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ROBOSTAR

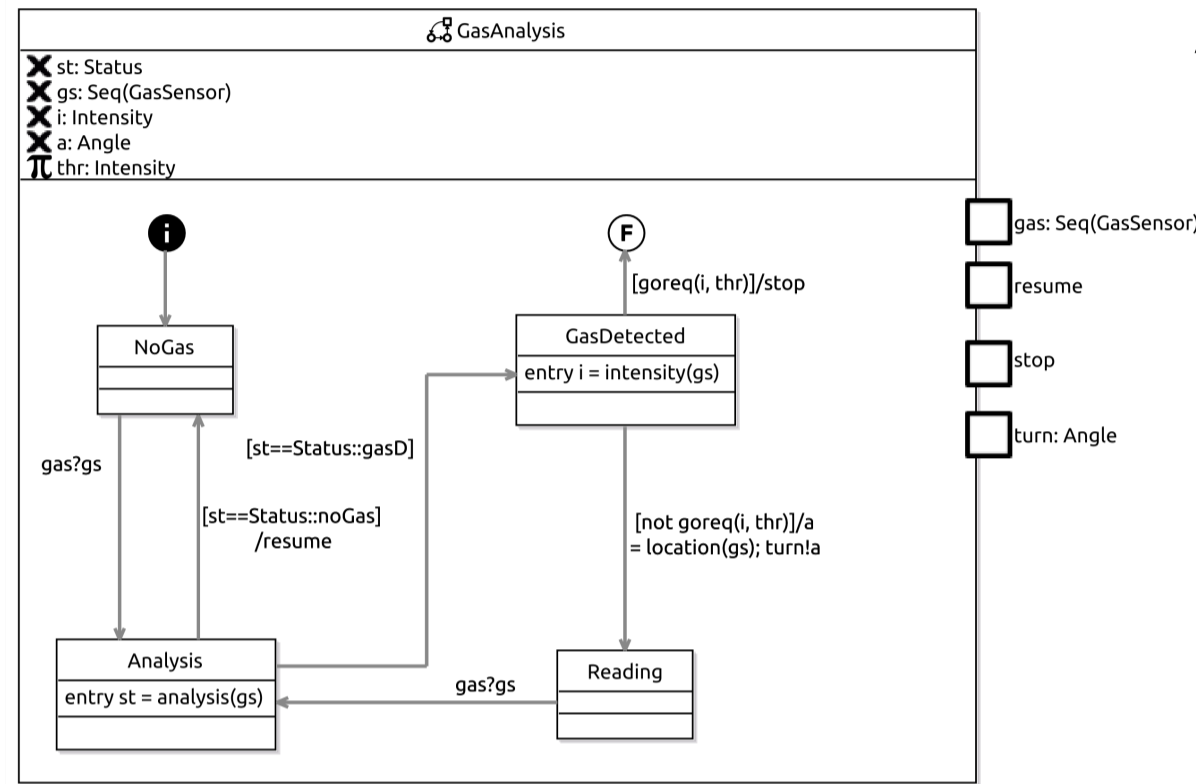# Formally Verified Animation for RoboChart

A semantics preservation animation for deterministic RoboChart models on terminal now

GasAnalysis

- ✕ st: Status
- ✕ gs: Seq(GasSensor)
- ✕ i: Intensity
- ✕ a: Angle
- ✕ thr: Intensity

gas: Seq(GasSensor)
resume
stop
turn: Angle

i

NoGas

gas?gs

[st==Status::gasD]

[st==Status::noGas]
/resume

Analysis
entry st = analysis(gs)

gas?gs

F

[goreq(i, thr)]/stop

GasDetected
entry i = intensity(gs)

