Multi-agent system for BESIII analysis

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on behalf of Dr. Sai working group

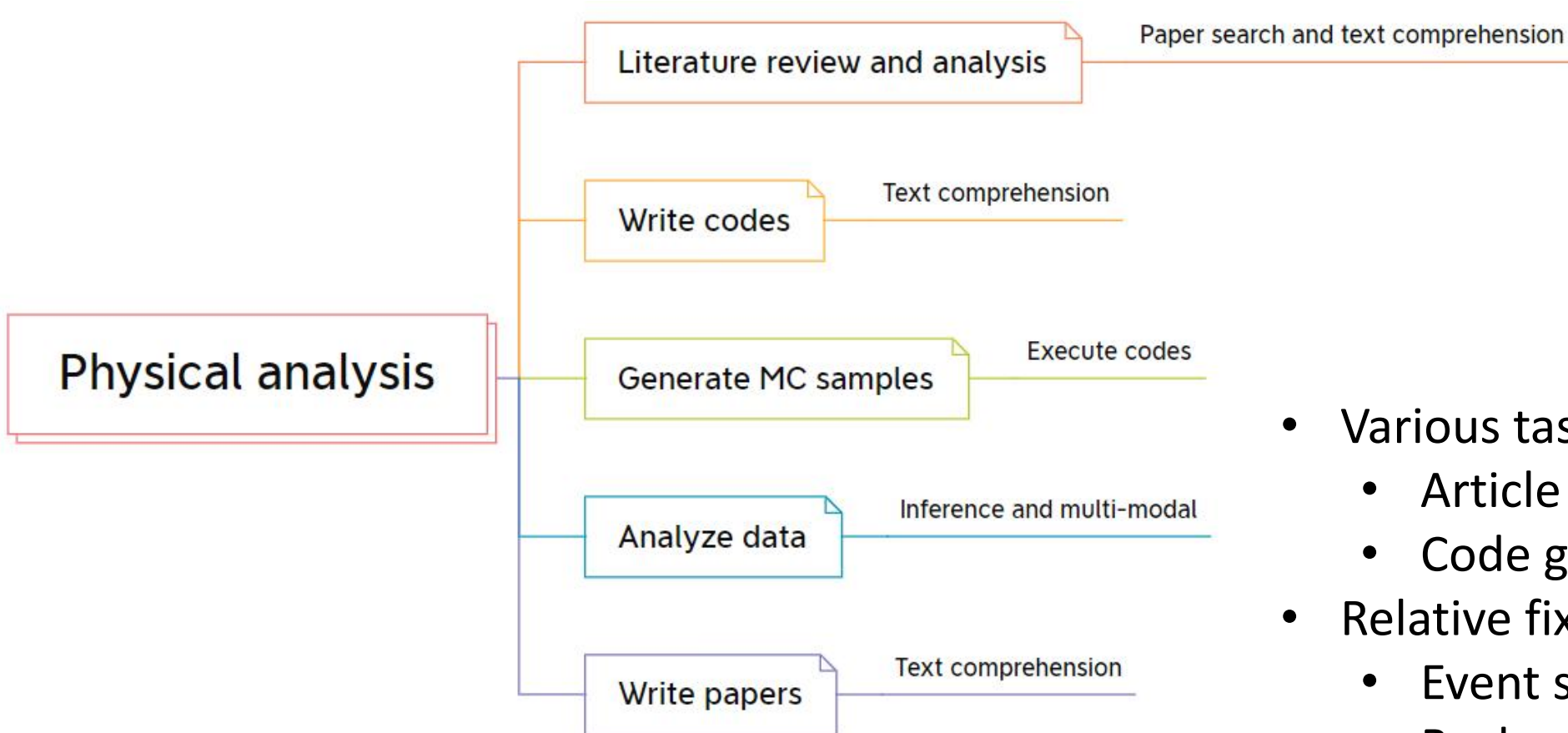Joint-efforts from IHEP-UCAS-LZU-JLU

QCML, ChangChun

2024.08.06

Outline

1. Introduction

2. BESIII AI

3. What is agent

4. Agents in BESIII AI

5. Work flow

6. The task tree

7. Summary

Introduction

Literature review and analysis — Paper search and text comprehension

Write codes — Text comprehension

Physical analysis

Generate MC samples — Execute codes

Analyze data — Inference and multi-modal

Write papers — Text comprehension

General process of BESIII analysis

- Various tasks about text
  - Article polishing
  - Code generation
- Relative fixed analysis process
  - Event selection
  - Background analysis
- **Suitable to use AI assistance!**

