ICST 2026 Tool Competition

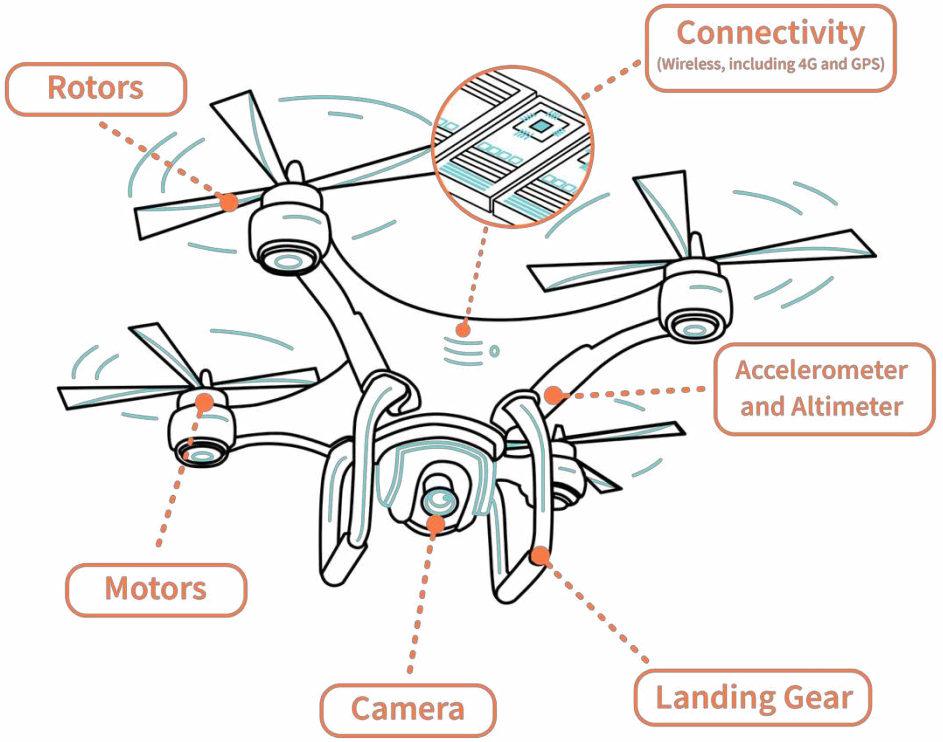
UAV Testing Track

Erdem Uysal, Gregory Loubet-Bonino, Ali Javadi, Prakash Aryan, Aren Babikian, Dmytro Humeniuk, Sajad Khatiri, Sebastiano Panichella

19th IEEE International Conference on Software Testing, Verification and Validation (ICST) 2026
Daejeon, Republic of Korea



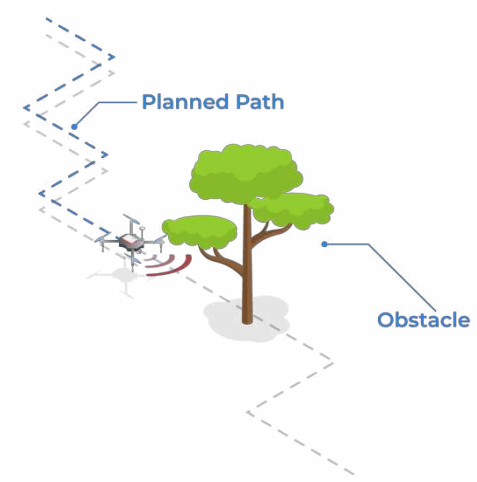

Unmanned Aerial Vehicles (UAVs)

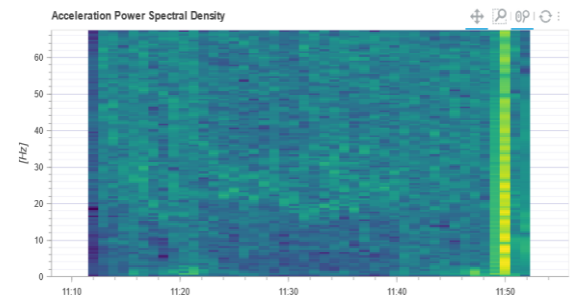



PX4 / PX4-Autopilot Public

Notifications | Fork 13.1k | Star 7.5k

Code | Issues 1.3k | Pull requests 456 | Actions | Projects | Security 4 | ...



