# Functional cycle of task-relative causal-epistemic autonomy

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A six-stage feedback cycle connects perception and evidence, a mutable model bundle, metacognitive control, epistemic action selection, command execution, and the environment-body-sensor system. Language is shown as an optional interface, while normative and safety constraints externally restrict permissible actions.

## Six functional stages

## 1. PERCEPTION & EVIDENCE

observations $o_t$ and histories; action–outcome contingencies; held-out interventional evidence

## 2. MUTABLE MODEL BUNDLE

Model bundle at time t: world model; self model; revisable causal categories; uncertainty, limits and failure modes.; World model: environmental dynamics. Self model: body-sensor consequences.

## 3. METACOGNITIVE CONTROL

calibrate confidence; detect error and conflict; form and test fault hypotheses

## 4. EPISTEMIC ACTION POLICY

select discriminating interventions; investigate • abstain • retain/revise; optimize information under cost

## 5. COMMAND & EXECUTION

command $c_t$ → executed action $a_t$; efference–consequence consistency; closed-loop sensorimotor coupling

## 6. ENVIRONMENT • BODY • SENSORS

state change • action consequences; morphology, actuator, sensor shifts; hidden state retained for evaluation

## Feedback and revision

Main cycle: perception and evidence supplies evidence to the mutable model bundle; the bundle supplies predictions and uncertainty to metacognitive control; metacognitive control supplies information need and decision to the epistemic action policy; the policy supplies a command to command and execution; execution supplies an action to environment, body and sensors; new observation returns to perception and evidence. A revision arrow from metacognitive control to the model bundle is labelled revise, retain or abandon categories.

## Optional linguistic interface

input • explanation • report; not constitutive of autonomy

## Normative and safety constraints

permissions • costs • human oversight; external to the epistemic capability test

## Interpretive boundary

Functional dependencies, not mandatory software modules. No inference to phenomenal consciousness, moral agency, or legal personhood.

Public SVG: https://jandisleigenova.com/artigos/figuras/epistemic-autonomy-functional-cycle-en.svg