Introduction
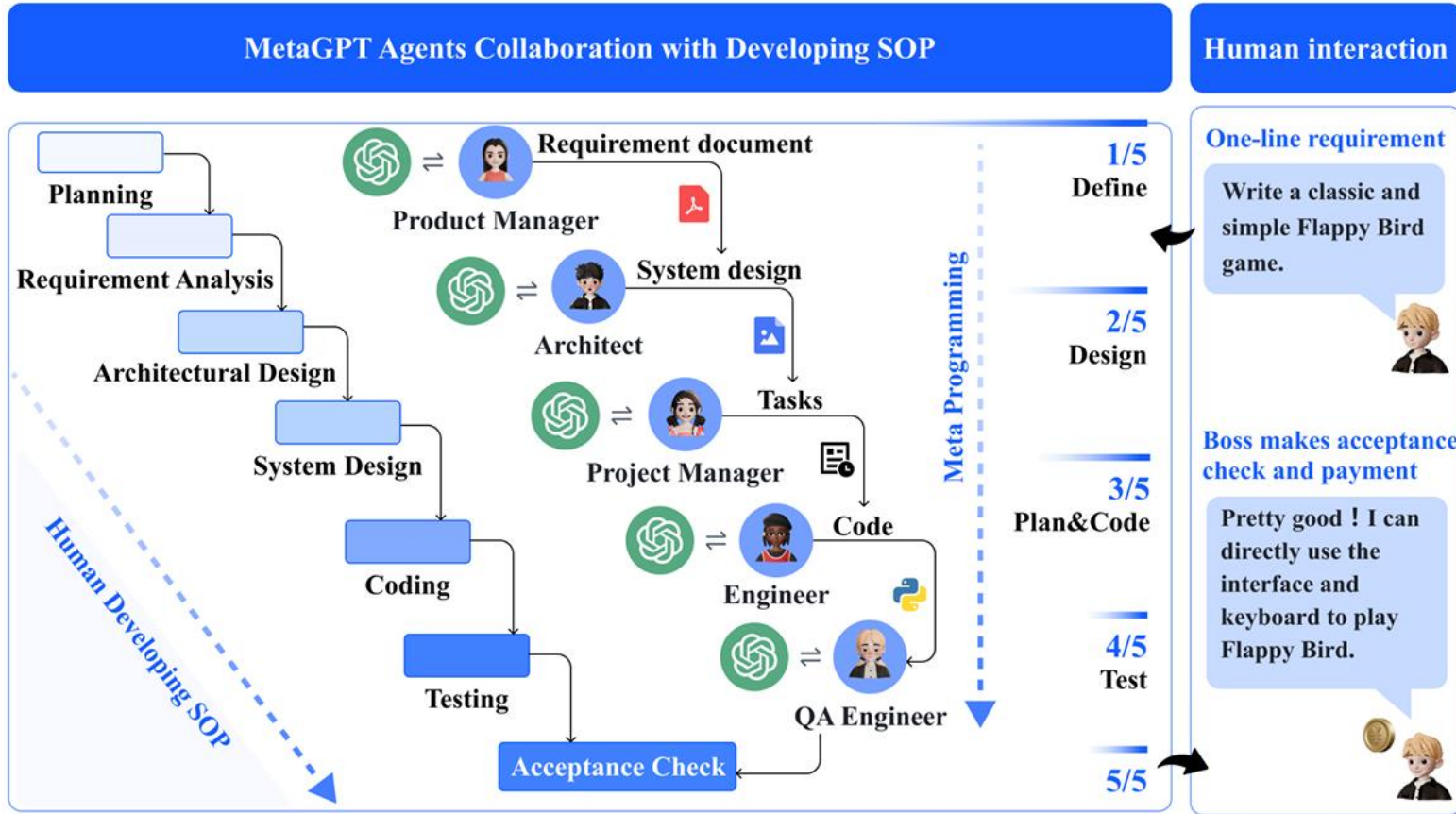
Generative agents: form a virtual town

arXiv: 2304.03442

- Agents with different identities
- Communication with NLP

Introduction

MetaGPT: Meta Programming for A Multi-Agent Collaborative Framework
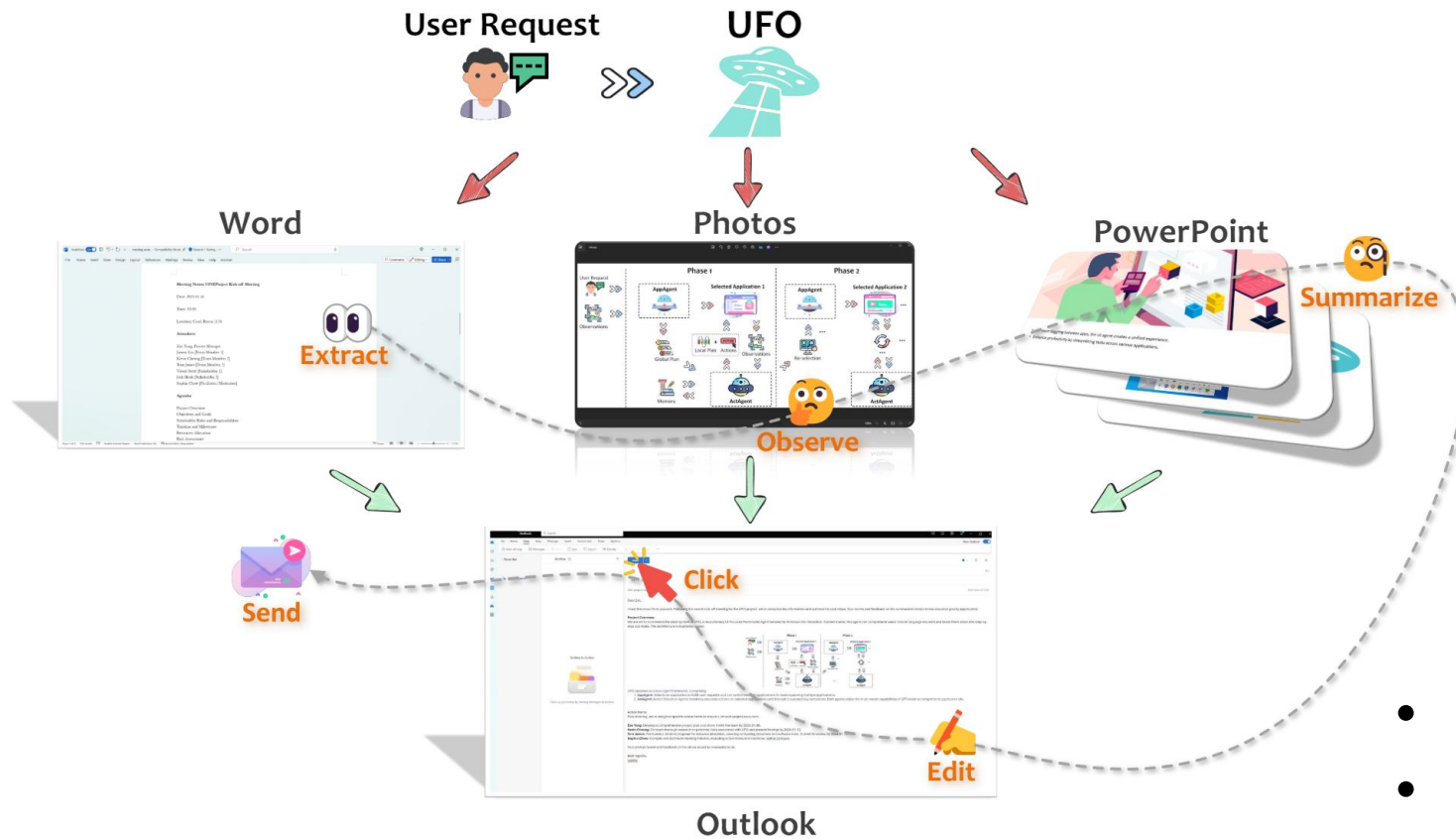