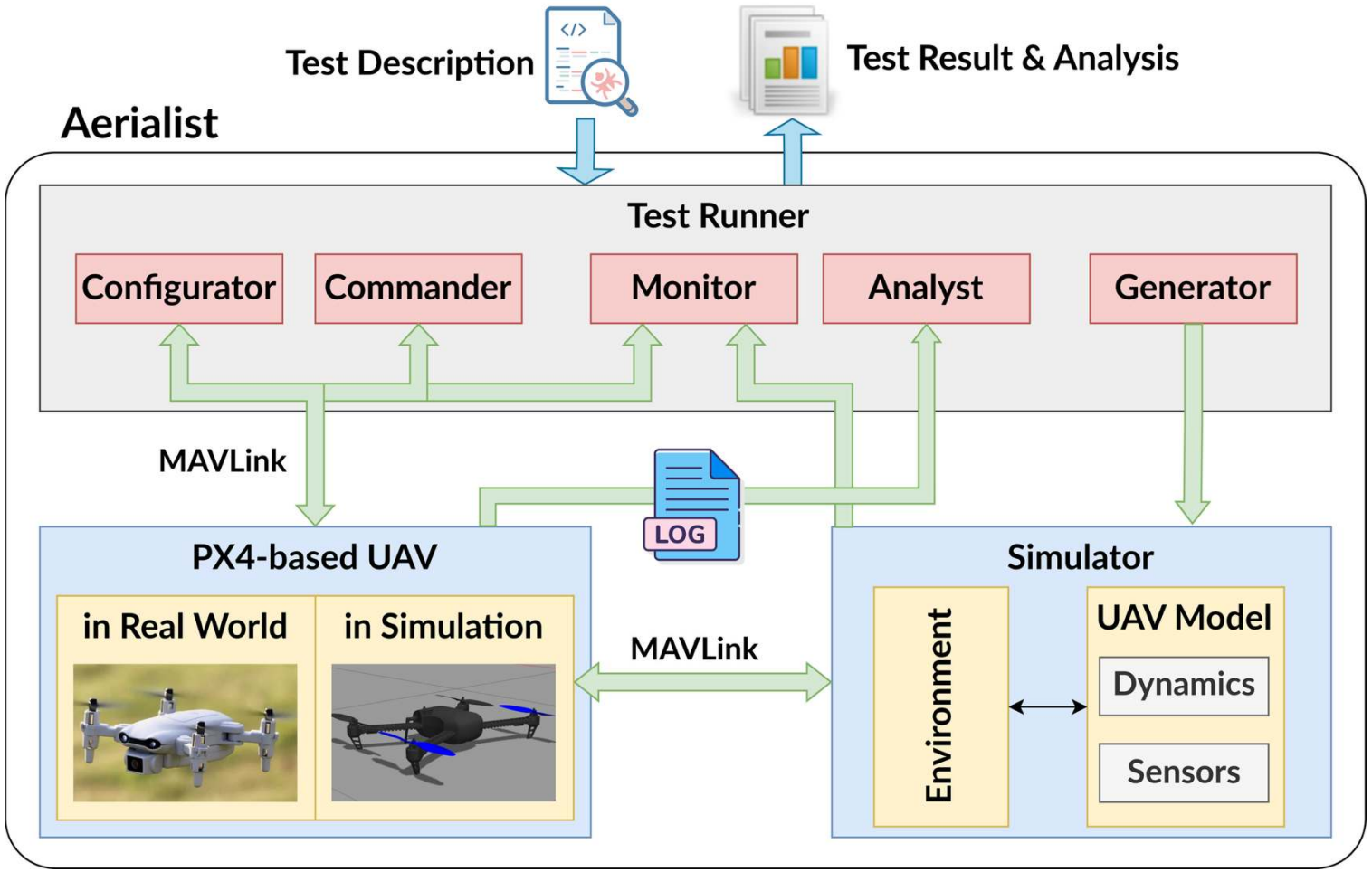


Aerialist

UAV Test Bench

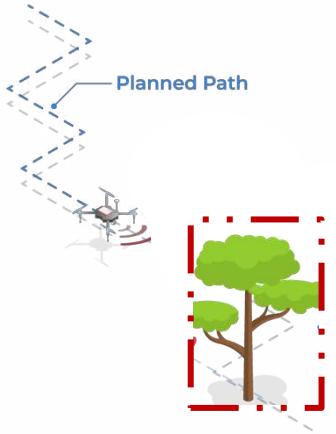
Test Description

- UAV Config.
- Env. Config.
- Commands
- Expectation

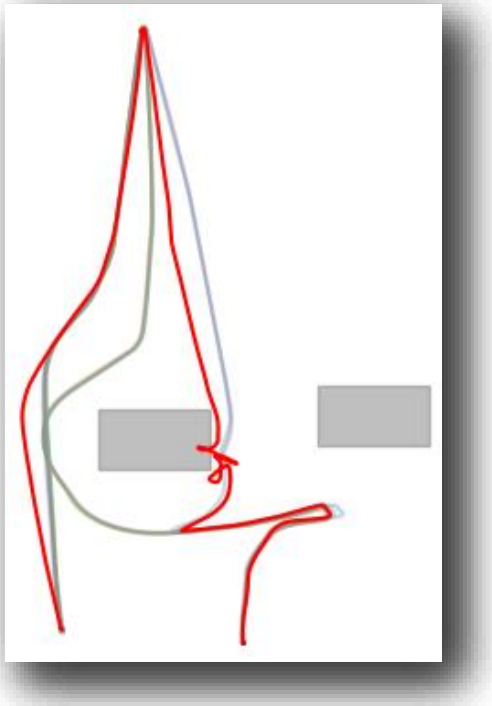


"*Simulation-based testing of unmanned aerial vehicles with Aerialist*", ICSE 2024
