Interaction-Oriented Programming for Cockpits and Controller Working Positions

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The **Smala** programming language
The **Djnn** framework and run-time

Interaction-oriented programming


F-PALG

Those systems are all interactive

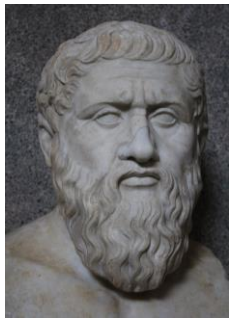
- Many interacting sub-systems
- Whose state depends on multiple asynchronous sources of event
- In which some sub-systems are human beings

djnn: a process-based approach

Plato

the world as *objects* with *properties*

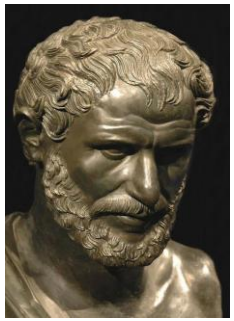
=> Object-Oriented Programming



Heraclitus

the world as *processes* that *change*

=> **Interaction-Oriented Programming**



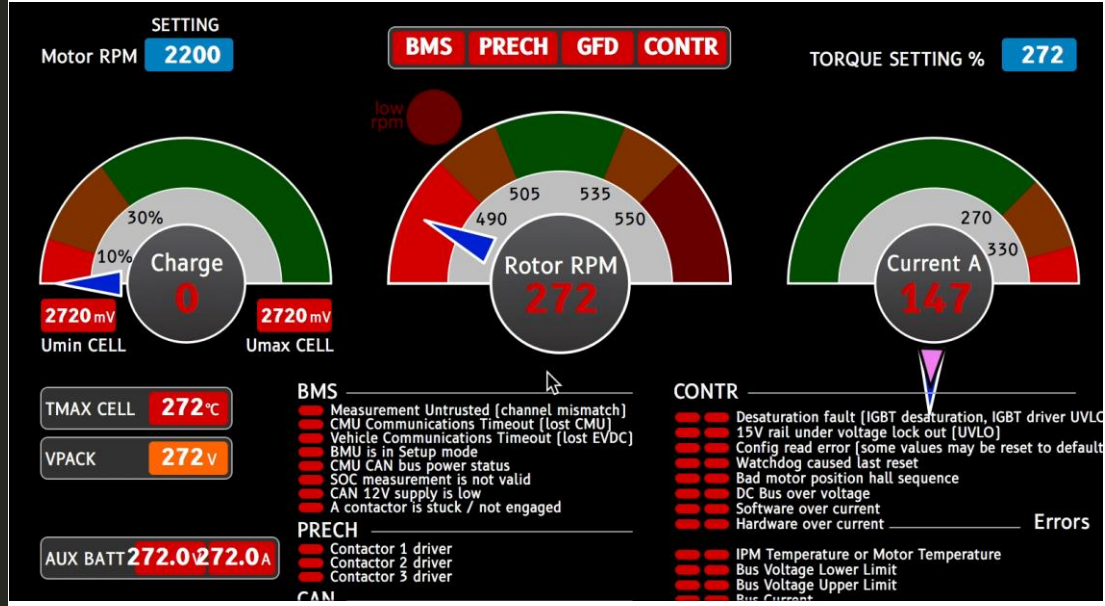
```
// page management
page = find(img.lower_panel.right.page)

addChildrenTo page {
  Component page_up
  Component page_down

  Switch status_control(page1) {
    page1 << svg.page_def.page1
    page2 << svg.page_def.page2
    page3 << svg.page_def.page3
  }
  FSM sc_fsm {
    State page2
    State page3
    State page1
    page1 -> page2 (page_up)
    page2 -> page3 (page_up)
    page3 -> page1 (page_up)
    page1 -> page3 (page_down)
    page2 -> page1 (page_down)
    page3 -> page2 (page_down)
  }
  sc_fsm.state => status_control.state
}

// mouse page down / page up
Component mouse_page_up_page_down {
  NoOutline noo
  FillColor black(0,0,0)
  Translation t(340, 265)
  Rectangle page_down(0, -5, 60, 20, 5, 5)
  Rectangle page_up(60, -5, 60, 20, 5, 5)
  page_down.press -> page.page_down
  page_up.press -> page.page_up
}

// gpio page down / page up
Component page_gpio {
  gpio_down = find(gpio:B4.in)
  gpio_up = find(gpio:B23.in)
  gpio_down -> page.page_down
  gpio_up -> page.page_up
}
```