- SOP (Standardized Operating Procedures)
  - task decomposition
  - effective coordination

arXiv: 2308.00352

Introduction

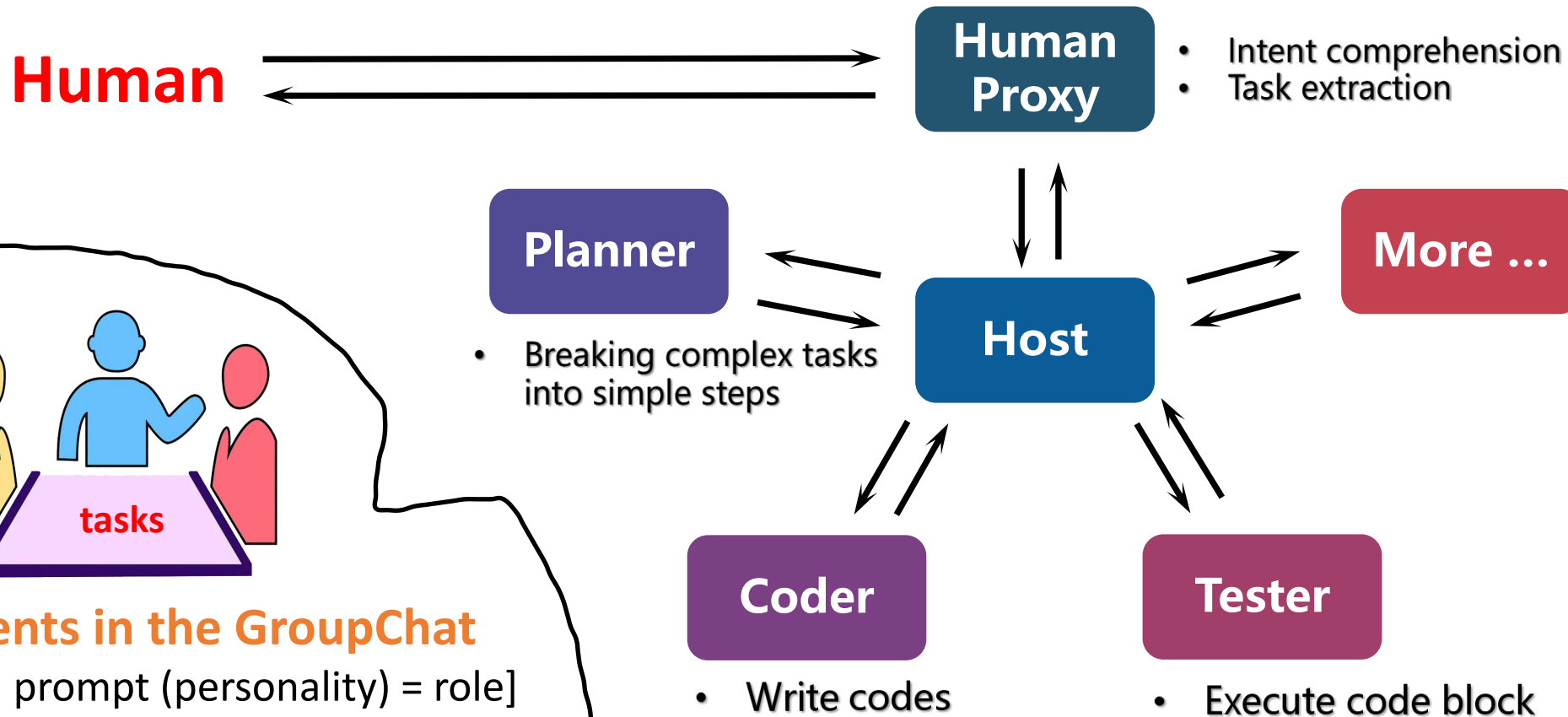UFO: A UI-Focused Agent for Windows OS Interaction (based on Pywin32 and GPT-Vision)

