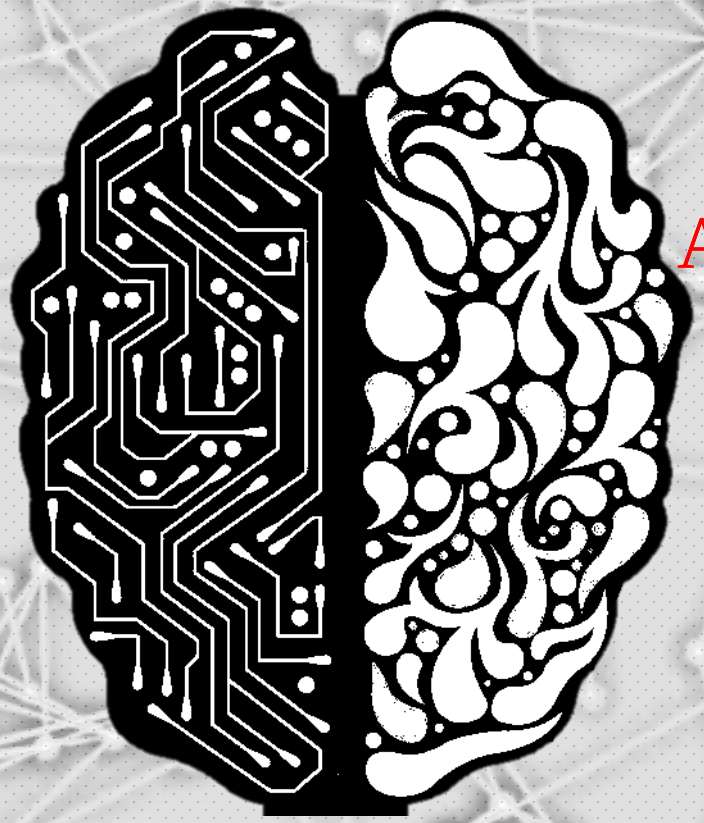


Multi-Agent Systems

Lecture IV

- Dr. Nestor Velasco Bermeo,

- Researcher CONSUS (Crop OptimisatioN through Sensing, Understanding & viSualisation),
- School of Computer Science
- University College Dublin (UCD)