Khatiri, Sajad, Sebastiano Panichella, and Paolo Tonella

Test Generation

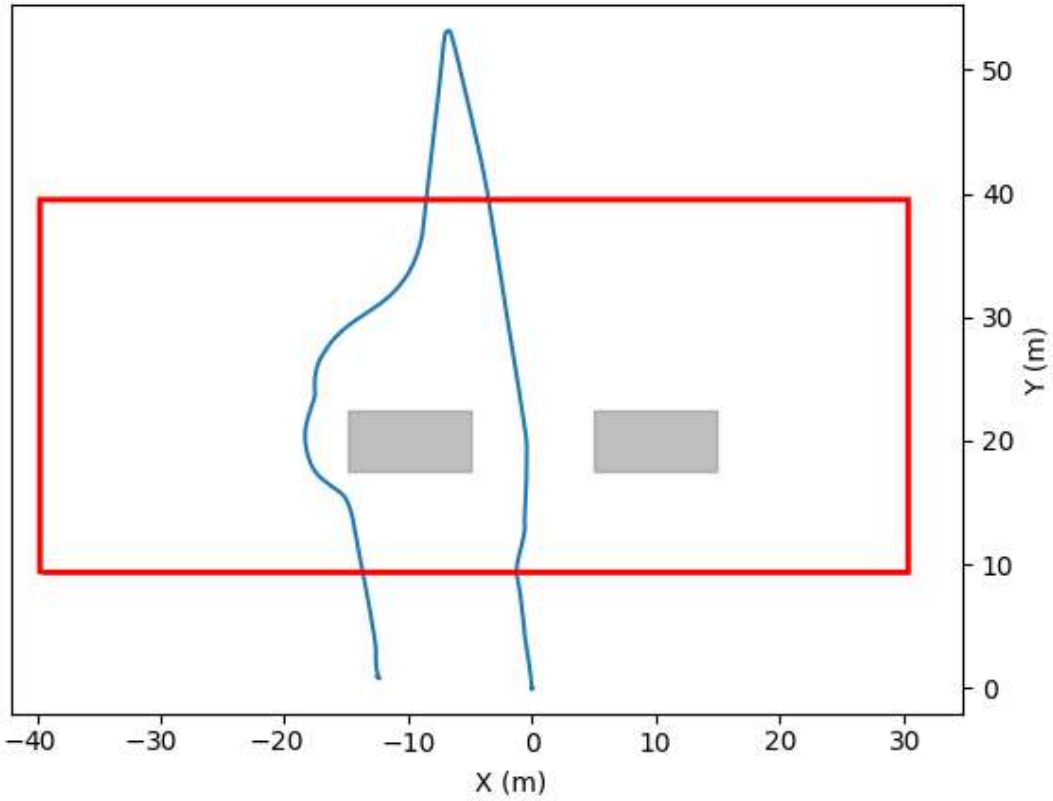


Given an **autonomous UAV flight mission** generate test cases that **violate safety distance** to the obstacles by **placing obstacles** in the environment