- Understand user intent
- Operate software on behalf of users

arXiv: 2402.07939

BESIII AI
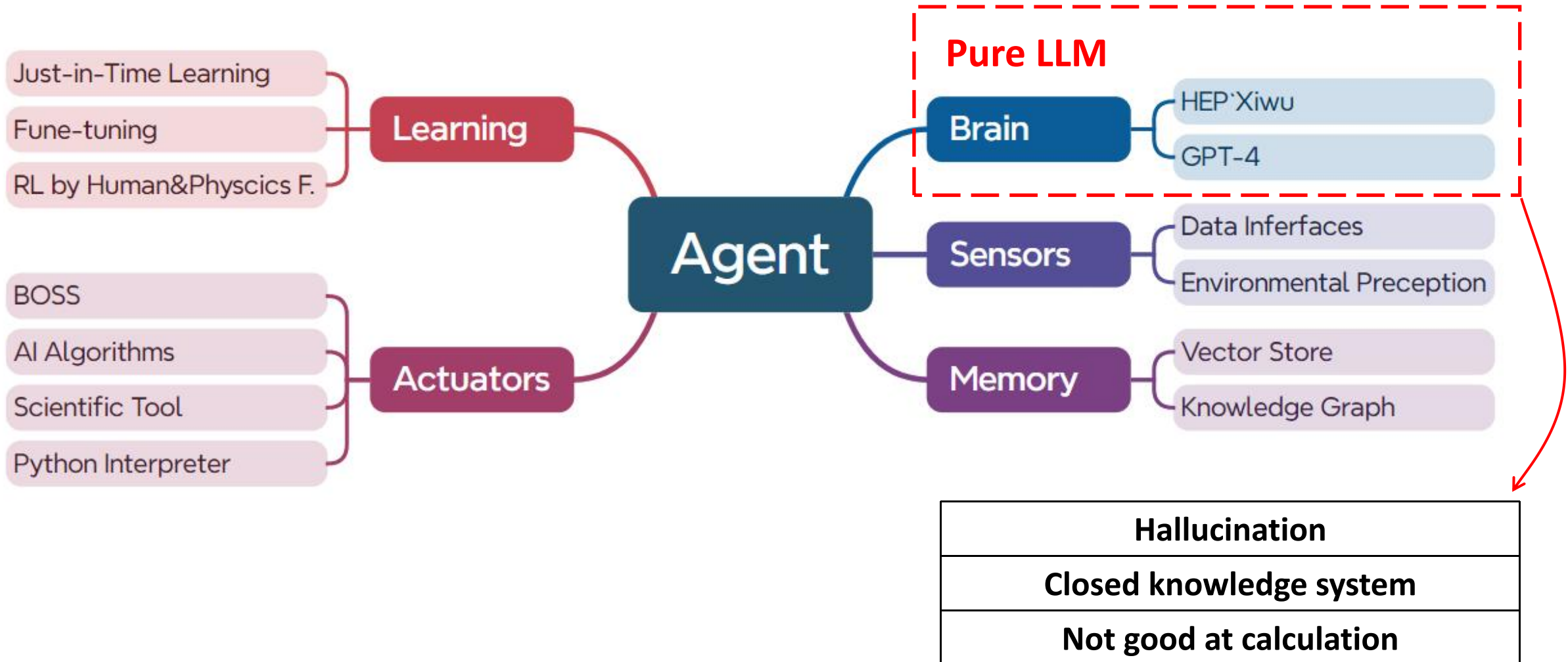
Dr. Sai's multi-agent collaborative system - handling complex tasks
- Based on AutoGen framework. (arxiv: 2308.08155)
- Each agent is equipped with specific knowledge, tools, and LLM.
- Improve work efficiency by assigning the right task to the right agent.

Human

Human Proxy
- Intent comprehension
- Task extraction

Planner
- Breaking complex tasks into simple steps

Host

More ...

Coder
- Write codes

Tester
- Execute code block

Roles/Agents in the GroupChat
[LLM + system prompt (personality) = role]

tasks

What is agent

An entity that can perceive its environment, make decisions, and take actions in order to reach certain goals or sets of goals.
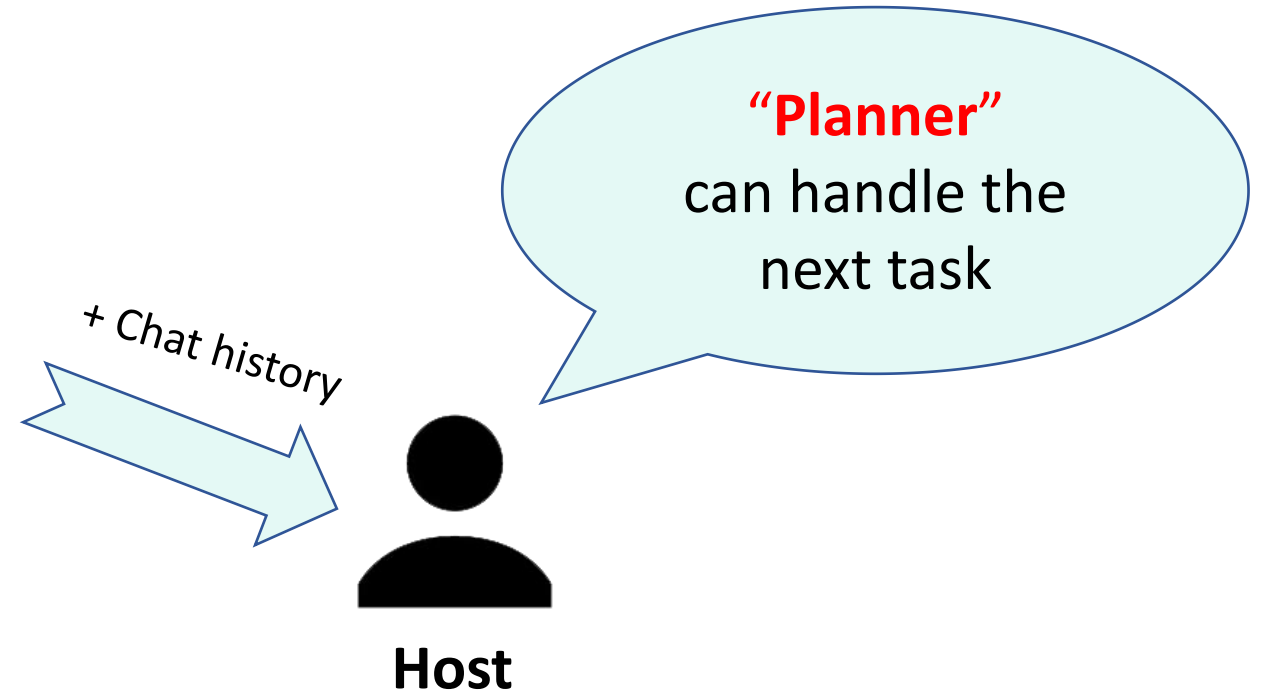
Agents in BESIII AI

Agents in BESIII AI

- Break down complex tasks into executable simple steps
- Use CoT, Chain of Thought

