

MetaCom 2024

Hong Kong | 12 – 14 | August 2024



NivTA: Towards a Naturally Interactable Edu-Metaverse Teaching Assistant for CAVE

Ye Jia, Zackary P. T. Sin , Xiangzhi Eric Wang , Chen Li,
Peter H. F. Ng , Xiao Huang , Junnan Dong , Yaowei
Wang , George Baciuc , Jiannong Cao, and Qing Li

The Hong Kong Polytechnic University

ye-aimmeng.jia@connect.polyu.hk

Table of Contents

	Page
I. Background & Pedagogical Motivation	3
II. Related Education Systems	4
III. Introduce to the NivTA	5
IV. K-Cube CAVE	9
V. Pilot User Study	11
VI. Findings & Future Work	12

I. Background & Pedagogical Motivation

Collaborative Learning (CL)

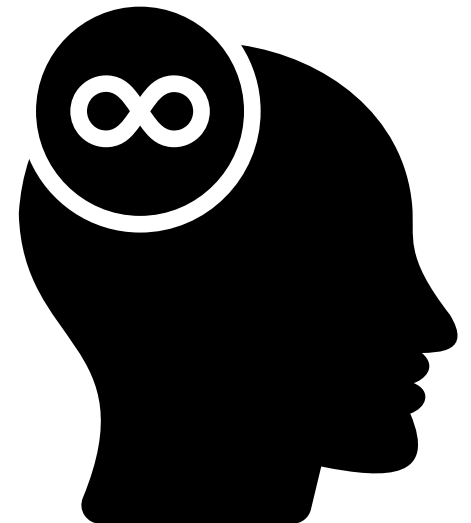
CL can be effectively described as a synchronized effort to jointly build and maintain a mutual understanding of a problem, as discussed in the works of Roschelle (1995).

Personalized Learning (PL)

PL in educational environments utilizes technology to cater to individual learning styles and paces, enhancing educational outcomes.

Students can benefit from these two learning styles in Edu-Metaverse.

How to design a system to support these two learning styles are becomes crucial in Edu-Metaverse.



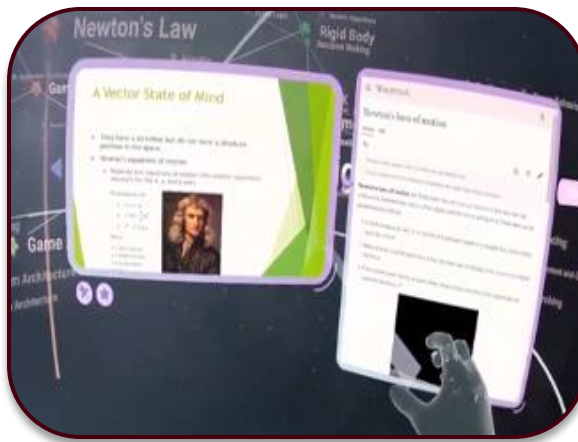
II. Related Education Systems

- PETER: A LLM Tutor

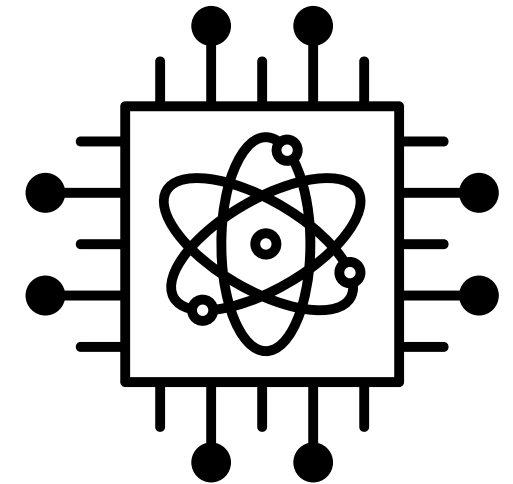


PETER (Proactive Educational Dialogues: Tailored Engagement & Reflection) utilizes Panopto to capture lectures, including slides and speech-to-text transcripts. It employs ConvAI, an LLM tool trained on this content and deployed through Unity WebGL, to craft a tailored educational tool.