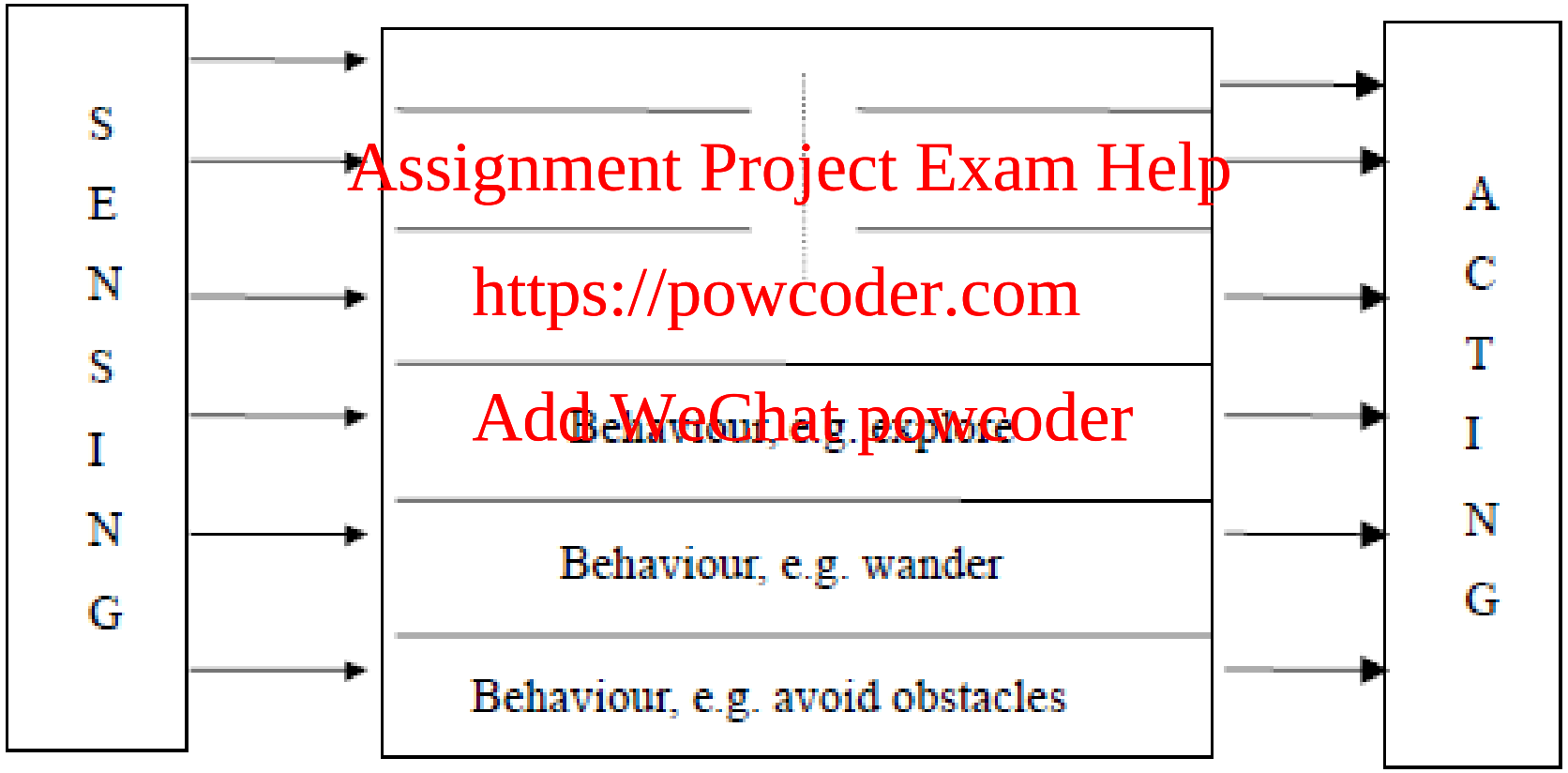
Lecture IV Learning Objectives

- ❑ Review the difference between reactive and deliberative agent architectures
- ❑To understand the Belief-Desire-Intention Architecture
- ❑To understand the different classes of Agent Communication.
- ❑To understand the different classes of Commitment Strategies.
- ❑To understand the principles and importance of Speech Acts