Planner

Coder

Tester

- Write code based on task content
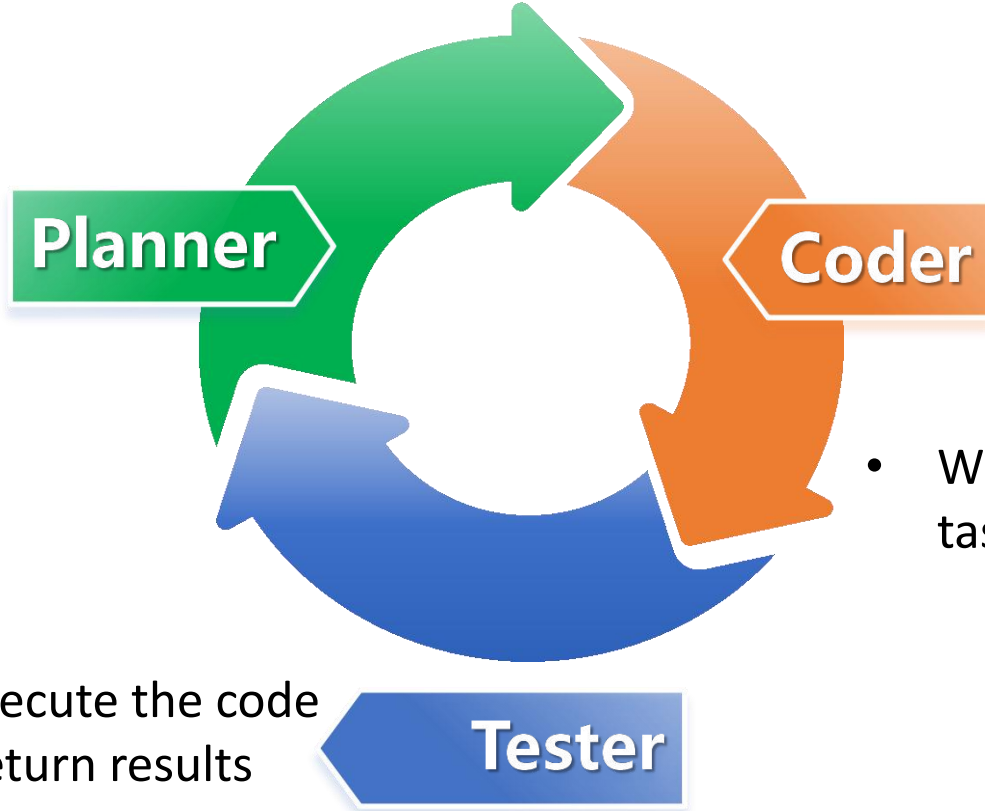
- Execute the code
- Return results

A typical collaboration process

👤 Human proxy
- Extract executable tasks from user query

👤 Navigator
- Link to external search engines
- Arxiv, DocDB/PDG(unfinished)

👤 Editor
- Polish scientific writings

👤 Charm
- Other tasks
- General reply

Agents in BESIII AI

Adaptation for BESIII analysis:

BESIII knowledge +

(RAG)

|		
Planner	=	provide more suitable and executable tasks related to the general BESIII analysis process and tools
Coder	=	provide common event selection codes and BOSS scripts
Tester	=	connect to the BOSS environment
Navigator	=	search in the internal DocDB, etc...
Editor	=	refer to the standard templates of BESIII memo/draft
Charm	=	other BESIII related knowledge, such as public/internal webpages, data paths...

Work flow
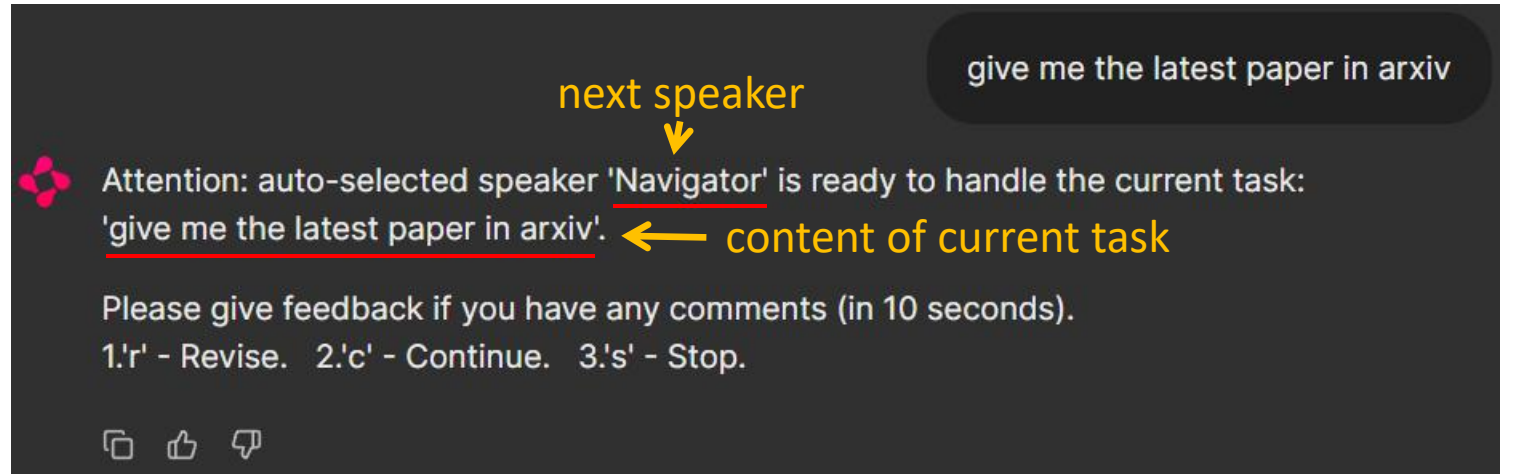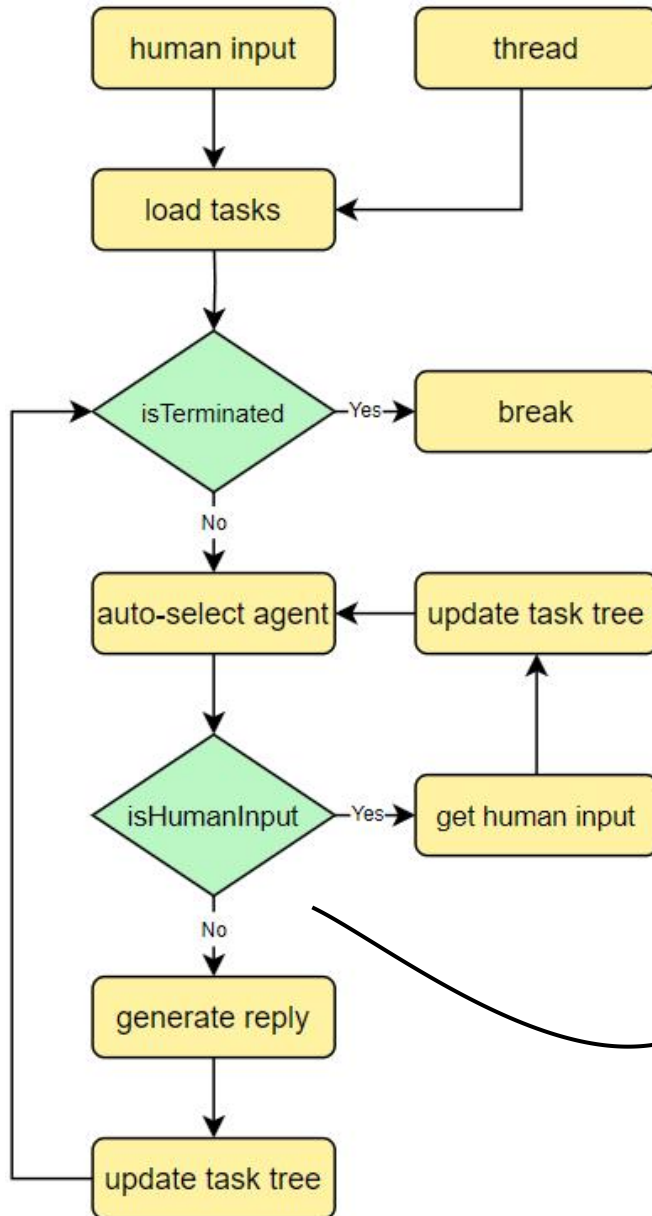
- Adequate information for human

