A Behavioral Interpretation of Resilience and Antifragility

Vincenzo De Florio

MOSAIC / Universiteit Antwerpen & iMinds

vincenzo.deflorio@gmail.com

ANTIFRAGILITY

RESILIENCE

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BEHAVIOR

RESILIENCE

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IDENTITY PRESERVING BEHAVIOR → INTERPLAY b/w (SYSTEM, ENVIRONMENT)

RESILIENCE

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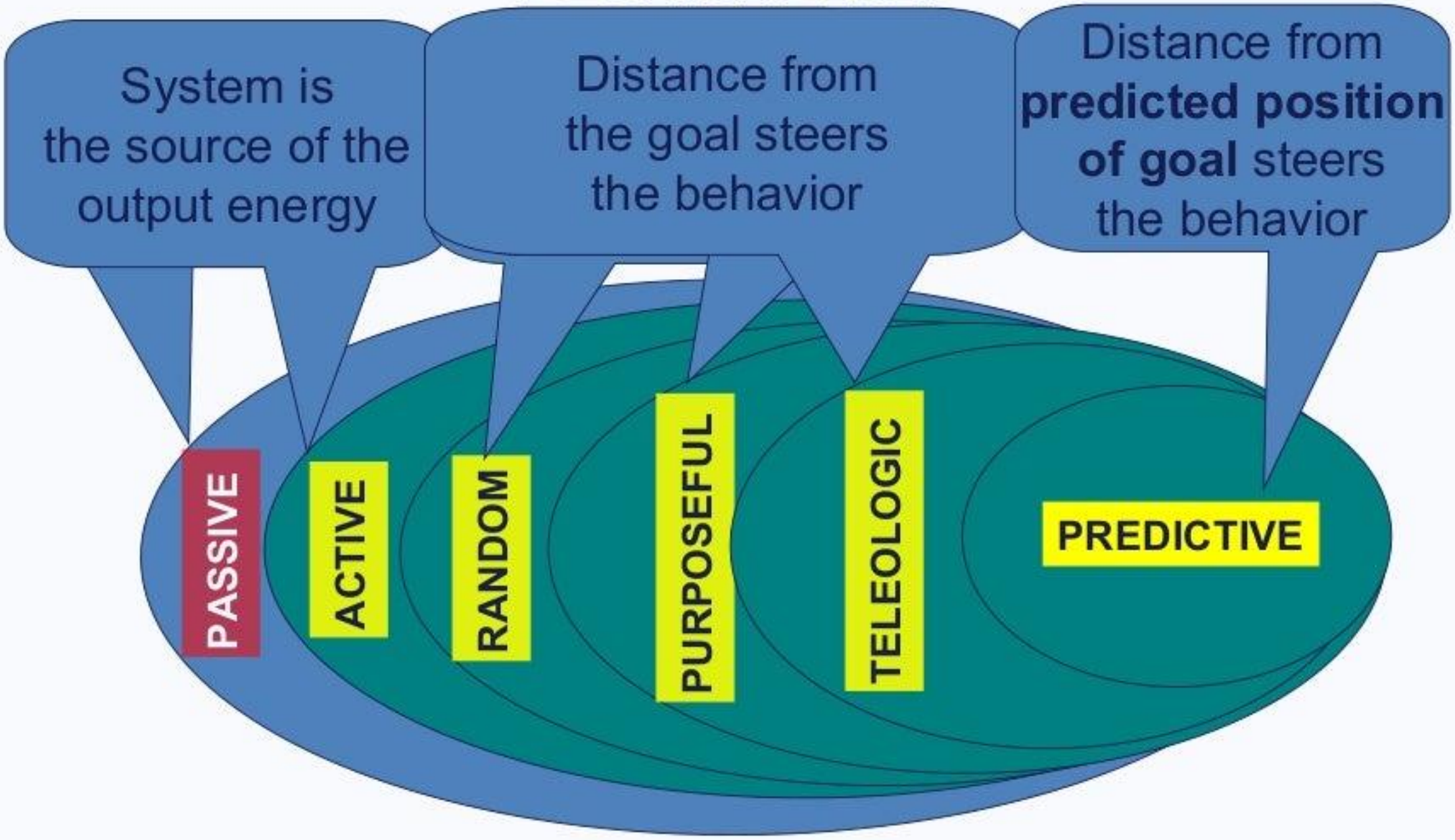
Behavioristic approach