- K-Cube VR



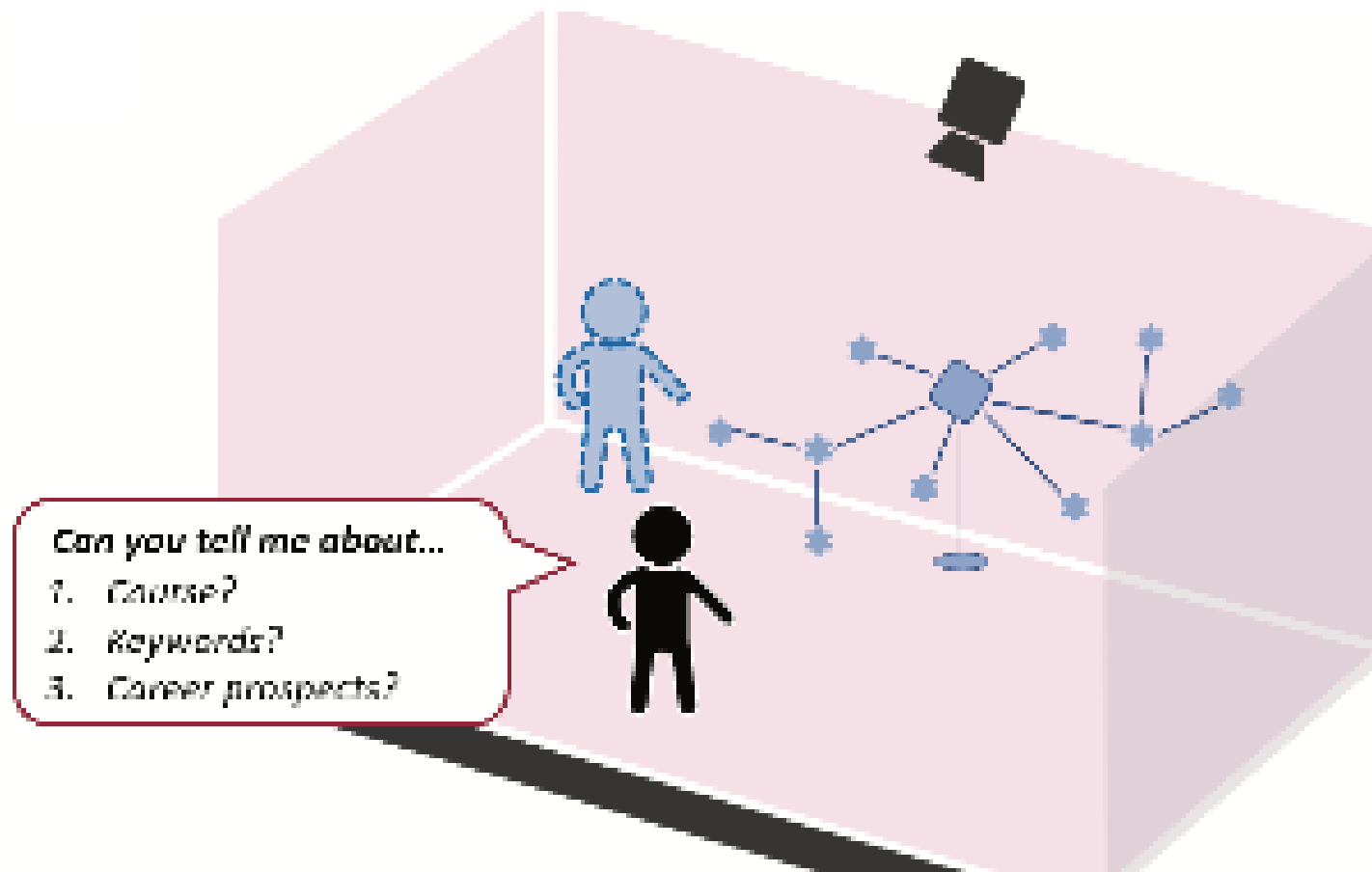
K-Cube is a crowdsourcing educational knowledge base that structuralizes educational concepts as a KG. In particular, K-Cube transforms the content of courses into a structured knowledge network. This network, or KG, encapsulates the fundamental concepts, terms, and subjects of a course by representing them as interconnected nodes