- Sufficient modifications before execution
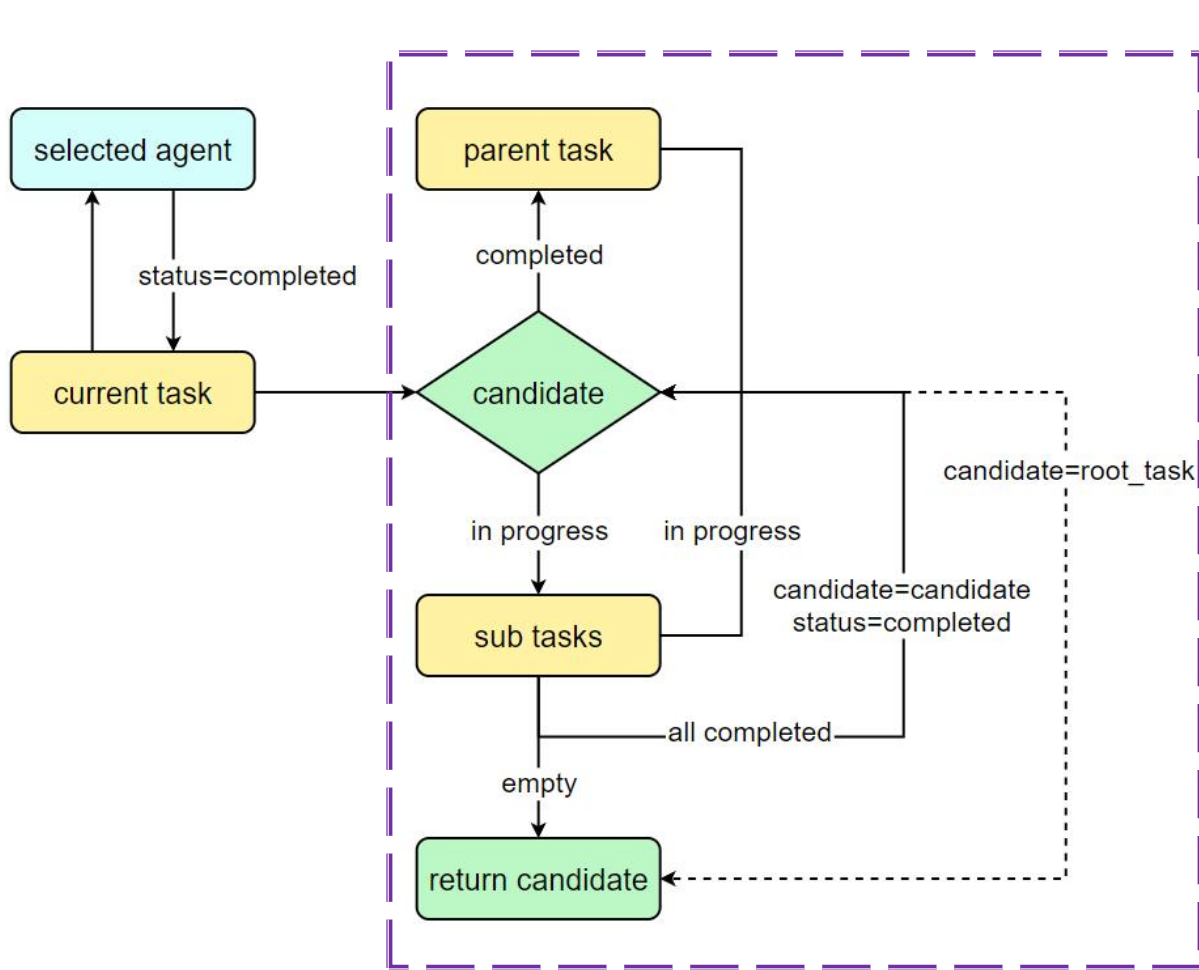
The task tree

