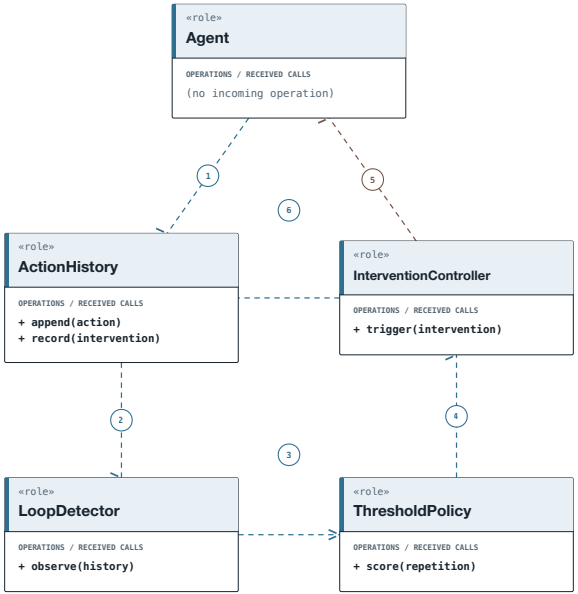
# P18 Hybrid loop detection

**Primitive / UML CLASS VIEW / ANALYTICAL MODEL**

Detect stalled or repetitive behavior.

**UML CLASS VIEW**

dashed arrow: call dependency · brown: return/failure · analytical, not an observed trace




**POINTCUT / PATTERN INTERFACE**

| | |
|---|---|
| CONTEXT | Successive agent observations or actions can repeat without progress. |
| TRIGGER | A loop signal crosses a configured threshold or composite condition. |
| STRUCTURE | Repetition signals, thresholds, and an intervention interface. |
| EFFECT | The harness diagnoses a loop and stops, redirects, or escalates. |

**CONTRACT / REQUIRED BEHAVIOR**

| | |
|---|---|
| REQUIRES | Action or observation history is available in comparable form. |
| ENSURES | Intervention is attributed to explicit evidence and recorded in the trace. |
| INVARIANT | A detector cannot block all exploration solely because outputs are similar. |
| VIOLATION | Detector error, disabled mode, or false positive has a recoverable path. |

**RELATIONSHIPS / ANALYTICAL CALLS**

number · caller → callee · message

1 Agent → ActionHistory append(action)
2 ActionHistory → LoopDetector observe(history)
3 LoopDetector → ThresholdPolicy score(repetition)
4 ThresholdPolicy → InterventionController trigger(intervention)
5 InterventionController ↩ Agent stop_or_redirect()
6 InterventionController → ActionHistory record(intervention)

**VARIATION / TEST / NEGATIVE CONTROL**

| | |
|---|---|
| VARIATION | Action repetition, observation similarity, semantic signals, and composite thresholds. |
| TEST_OBLIGATION | Test exact repeats, productive variation, false positives, and intervention. |
| NEGATIVE_CONTROL | A recursion depth limit alone is not semantic loop detection. |