III. Introduce to the NivTA

NivTA: Naturally Interactable Virtual Teaching Assistant

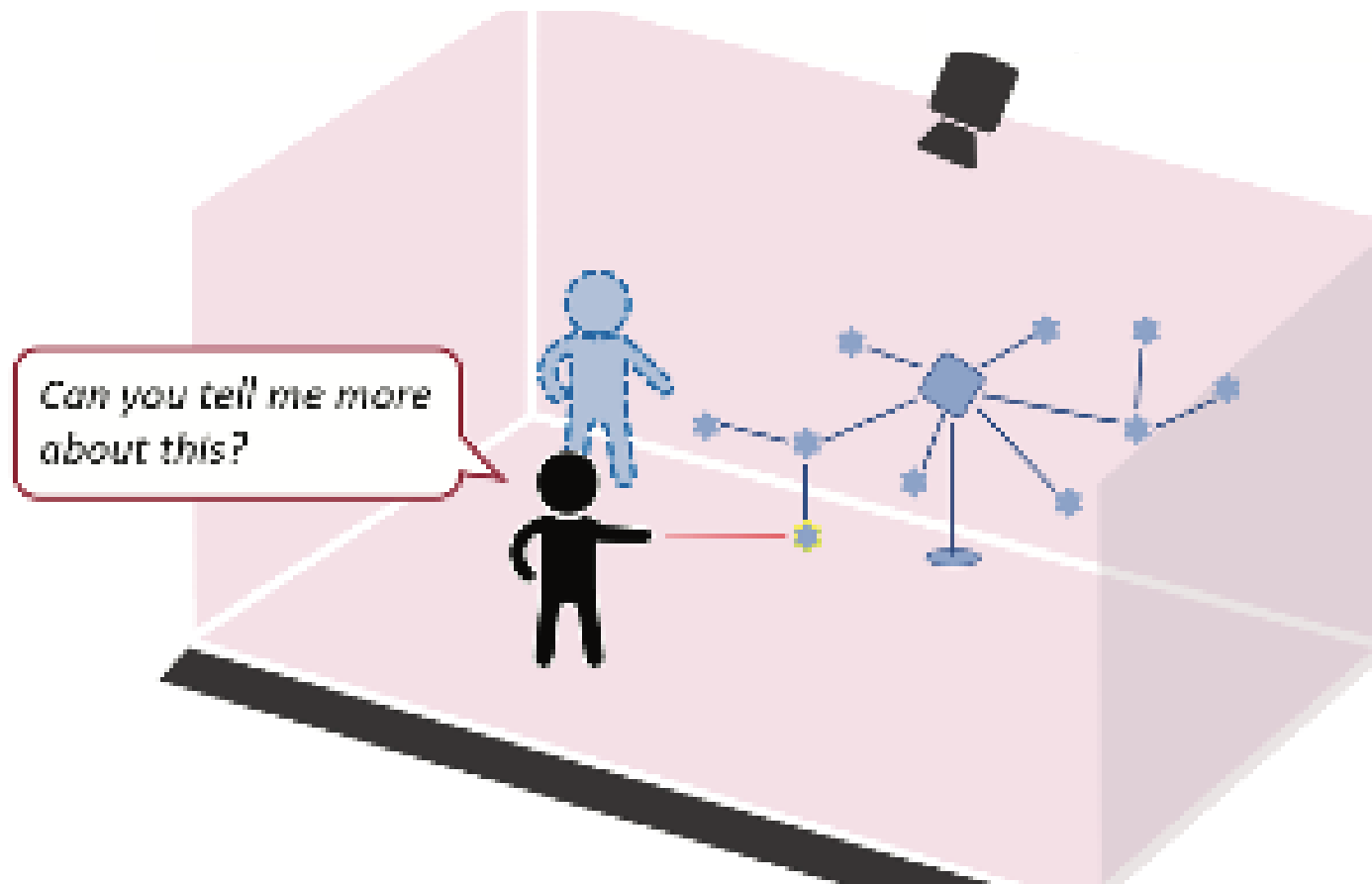
- a) **Speech:** People are challenged by text-based communication in virtual environments. Thus, oral speech is a better method of communicating.



