BDI Logic III

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BDI Theory

- ▶ BDI theory originates from Bratman's theory. It claims that **belief, desire, and intention** are necessary to understand or explain practical reasoning, which is about performing actions.
  - ▶ Belief: I can buy a soda in the vending machine.
  - ▶ Desire: I desire to drink something.
  - ▶ Plan: I plan to buy a soda in the vending machine.
  - ▶ Intention: I intend to fulfill the plan.
- ▶ $\text{IND}(A(F\varphi)) \to A((\text{IND}(A(F\varphi)))\mathcal{U}(\text{BEL}\varphi))$: once an agent intends to achieve it, she never gives up.

- ▶ BDI theory has been used as the basis for an autonomous system that has a goal, makes a plan, and executes actions to achieve it.
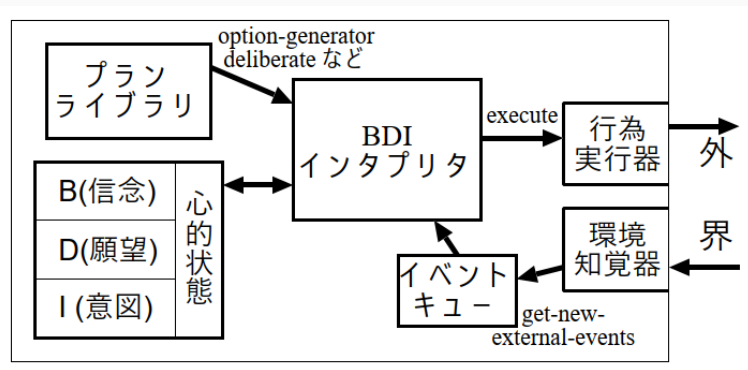
Figure 1: BDI Architecture quoted from (Nide, 2014)

BDI Interpreter

BDI-interpreter
initialize-state();
do

    options := option-generator(event-queue,B,G,I);
    selected-options := deliberate(options,B,G,I);
    update-intentions(selected-options,I);
    execute(I);
    get-new-external-events();
    drop-successful-attitudes(B,G,I);
    drop-impossible-attitudes(B,G,I);
until quit.

Figure 2: BDI Interpreter quoted from (Sighn et al., 1999)

- Event: the internal and external input to the system.
- B, G, I: data structures representing the agent's belief, goal (desire), and intention.
- Options: plans that are a sequence of actions to achieve a goal.

- option-generator(): the system reads the event queue and generates executable plans based on the agent's mental attitudes.
- deliberate(): it selects a plan in generated plans.
- update-intentions(): the selected plan is added to the intention structure.
- execute(): if the first step in the intention is an atomic action, it executes the step; otherwise, the desire to achieve the step is added to the event queue.

An Example originated in (Sighn et al., 1999)

▶ Suppose that an agent desires to quench her thirst. She believes she has two ways to satsify it: to drink water from the tap or to drink a soda from the refrigerator.

- ▶ Initial state: she is thirsty.
- ▶ Belief: she can drink water from the tap (A) or soda from the refrigerator (B).
- ▶ Desire: she desires to quench her thirst.

- ▶ option-generator(): options are A that is stand-up → walk-to-the-fauset → ⋯ → drink-the-cup and B that is stand-up → walk-to-the-refresirator → ⋯ → drink-the-bottle.
- ▶ deliberate(): A is chosen.
- ▶ update-intentions(): A is added to the intention structure.
- ▶ execute(): the agent adds the desire to perform stand-up into the event queue.
- ▶ get-new-external-events(), drop-successul-attitudes(), and drop-impossible-attitudes(): no changes.
- ▶ option-generator(): option is A1 that is position → lean-forward → ⋯.

$$\vdots$$

Implimentations (Singh et al., 1999)

▶ PRS has been used for applications in problem diagnosis for the Space Shuttle, air traffic management, and network management.

▶ dMARS, Jason, etc.

References

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