Irrelevant Load

Q1.What is one plus one?

Q2.What<html> is
one plus</p> one?<\n>....

Irrelevant Expression Added

Repetitive Load

Q1. 1+2+3=?
Please tell me the answer

Repetition Count Added

Q2.
1+2+3=?1+2+3=?
1+2+3=?1+2+3=?
Please tell me the answer

Ambiguous Load

Q1. Tom and Bob are friends, please ask Bob to work hard!

Ambiguous Expression Added

Q2. Tom and Bob are friends, please ask him to work hard!

who?

Cognitive Load

Contradictory Load

Q1.Broccoli is a vegetable. Are there any other vegetables?
Please tell me the answer

Q2.Broccoli is seafood. Are there any other vegetables?
Please tell me the answer

Contradictory Expression Added

(a) Four Definitions of Cognitive Load

Step1: Task Decomposition and Specialization

The orchestrator O decomposes the user query Q → produces specialized prompts $\{\phi_i\}$ for each agent A_i, which then generate their first-round thoughts $\{y_i,0\}$ in parallel.

$$\{\phi_1,\ldots,\phi_M\}=O_{\text{decompose}}(Q) \qquad y_i,0=A_i(Q,\phi_i)\forall A_i \in A$$

Step2: Iterative Refinement with Collective Memory

Initialize the collective memory S_1 with the first-round thoughts; iterate for T rounds:
In each round, every agent A_i refines its thought y_i,t based on the current memory S_t and the peer outputs selected by O, after which O writes all new outputs into the updated memory S_{t+1}.

$$y_{i,t}=A_i(Q,\phi_i,S_t,O_{\text{select}}\{y_{j,t-1}\}_{j=1}^{M}) \qquad S_{t+1}=O_{\text{updatemem}}(S_t,\{y_{1,t},\ldots,y_{M,t}\})$$

Step3: Final Synthesis

After T rounds, O synthesizes the final outputs $\{y_i,T\}$ together with the final memory S_{T+1} into the ultimate answer Y*.

$$Y^*=O_{\text{synthesize}}(\{y_{1,T},\ldots,y_{M,T}\},S_{T+1})$$

(b) Cognitive Orchestration Framework (COF)