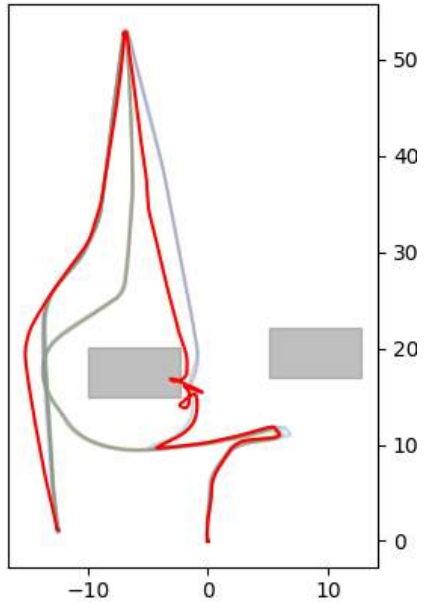
Competition Rules

- Use the provided platform for test definition
- Test Generation using a Search-based approach
- Place up to 3 box-shaped obstacles
  - size (length, width, height)
  - position (x, y, z)
  - orientation (r)
- Obstacles should
  - keep the mission physically possible
  - fit in the predefined area
  - be Taller than the flight altitude (10m)



Evaluation

- **1 baseline** approach (Surrealist)
- **1 competing** test generation tools (1 submitted)
- Generated tests for **4 flight missions**
  - With **100 Simulation budget**
  - Using our Kubernetes evaluation platform
  - Report the failing ones
- **20 Tests** from each test suite were evaluated
  - Simulated **3 times**
  - Assign points to each execution
  - Assign score to each test case
  - Estimate Test Suite Score



$$point(sim) = \begin{cases} 5, & \text{if } min\_dist(sim) < 0.25m \\ 2, & \text{if } 0.25m \leq min\_dist(sim) < 1m \\ 1, & \text{if } 1m \leq min\_dist(sim) < 1.5m \\ 0, & \text{if } min\_dist(sim) \geq 1.5m \end{cases}$$

$$test\_score(t) = \frac{avg\_point(t) \times 10}{\#obst(t)^2 \times avg\_time(t)}$$

$$suite\_score(s) = (\sum_t test\_score(t) + rest\_score(s)) \times sim\_pen(s)$$