[not goreq(i, thr)]/a
= location(gs); turn!a

Reading

```
Internal Activity...
Events: (1) RandomWalkCall (); (2) Gas (Din, []); (3) Gas (Din, [(0, 0)]); (4) Gas (Din, [(0, 1)]); (5) Gas
 (Din, [(1, 0)]); (6) Gas (Din, [(1, 1)]); (7) Gas (Din, [(0, 0),(0, 0)]); (8) Gas (Din, [(0, 0),(0, 1)]);
(9) Gas (Din, [(0, 0),(1, 0)]); (10) Gas (Din, [(0, 0),(1, 1)]); (11) Gas (Din, [(0, 1),(0, 0)]); (12) Gas
(Din, [(0, 1),(0, 1)]); (13) Gas (Din, [(0, 1),(1, 0)]); (14) Gas (Din, [(0, 1),(1, 1)]); (15) Gas (Din, [(
1, 0),(0, 0)]); (16) Gas (Din, [(1, 0),(0, 1)]); (17) Gas (Din, [(1, 0),(1, 0)]); (18) Gas (Din, [(1, 0),(1
, 1)]); (19) Gas (Din, [(1, 1),(0, 0)]); (20) Gas (Din, [(1, 1),(0, 1)]); (21) Gas (Din, [(1, 1),(1, 0)]);
(22) Gas (Din, [(1, 1),(1, 1)]);
1
[Choose: 1-22]: RandomWalkCall ()
Events: (1) Gas (Din, []); (2) Gas (Din, [(0, 0)]); (3) Gas (Din, [(0, 1)]); (4) Gas (Din, [(1, 0)]); (5) G
as (Din, [(1, 1)]); (6) Gas (Din, [(0, 0),(0, 0)]); (7) Gas (Din, [(0, 0),(0, 1)]); (8) Gas (Din, [(0, 0),(
1, 0)]); (9) Gas (Din, [(0, 0),(1, 1)]); (10) Gas (Din, [(0, 1),(0, 0)]); (11) Gas (Din, [(0, 1),(0, 1)]);
(12) Gas (Din, [(0, 1),(1, 0)]); (13) Gas (Din, [(0, 1),(1, 1)]); (14) Gas (Din, [(1, 0),(0, 0)]); (15) Gas
 (Din, [(1, 0),(0, 1)]); (16) Gas (Din, [(1, 0),(1, 0)]); (17) Gas (Din, [(1, 0),(1, 1)]); (18) Gas (Din, [
(1, 1),(0, 0)]); (19) Gas (Din, [(1, 1),(0, 1)]); (20) Gas (Din, [(1, 1),(1, 0)]); (21) Gas (Din, [(1, 1),(
1, 1)]);
9
[Choose: 1-21]: Gas (Din, [(0, 0),(1, 1)])
Internal Activity...
Events: (1) MoveCall (0,Chemical_Angle_Front);
1
[Choose: 1-1]: MoveCall (0,Chemical_Angle_Front)
Events: (1) Flag Dout;
1
[Choose: 1-1]: Flag Dout
Internal Activity...
Terminated: ()
```

Isabelle/UTP

Animation Code
(Haskell)

2 Auto-generation

Equational logic

Code generator
of Isabelle/HOL

RoboTool

RoboChart model

Auto-generation

1 Manual translation

CSP semantics
(denotational)

Analysis (FDR)

CSP semantics
(operational)

Interaction Trees

Linked for deterministic processes

```
definition D__ChemicalDetector where
"D__ChemicalDetector (idd::integer) =
 (
   (
     (par_hide
       (discard_state (buffer0 []))
       ChemicalDetector_controllers_buffer_events
       (
         (
           (
             (rename D__MainController idd)
             ‖ (ChemicalDetector_controllers_sync_events)
             (rename D__MicroController idd)
           ) \ (ChemicalDetector_controllers_sync_events - (set [terminate_C ()]))
         )
         ‖ (set [])
         Memory_ChemicalDetector
       )
   ) ⟦ set [terminate_C ()] ▷ skip
 ) \ (set [terminate_C ()])
 )
"

export_code
  D__ChemicalDetector
  in Haskell
  module_name RoboChart_ChemicalDetector
  file_prefix RoboChart_ChemicalDetector
  (string_classes)
```