Hierarchical task model

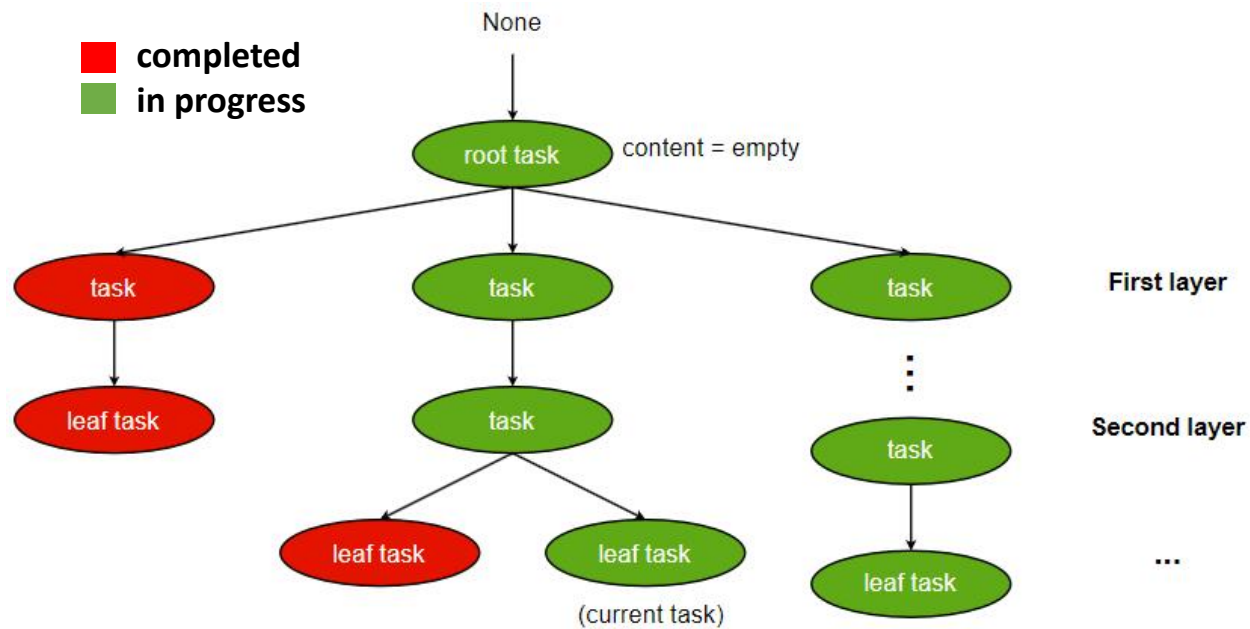- clear task decomposition

- easy to management

1. id   2. created time
3. content   4. source
5. status   6. task type
                        ...
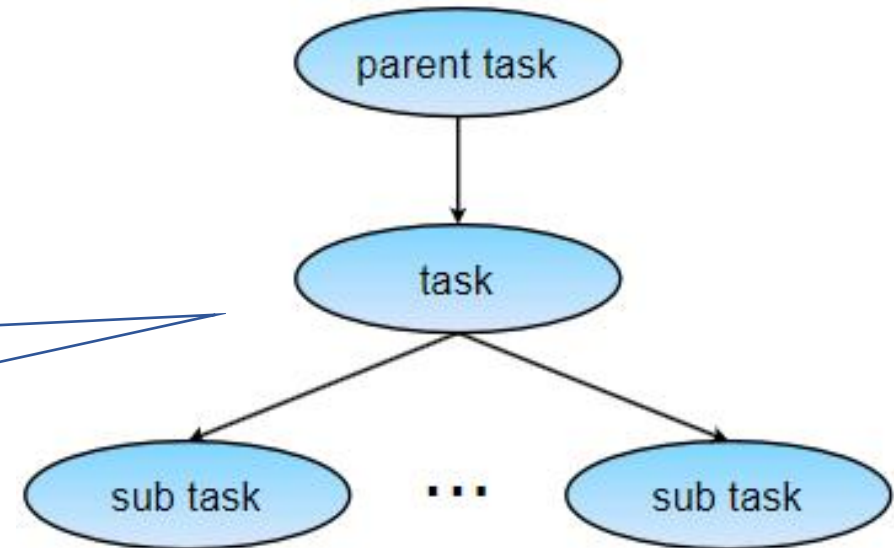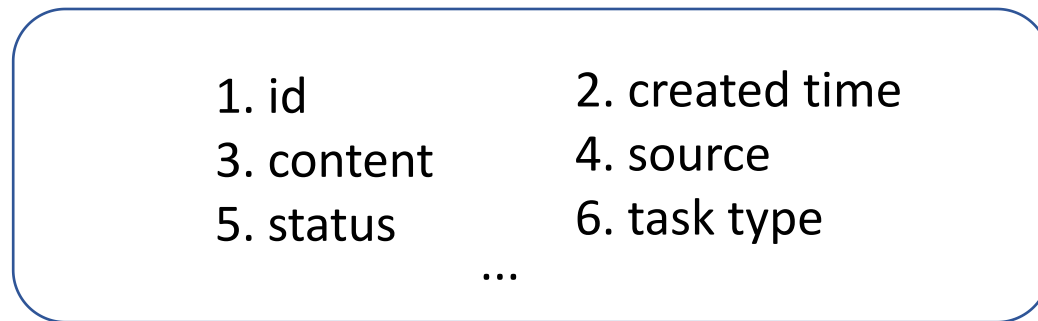
parent task and subtasks are also properties!