Tests Count

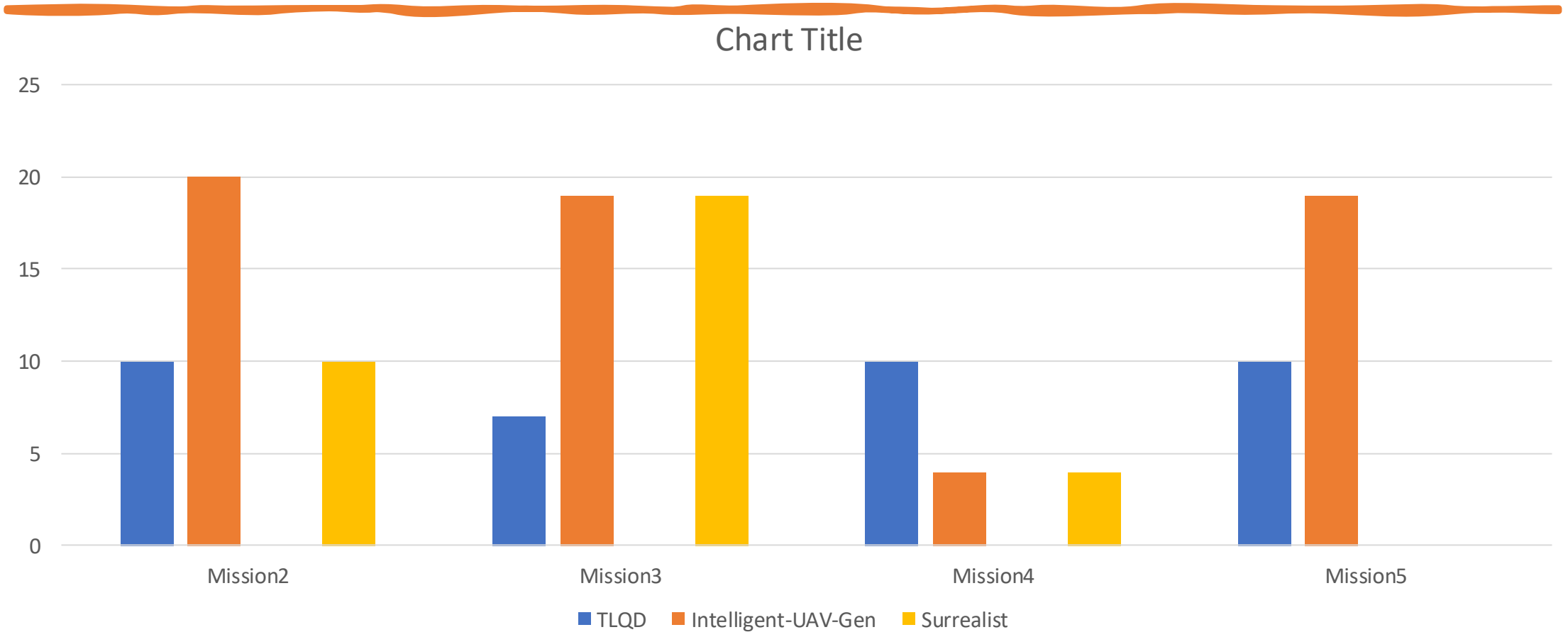
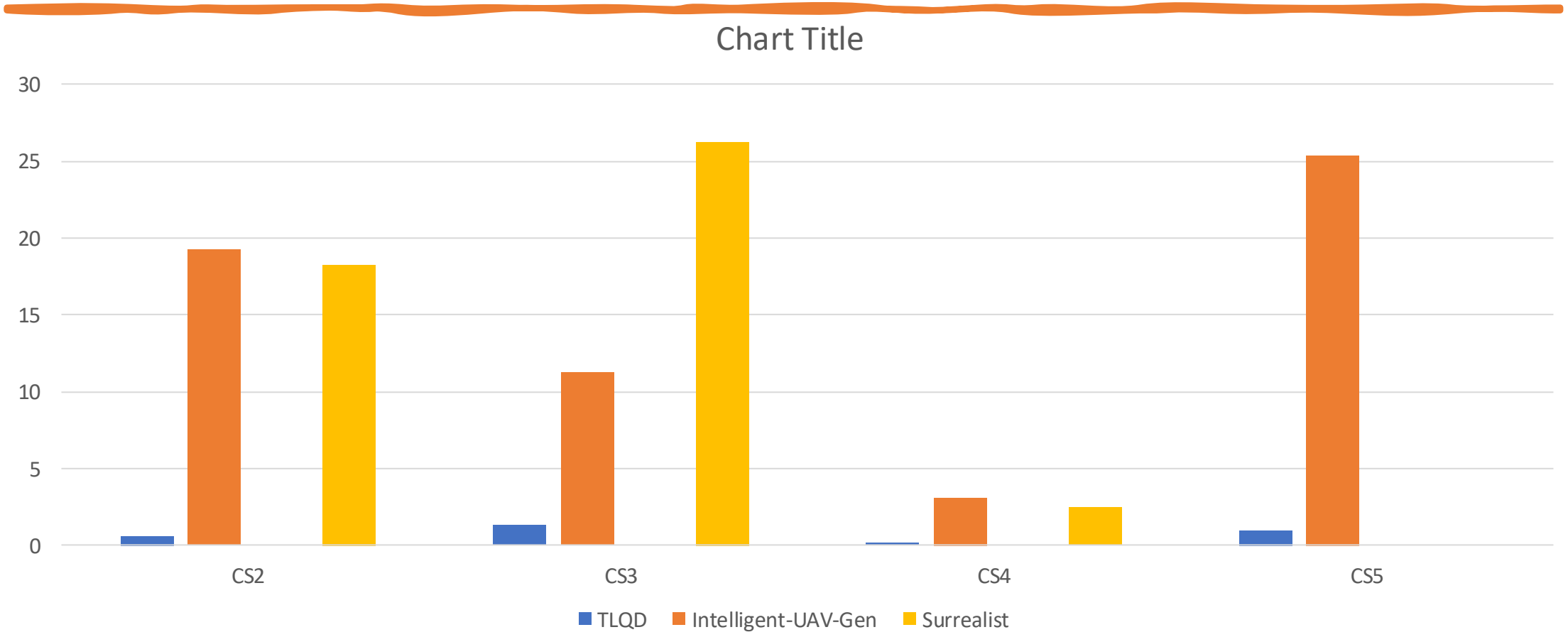
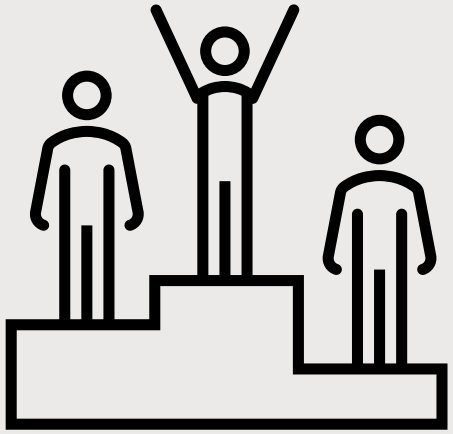


