Multi-Agent Systems

Lecture IV

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- Let us consider these three mental attitudes:
  - **Beliefs**
  - **Desires**
  - **Intents**

- **Beliefs:** represent environment characteristics, which are updated accordingly after the perception of each action.

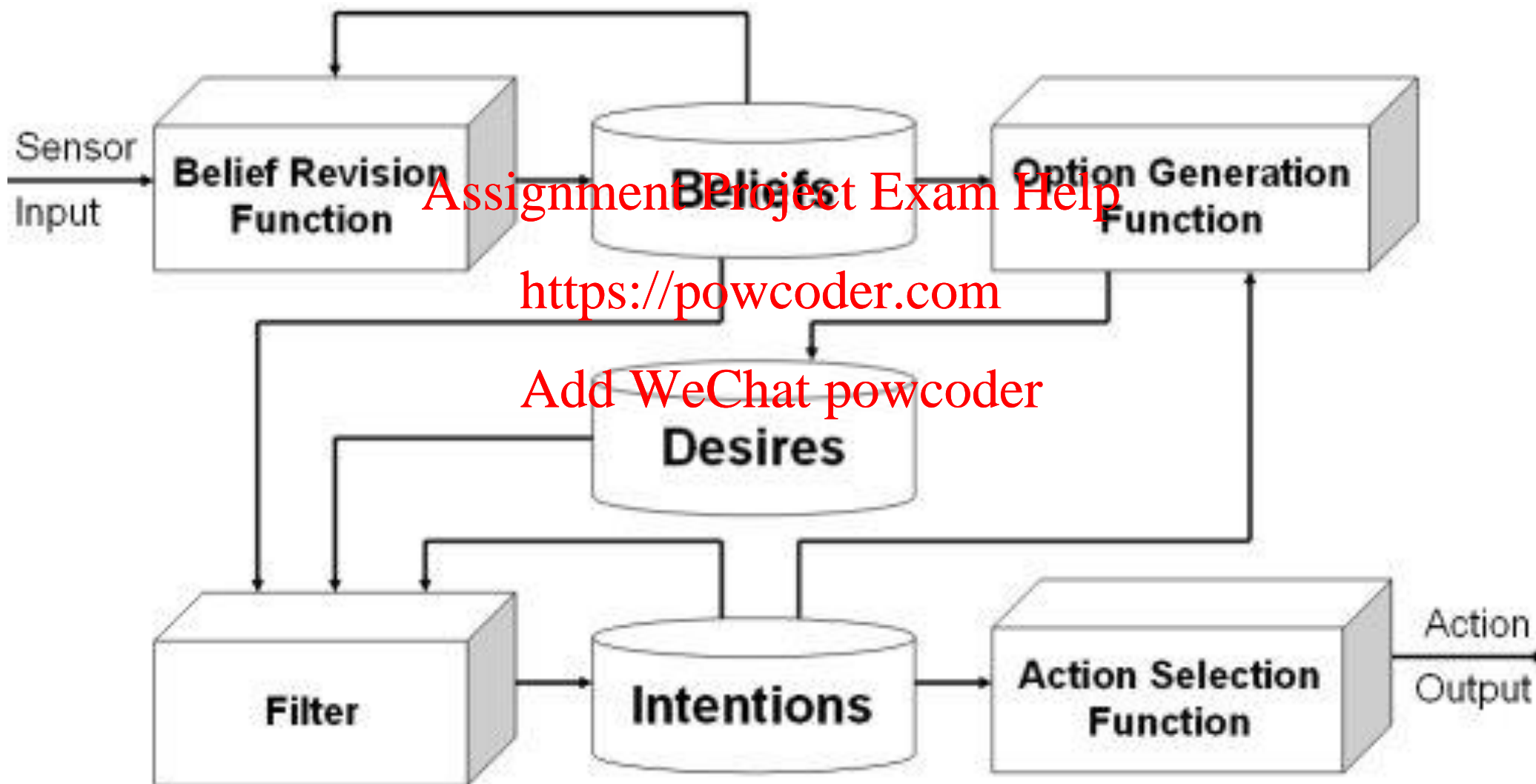• **Desires:** Store information of; goals, properties and costs associated.

• **Intentions:** current action plan chosen. Captures the **deliberative** component of the system.

Practical Reasoning in a BDI agent

Sensor Input

Belief Revision Function

Beliefs

Option Generation Function

Desires

Filter

Intentions

Action Selection Function

Action Output

Practical reasoning in a BDI agent

- **Belief revision function;** takes a perceptual input and the agent's current beliefs, and on the basis of these, determines a new set of beliefs;

- **Beliefs (current);** represent information about its current environment;

- **Option Generation Function;** determines available options, on the basis of its current beliefs about its environment and its current intentions.

Practical reasoning in a BDI agent

- **Filter;** (function) agent's deliberation process, determines intentions based on the current **BDIs**;

- **Set of current options;** representing possible courses of actions.

- **Intentions (Set);** agent's current focus

- **Action selection function;** determines an action to perform on the basis of current intentions.

Early Multi-Agent Environments

❑ ABE (Erman et al 1988)

❑ ARCHON (Wittig 1989)

❑ CooperA (Sommaruga et al 1989)

❑ MACE (Gasser et al 1987)

❑ MADE (Wooldridge & O'Hare 1990)

❑ Agent Factory (O'Hare 1992)

❑ MCS (Doran et al 1991)

❑ GBB (Hayes-Roth et al 1988)

Classes of Commitment Strategies

- Several degrees of commitment may be exhibited by agents.

- Rao and Georgeff identified three discrete points on this commitment continuum:

- ❑ **Blind Commitment**

- ❑ **Single-Minded Commitment**

- ❑ **Open-Minded Commitment**

Blind commitment is defined as the adherence to a commitment until such time as the agent believes it has achieved the commitment.

Single-Minded Commitment

- Single-minded commitment represents a relaxation of blind commitment in that the agent will not drop its commitments unless it believes that they are no longer achievable.

- The computational overhead of ascertaining whether a given goal is achievable can be considerable.

- Rao and Georgeff suggest that this can be achieved by permitting belief revision but not goal revision.

Open-Minded Commitment

- Open-minded commitment offers a further relaxation in that an agent is willing to revise its goals and beliefs, retaining commitments that are still compatible with its goals.

Coordination through Communication...

- Coordination represents the problem or activity of reconciling the actions of the individual agent with those of the *group* or indeed *organisation.*

- Since agents actions are derived from their goals and since agents are frequently *benevolant* there **will** inevitably be conflict.

- Such *interference* can only be reconciled through communication.