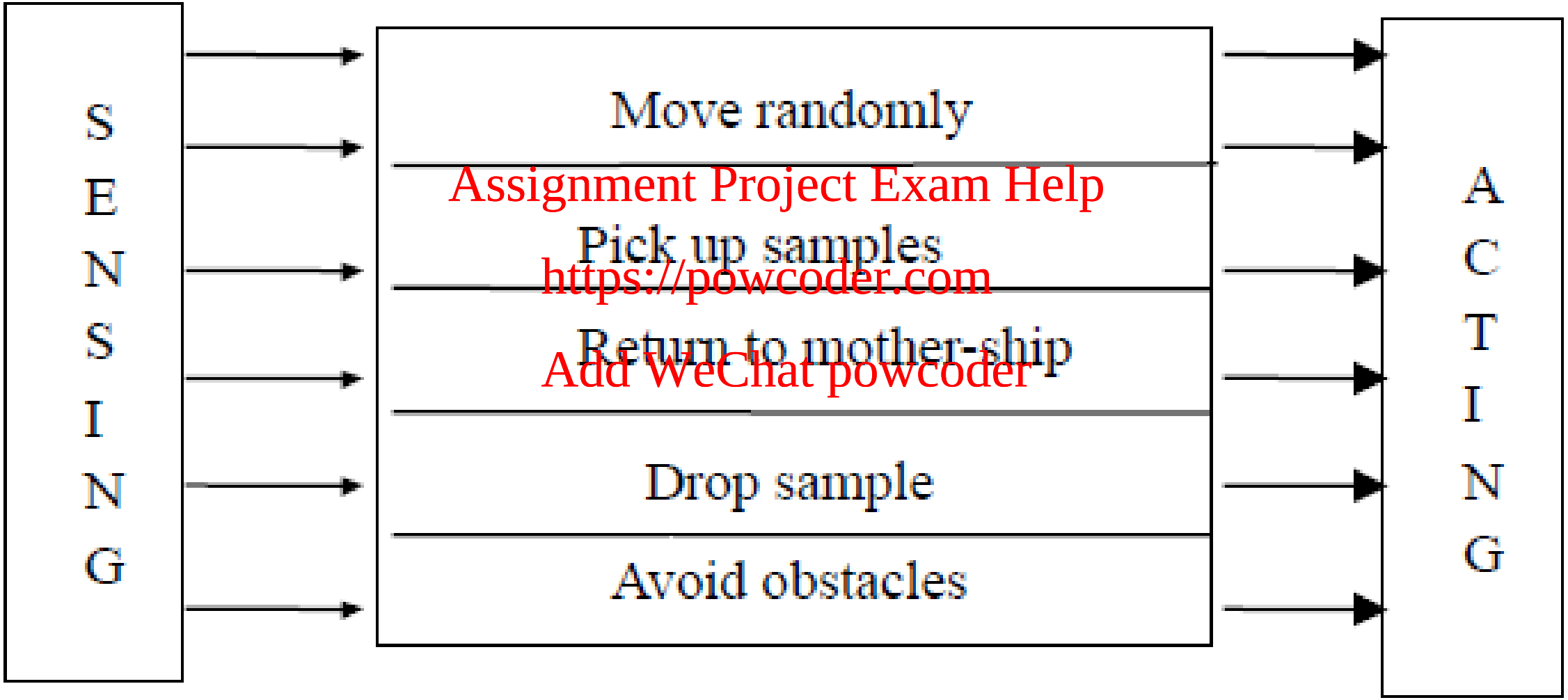
Why Deliberative Architectures

- Agents with reactive architectures:
  - Can’t reason over hypothetical elements or situations.
  - Perform poorly in environments where actions can’t be ignored if proven to be unwise.
  - Can’t organize activities over time to coordinate with other agents.
  - Represents simple behaviour.
- It’s complicated to present an “intelligent” behaviour from a purely reactive architecture.

Simple Reactive Structure



Another Example… (MES)



Mars Explorer System

- Implements Brooks' Subsumption Architecture
- Hierarchy of task accomplishing behaviours
- Follows simple-rule structure
- Competing for control
- represented as augmented finite state machines (AFSM)
- Triggered when an input surpasses a threshold
- lower level modules can inhibit those in higher levels
- modules are grouped and placed into layers