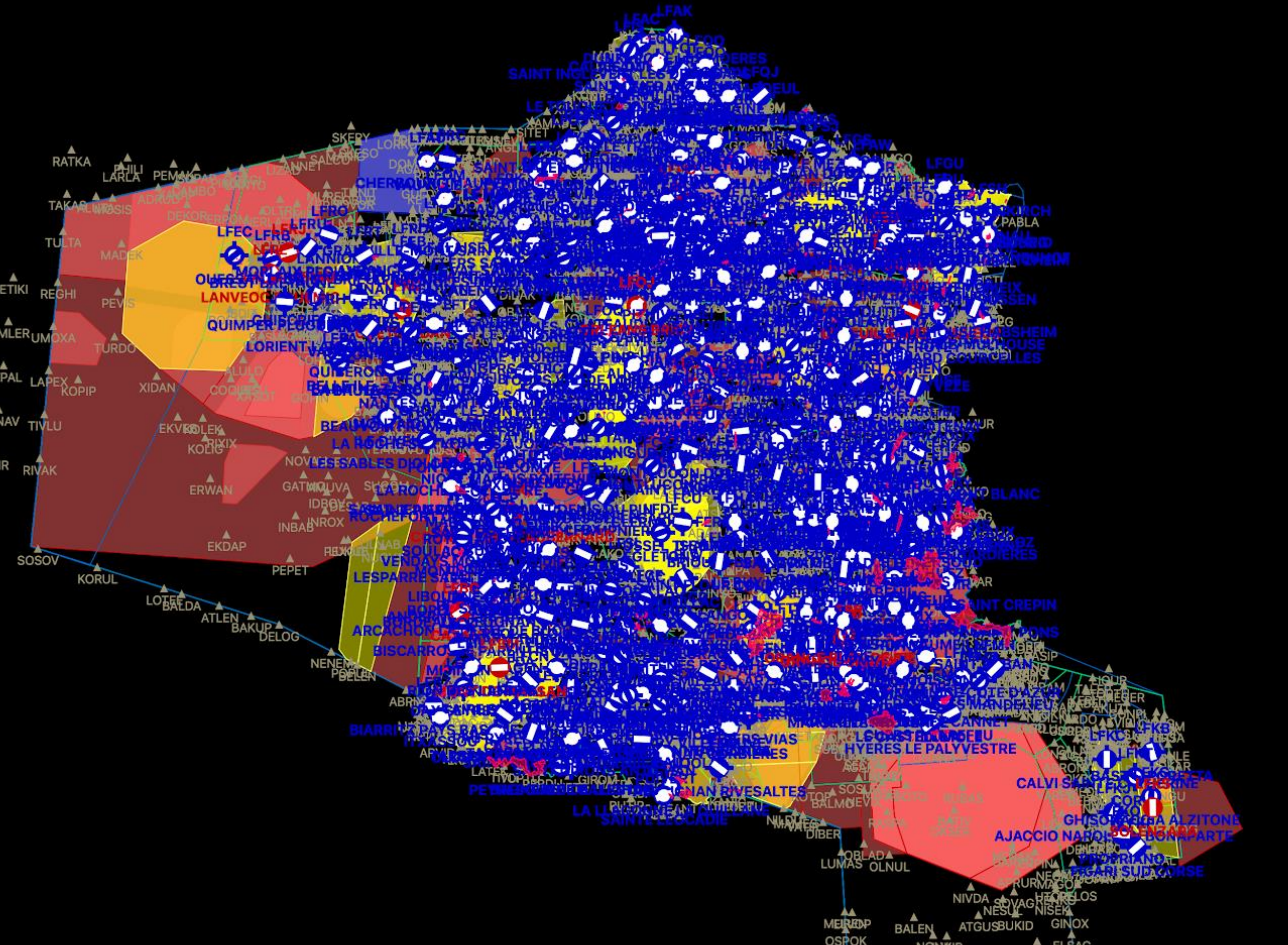
IOP: Input from graphics and GPIO
Unification: Interchangeable input
Iterative design: Switch Debug/Operation

```
1  ATT aka pfd.ATT
2
3  FSM pfd_mode {
4
5      State occidental {
6                      zero =: ATT.aeroplane_roll
7          -aeroplane_roll => ATT.horizon_roll
8          -aeroplane_roll => ATT.pointer_roll
9                      zero =: ATT.bankscale_roll
10         -aeroplane_roll => ATT.pitchscale_roll
11                 -radius =: ATT.slip_trans_y
12                    one =: ATT.pointer_opacity
13                    one =: ATT.slip_opacity
14     }
15
16     State russian {
17          aeroplane_roll => ATT.aeroplane_roll
18                     zero =: ATT.horizon_roll
19                     zero =: ATT.pointer_roll
20                     zero =: ATT.bankscale_roll
21                     zero =: ATT.pitchscale_roll
22               //-10+zero =: ATT.slip_trans_y // agnost
23                     zero =: ATT.pointer_opacity
24                     zero =: ATT.slip_opacity
25     }
26
27     State newpfd {
28                     zero =: ATT.aeroplane_roll
29         -aeroplane_roll => ATT.horizon_roll
30                     zero =: ATT.pointer_roll
31         -aeroplane_roll => ATT.bankscale_roll
32         -aeroplane_roll => ATT.pitchscale_roll
33                -10+zero =: ATT.slip_trans_y
34                     zero =: ATT.pointer_opacity
35                     one  =: ATT.slip_opacity
36     }
37
38 }
```

IOP: States - assignment
Unification:
Iterative design:

Status

- Already working:
  - « Static » interfaces (no new objects during run-time)
  - Graphics, SVG, direct manipulation, multitouch, network
  - Suitable for research projects
- Work-in-Progress
  - Dynamic interfaces
  - Scalability, latency, dependability
  - Suitable for prototyping projects and/or non-critical applications (SWAL>=4)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SKERY
SITET
RATKA
LARLA
TAKAS
TULTA
MADEK
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TURDO
LAPEX
KOPIP
XIDAN
TIVLU
RIVAK
ERWAN
EKDAP
SOSOV
KORUL
PEPET
BALDA
ATLEN
DELOG
NENEM
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FIGARI SUD CORSE
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LUMAS
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GINOX
OSPOK

smala.io

https://github.com/lii-enac/djnn-cpp
https://github.com/lii-enac/smala