The task tree

Process automation

Get next task
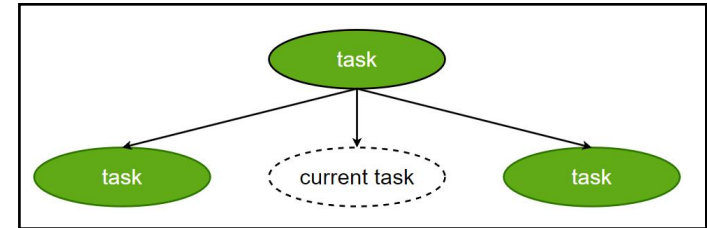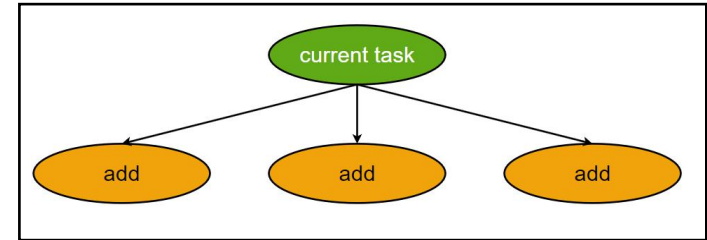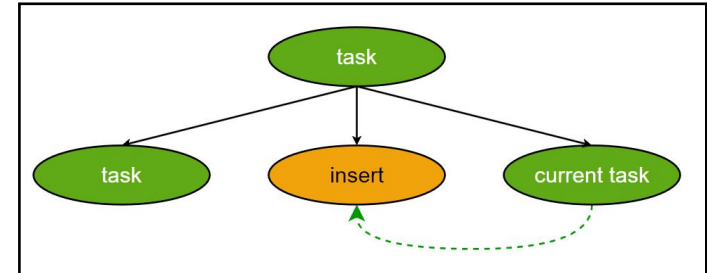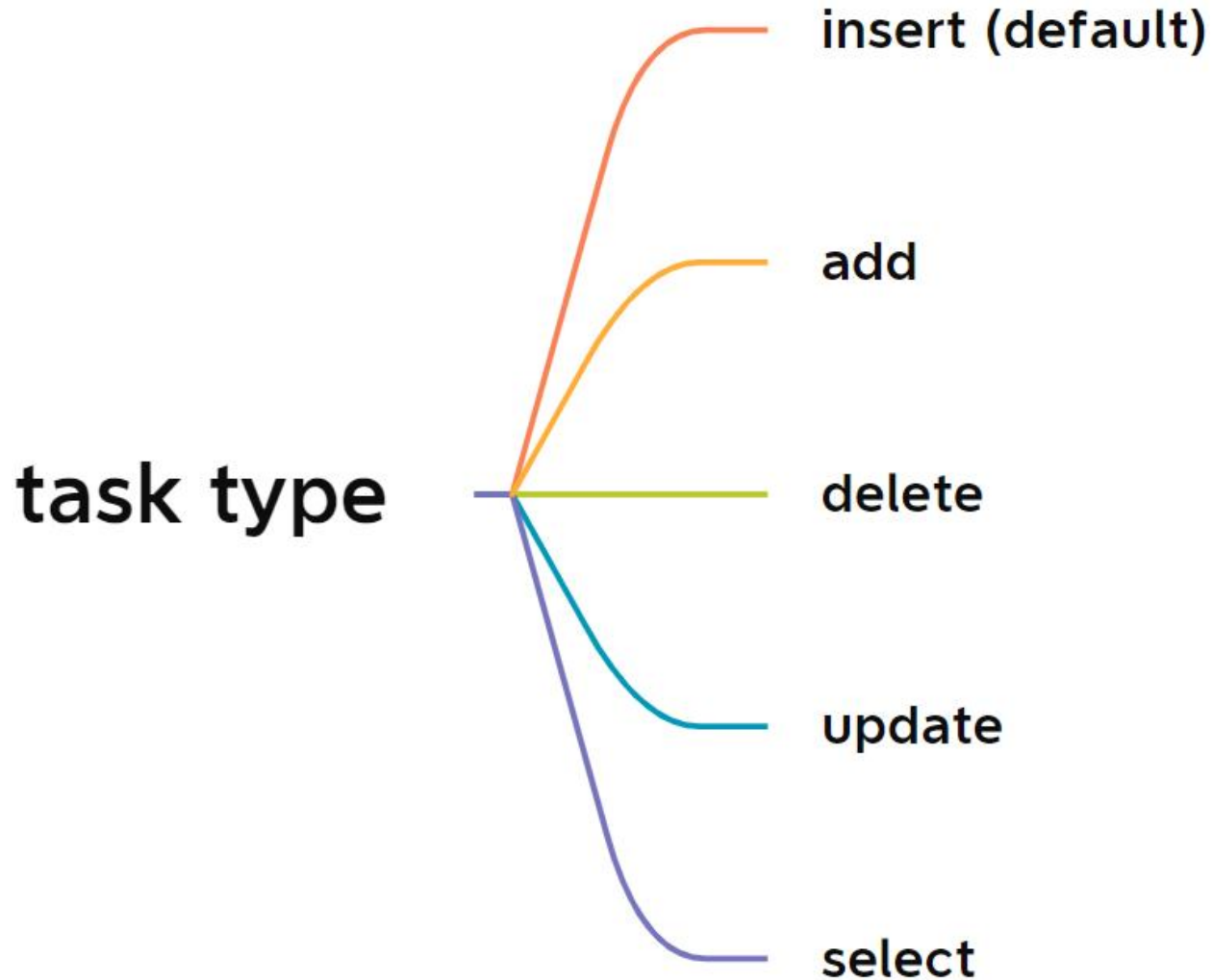
Task tree

The task tree

- Multiple ways to interact with the task tree!
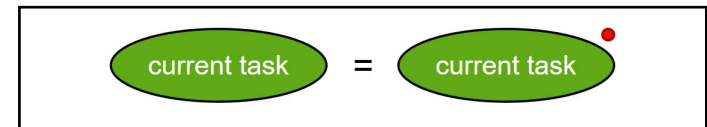
Summary

➢ We develop a multi-agent system for BESIII analysis in an early stage.

➢ This system can choose the appropriate agents one at a time to handle a series of tasks sequentially, and allows users to make sufficient modifications.

➢ More agents can be added to the system.

➢ At present, agents may have difficulty understanding long texts, leading to selecting the wrong role or focusing on the wrong task content. However, we believe with the collection of user feedback and the retraining of agents, this system will become more intelligent.

Thanks