Chart Title
25
20
15
10
5
0
Mission2
Mission3
Mission4
Mission5
TLQD
Intelligent-UAV-Gen
Surrealist

Test Suite Score

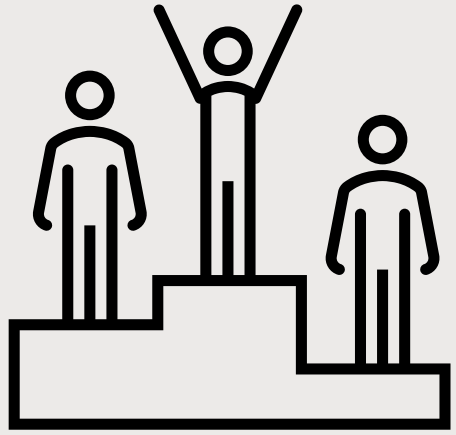




Ranking

Total Score

1. **Intelligent-UAV-Gen**
2. **Surrealist [baseline]**



Ranking

Total Score

Surrealist [baseline]

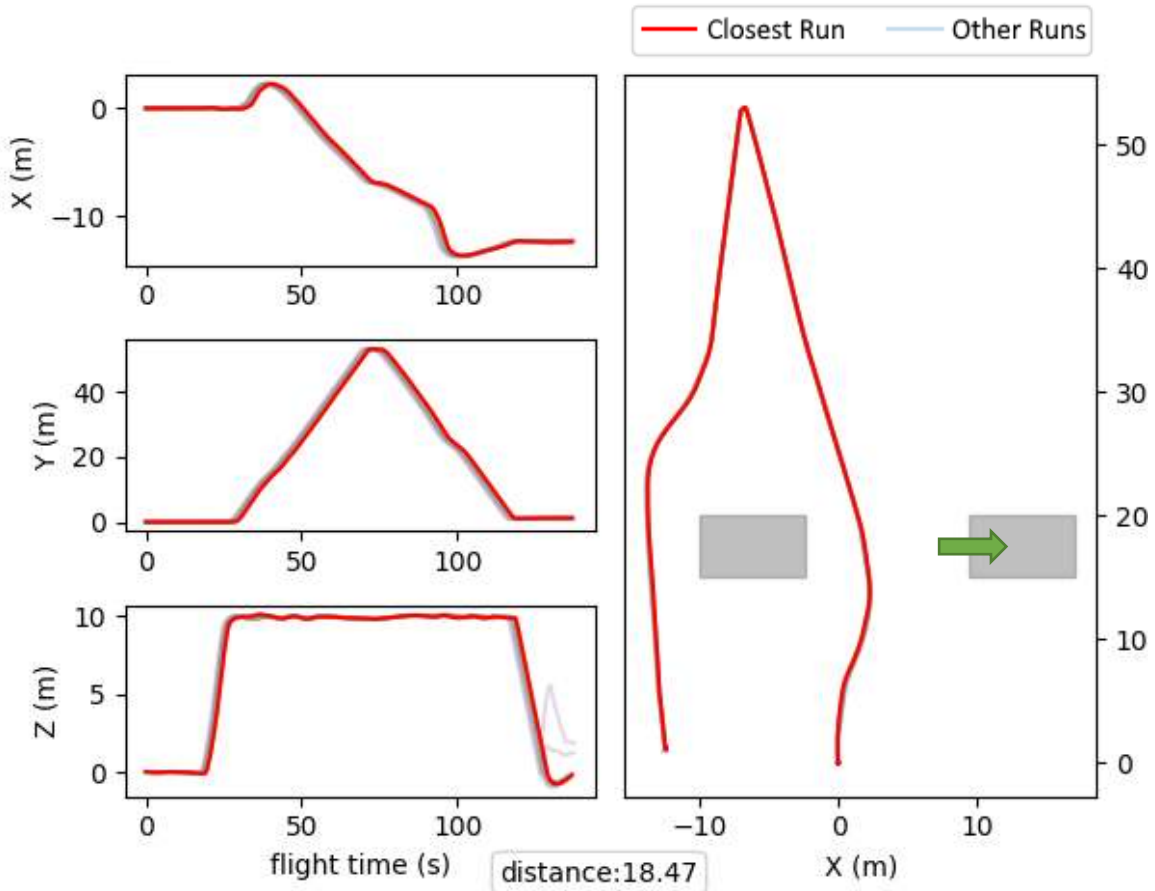
TLQD

github.com/skhatiri/UAV-Testing-Competition

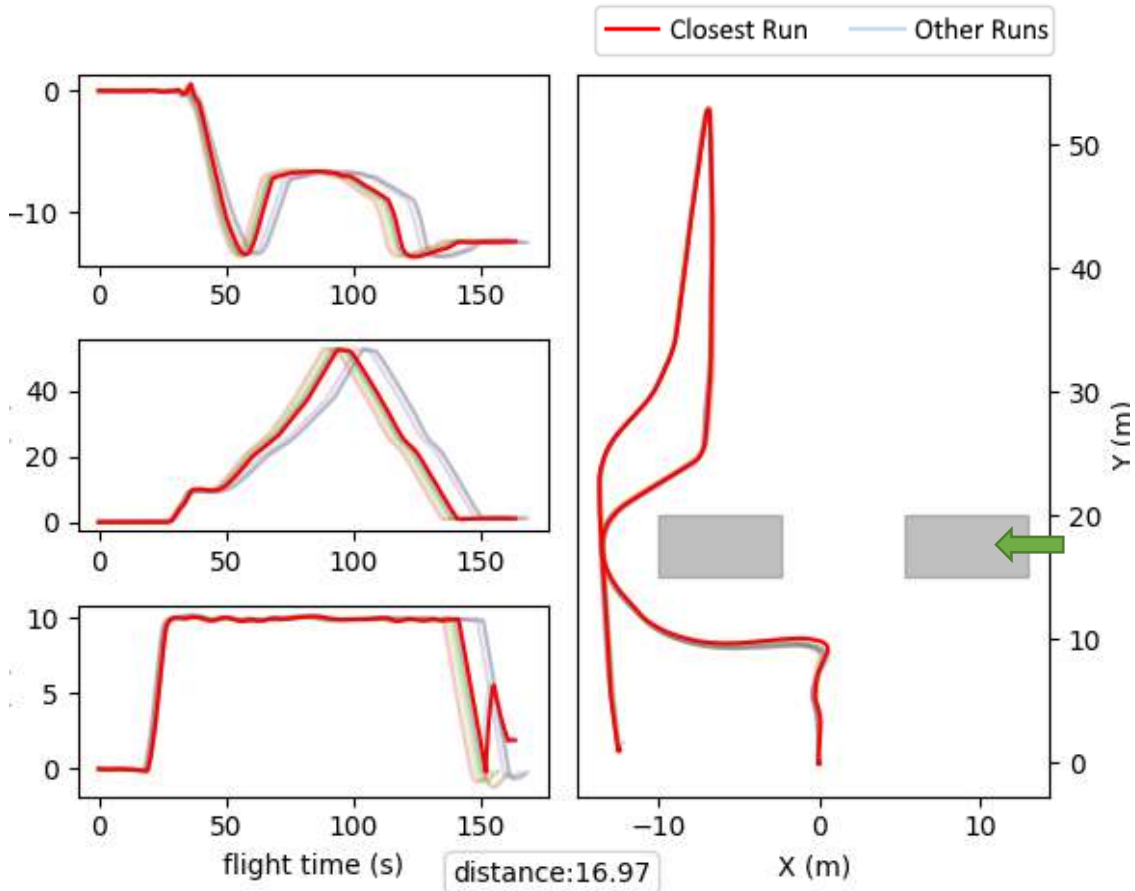
github.com/skhatiri/Aerialist

SCAN ME

Obstacle **Move** (Δx = **-4**)



Obstacle **Move** (Δx = **-8**)



UAV System Test

UAV Configurations	Autopilot Parameter Config Files (mission plan)
Environment Configurations	Weather Condition Surrounding Objects
Runtime Commands	Radio Controller Commands Starting Mission
Expected Behavior	Flight Trajectory Safety Requirements

