func:
                    ref: expansive_growth
                  weight: 1.0

                orbax: # Grows where
                  dt: 0.008
                  kernel:
                    ref: large_disk
```

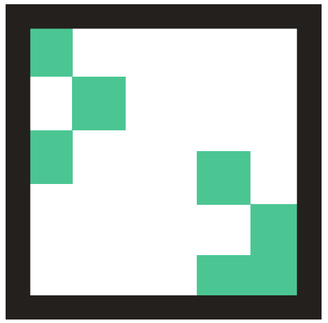


Cell Lang



Feio, difícil





autômato celular

Exemplos Selecionados

1

Duas formas de vida interagindo

2

Uma forma de vida com múltiplas regras

3

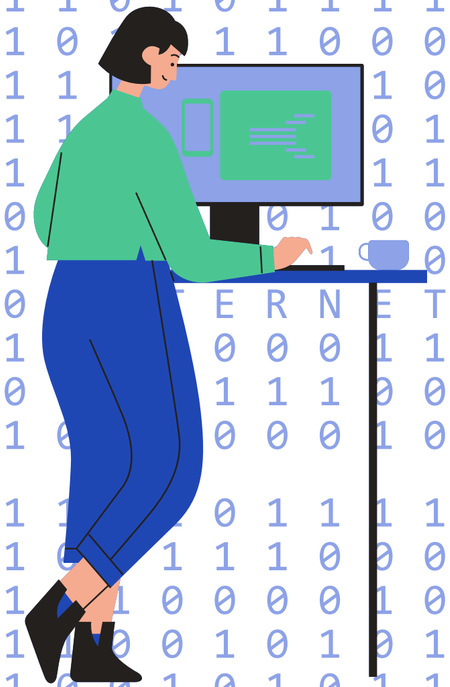
Variante de Conway com kernel customizado

1 Exemplo