- Rosenblueth, Wiener, & Bigelow, “Behavior, purpose and teleology”, Phi.Sci. 10 (*1943*!):
- “Given any **system** relatively abstracted from its **environment** for study, the behavioristic approach consists in the examination of **the output of the system** and of **the relations of this output to the input**.
  - By **output** is meant **any change produced in the environment by the system** .
  - By **input**, conversely, is meant **any event external to the system that modifies this system in any manner**

Behavior



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Behavior classes

- From a systemic point of view:
- Passive < active;

random < purposeful < teleological < predictive .

Resilient behaviors

- **Active behavior** intended to **retain the system identity**
- Aristotelian Entelechy!
  "Being at work while staying the same"

Resilient behaviors

- Active behavior, thus

1. **only purposeful**
2. **only teleological**
3. **predictive**

Resilient, only-purposeful behavior

- **ELASTICITY**
  "The ability of a body that has been subjected to an external force to recover its size and shape, following deformation"
  (McGraw-Hill, 2003)
- No "advanced" behavior; system just makes use of its internal characteristics and resources so as to *mask* the action of external forces

→ Redundancy-based.

Resilient, teleological & predictive behaviors

- **ENTELECHISM**
- System is able to exert **teleological or predictive behaviors**; it continuously adjusts its functions to compensate for changes
- so as to **persist** one's “identity”
- **IDENTITY**: a system's **peculiar** and **distinctive** **functional** and **non-functional** features

Identity

- Ability to "comply to one's definition"
- Related to fidelity: "compliance between corresponding figures of interest in two separate but communicating domains"
- More in "Antifragility = Elasticity + Resilience + Machine Learning. Models and Algorithms for Open System Fidelity", http://goo.gl/VvtXRt

Resilient behaviors (cont.d)

- Active behavior, thus

1. **only purposeful** } ELASTICITY
2. **only teleological** } ENTELECHISM
3. **predictive** } ENTELECHISM
4. **Auto-predictive & evolving** } ANTIFRAGI-LITY

Computational Antifragility

- Behavior of a system that
  - predicts future sys-env fit
  - learns from the past & evolves
- "Being-at-work while improving-the-self"
- System does not stay the same: The feedback changes the "self"
- Resilience + machine learning (see cited paper)

IDENTITY
PRESERVING

INTERPLAY b/w

BEHAVIOR → (SYSTEM, ENVIRONMENT)