Deliberative Architectures

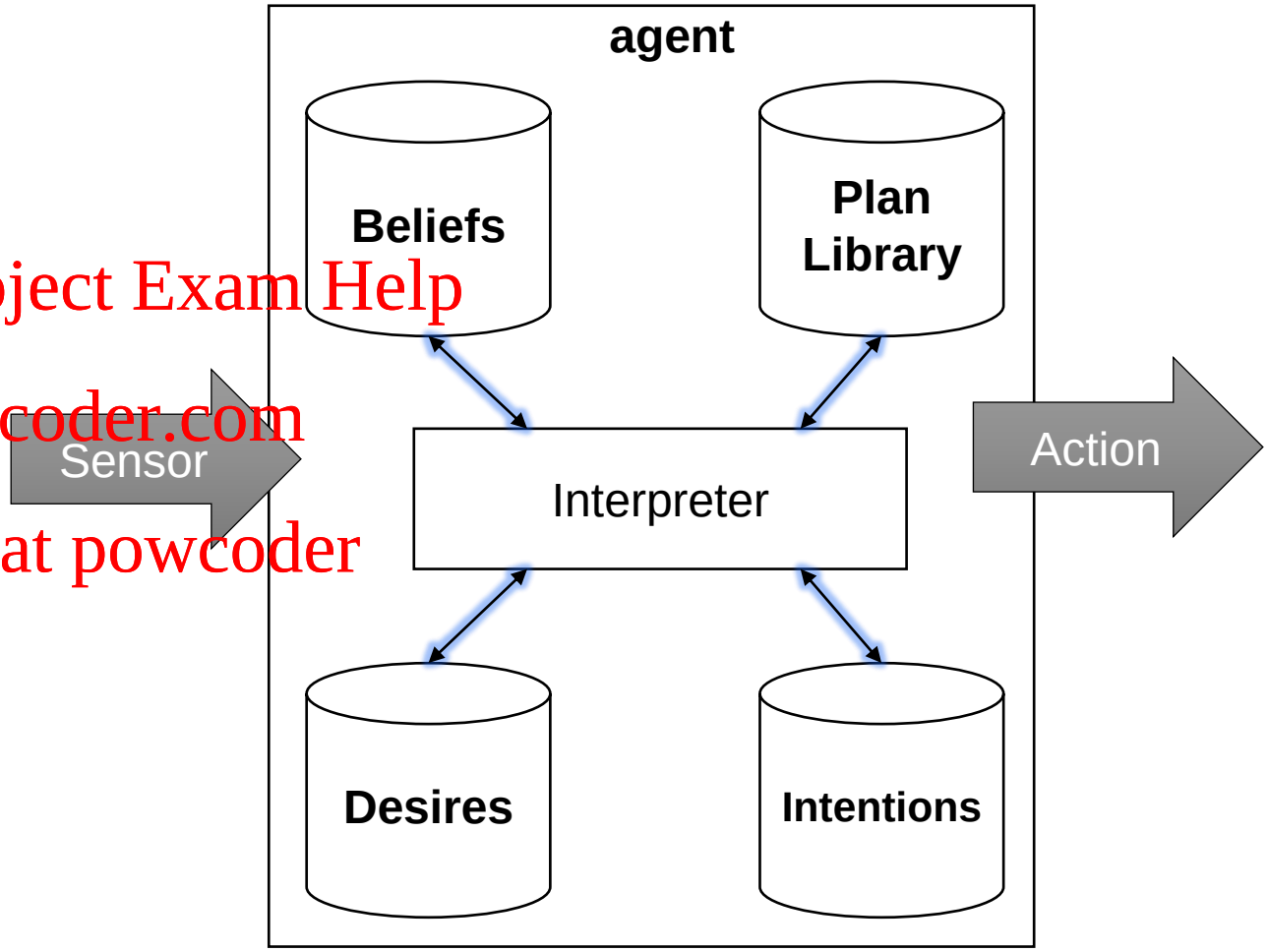
- BDI - Belief Desire Intention
- PRS- Procedural Reasoning Systems
- IRMA - Intelligent Resource-Bounded Machine Architecture

Belief Desire Intention Architecture

- Employed in the development of Reflective Systems.
- Based on Michael Bratman's philosophical model of human practical reasoning.
- The term BDI is attributed to Rao and Georgeff (1992).
- Models the reflective process in terms of the interplay between these three mental attitudes.
- Implemented model of practical reasoning agents

Procedural Reasoning Systems (PRS)

- Each agent is equipped with a **plan library**
- Such library represents agent's procedural knowledge.
- No plans == No Options
- Agents with PRS posses explicit BDIs



Intelligent Resource-Bounded Machine Architecture (IRMA)

- Based on the following data structures:
  - Plan library
  - Beliefs
  - Desires
  - Intentions
- But also:
  - Reasoner
  - means-end analyser
  - Opportunity analyser (environment monitor & Option generator)
  - Filtering process (compatibility)