UAV System Test

manual1-replay-k8s.yaml

samples > tests > manual1-replay-k8s.yaml

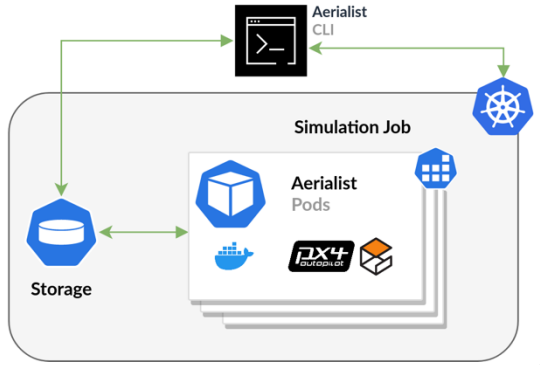
```yaml
drone:
  port: sitl #{sitl, ros, cf}

simulation:
  simulator: gazebo #{gazebo,jmavsim,ros}
  speed: 1
  headless: true

test:
  commands_file: samples/flights/manual1.ulg
  speed: 1

assertion:
  log_file: samples/flights/manual1.ulg
  variable: trajectory

agent:
  engine: k8s # {k8s, docker, local}
  count: 5
  path: https://filer.cloudlab.zhaw.ch/remote.php/webdav/test/
  id: yaml-test
```



Calls for New UAV/SDC tool Chairs

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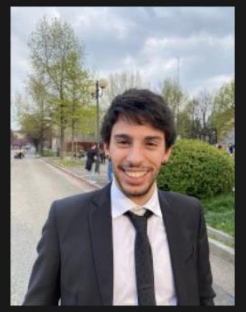
SBFT/ICST TOOL COMPETITION: SELF-DRIVING CAR TESTING

Aryan Prakash
University of Bern
Switzerland

Christian Birchler