RESILIENCE

ANTIFRAGILITY

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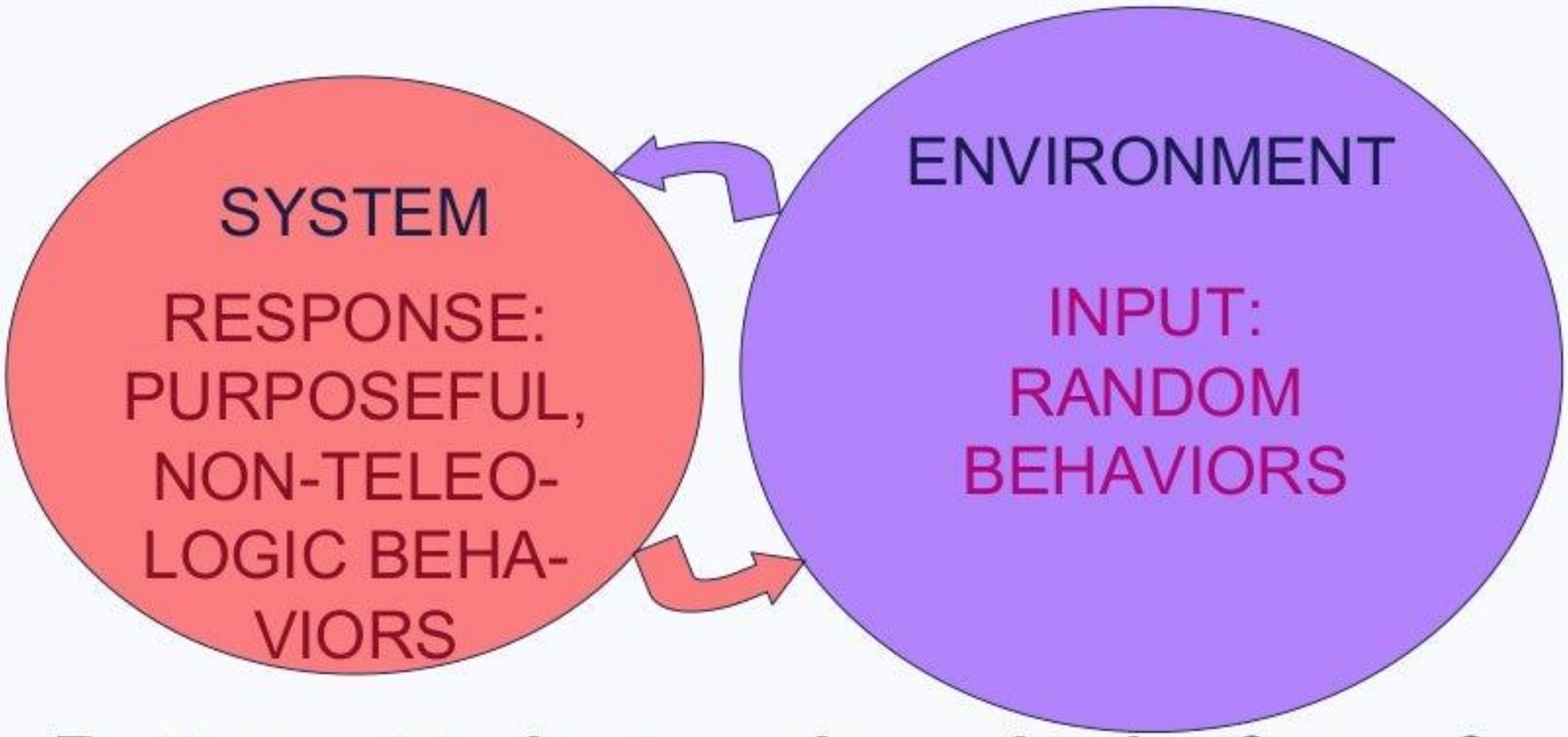
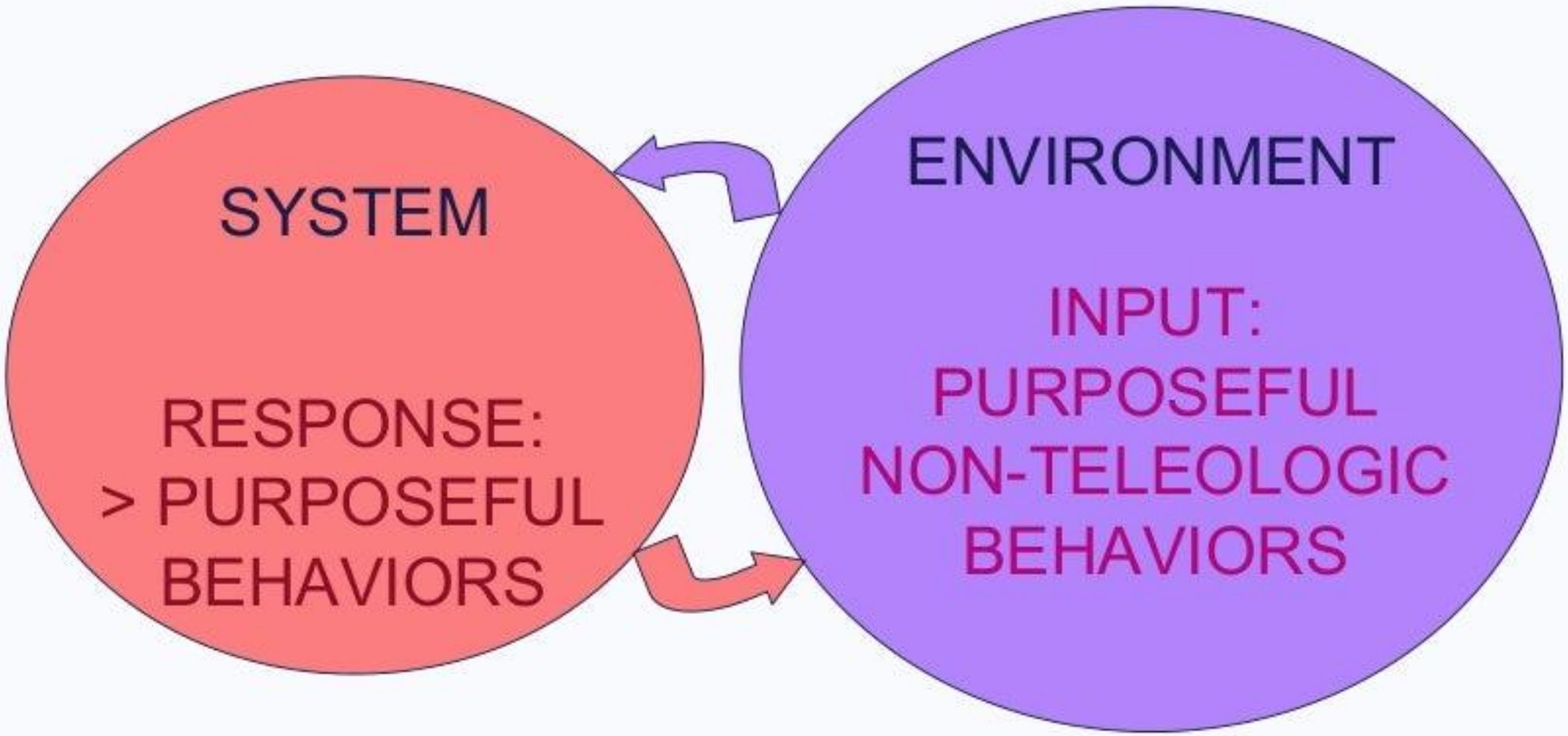
Resilience: Interplay(S, E)