```
(define-lifeform predator
  (color: "red")
  (initial: random_discrete)
  (rules:
    (rule hunt -> (dt: 0.1 kernel: k1 function: f1 weight: 1.0))))
(define-lifeform prey
  (color: "blue")
  (initial: random_discrete)
  (rules:
    (rule escape -> (dt: 0.1 kernel: k2 function: f2 weight: 0.8)))))
```

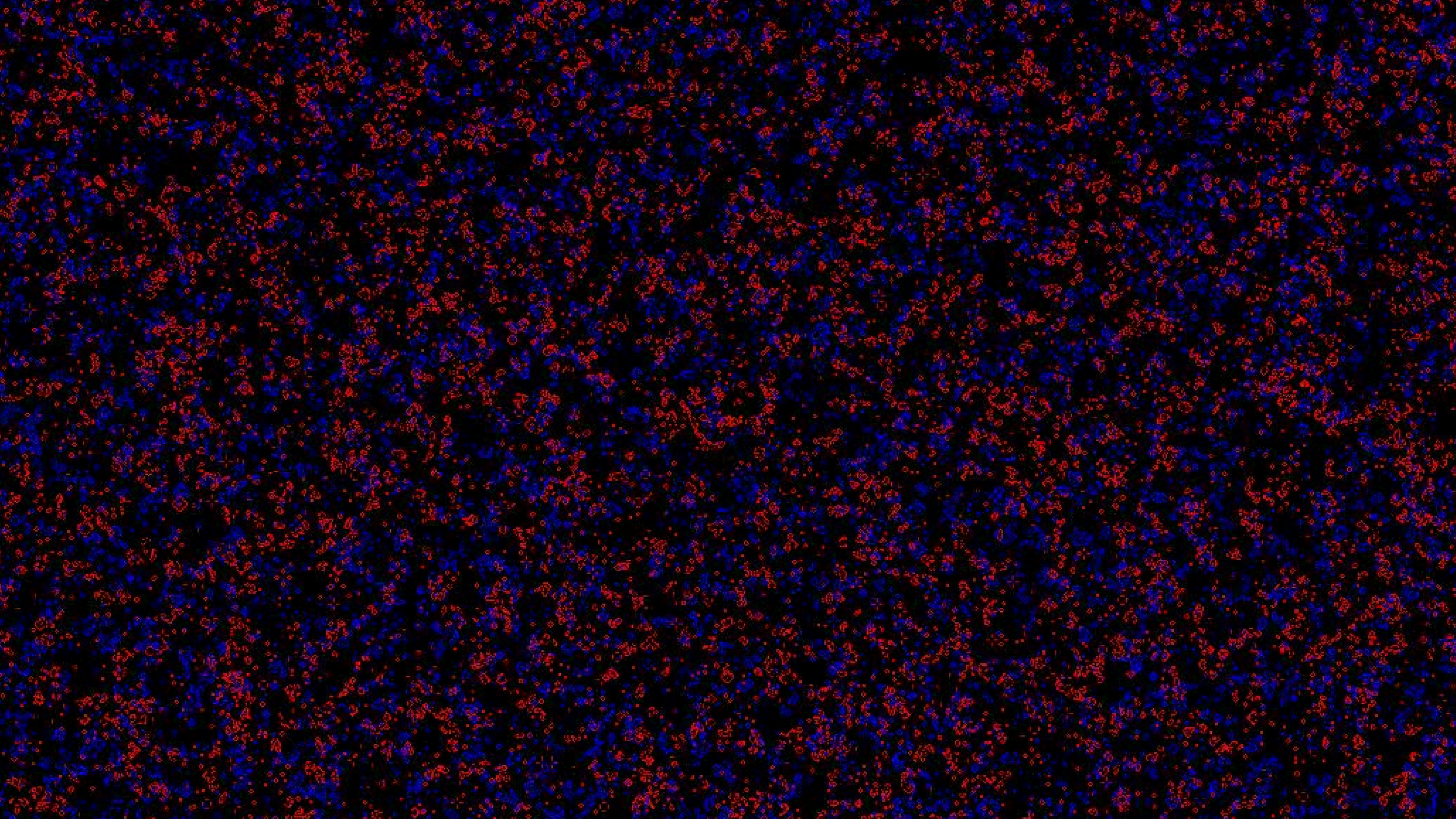
2 Exemplo

```
(functions
  (define-function f1 (gaussian mean: 0.5 sigma: 0.2 growth: 1.0))
  (define-function f2 (step threshold: 0.7 slope: 15)))
(kernels
  (define-kernel k1 (disk radius: 2 blur: (sigma: 1 size: 5)))
  (define-kernel k2 (ring outer: 5 inner: 1 blur: (sigma: 0.8 size: 5))))
(lifeforms
  (define-lifeform slime
    (color: "purple")
    (initial: random_discrete)
    (rules:
      (rule spread -> (dt: 0.05 kernel: k1 function: f1 weight: 1.0))
      (rule retreat -> (dt: 0.05 kernel: k2 function: f2 weight: 0.5)))))
```



3 Exemplo

```
(kernels
  (define-kernel conway_kernel (square custom_array: "[[1 1 1] [1 0 1] [1 1 1]]")))
(lifeforms
  (define-lifeform conway
    (color: "red")
    (initial: random_discrete)
    (rules:
      (rule conway -> (dt: 1.0 kernel: conway_kernel function: conway_rules weight: 1.0))))
  (define-lifeform conway2
    (color: "blue")
    (initial: random_discrete)
    (rules:
      (rule conway2 -> (dt: 1.0 kernel: conway_kernel function: conway_rules weight: 1.0)))))
```



Conclusões da CellLang

Facilita a criação do arquivo de configuração

Fácil, rápida e intuitiva

Permite a criatividade

Hype demais! 😎

Próximos Passos

Implementação de diferentes estilos

Correção da formatação, para melhor compatibilidade

Facilitar a criação de autômatos complexos


Obrigade !