University of Bern
Switzerland

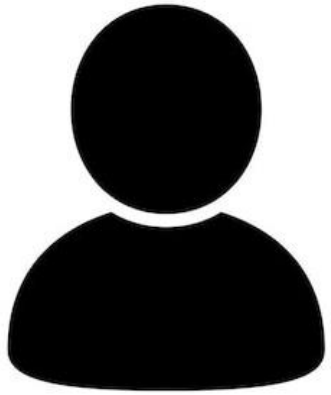


Tommaso Fulcini
Politecnico di Torino
Italy

Luigi Sterace
Università degli Studi di Napoli Federico II
Italy

Sebastiano Panichella
University of Bern
Switzerland
AI4I - The Italian Institute of Artificial Intelligence for Industry
Italy

Calls for New tool Chairs…



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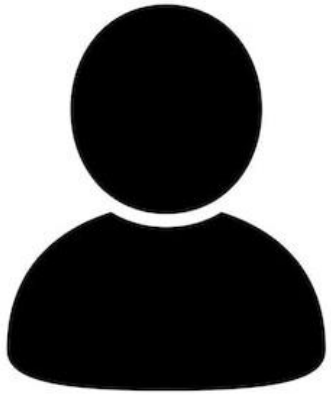
UAV



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SDC

UAV/SDC tool Competition: Any Feedback?

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More info: https://tinyurl.com/software-uas

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Apply: **https://lnkd.in/eAxQmThK**

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