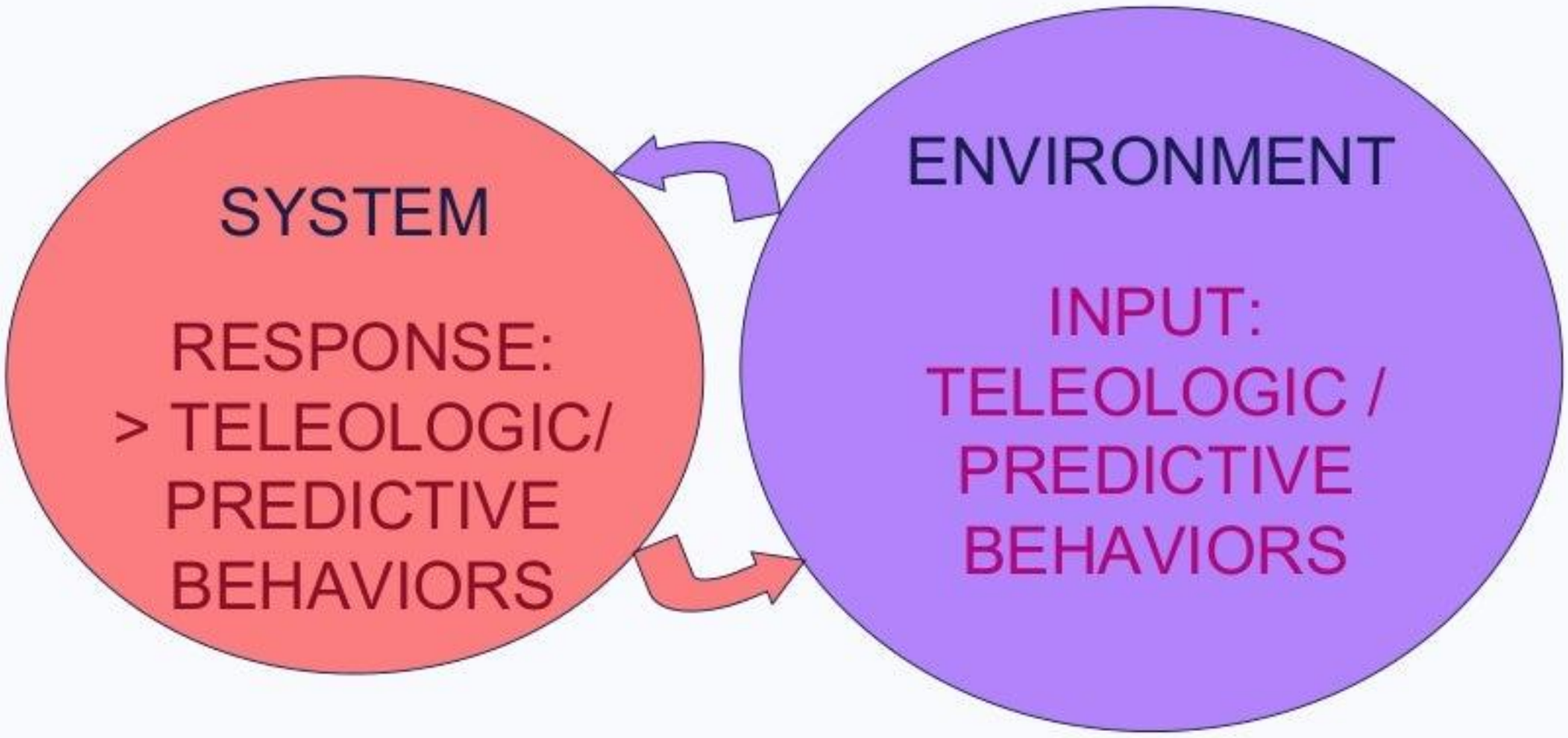


Better not to be too clever in the face of a turbulent environment!

Resilience: Interplay(S, E)



Resilience: Interplay(S, E)



"Behavioral" Game Theory

SYSTEM \ ENVIRONMENT	Passive	Random	Purposeful	Teleologic	Predictive	Antifragile
Passive	?,?	-1,1	-1,1	-1,1	-1,1	-1,1
Random	1,-1	?,?	-1,1	-1,1	-1,1	-1,1 (*)
Purposeful	1,-1	1,-1	?,?	-1,1	-1,1	-1,1
Teleologic	1,-1	-1,1	1,-1	?,?	-1,1	-1,1
Predictive	1,-1	-1,1	1,-1	1,-1	?,?	-1,1
Antifragile	1,-1	1,-1 (*)	1,-1	1,-1	1,-1	?,?

(*): if a player can learn that the other one is behaving randomly

Antifragility

- Conjecture: antifragility is (also) the ability to be "auto-resilient":
  - Monitor/Analyze/Learn the behaviors of the "opponent"
  - Adjust one's behavior so as to maximize the chances to "win"
  - Learn from mistakes and successes