III. Introduce to the NivTA

NivTA: Naturally Interactable Virtual Teaching Assistant

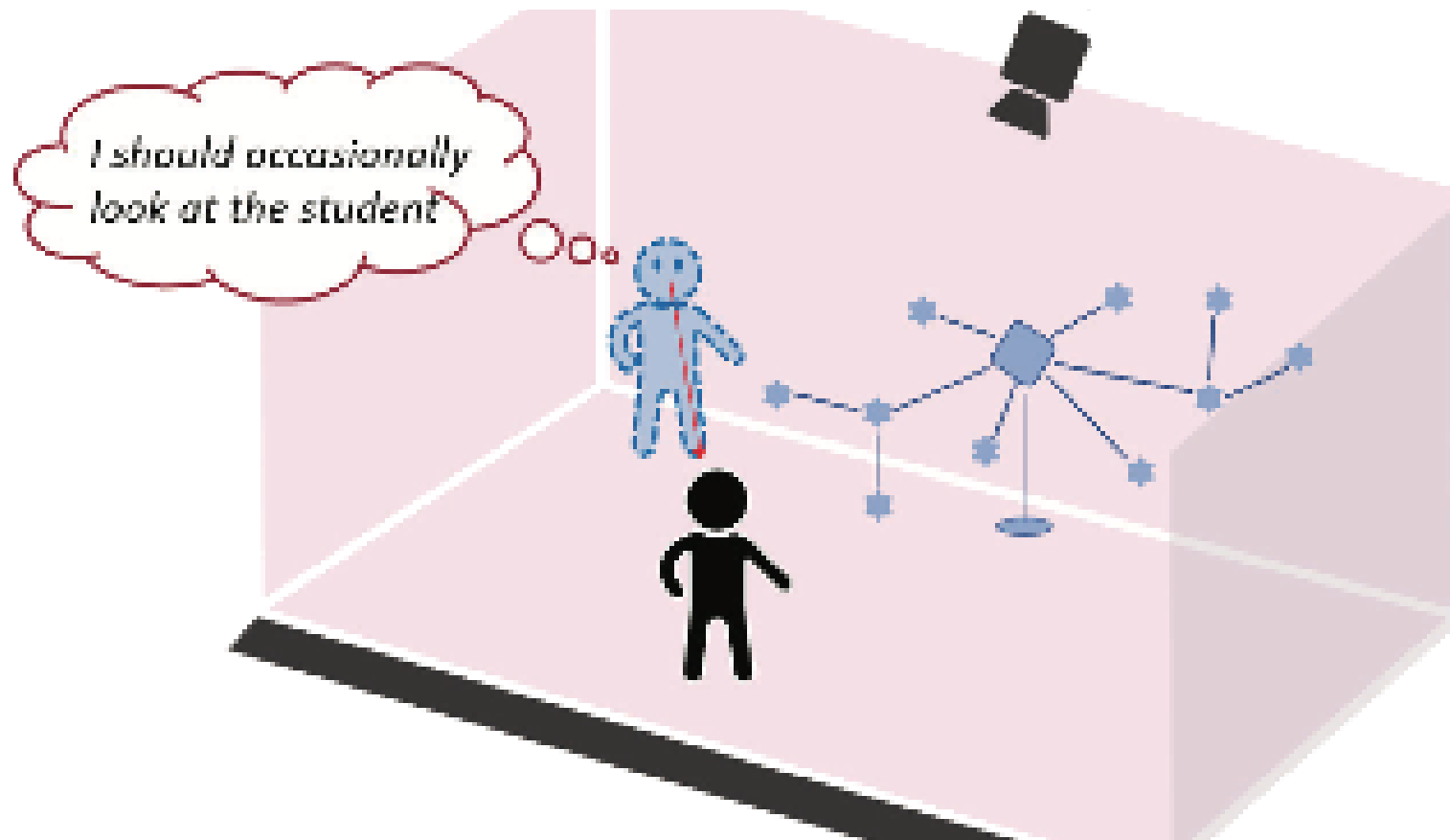
b) Gesture: Users can simply point at a node in the KG and ask "What is this?", and NivTA will try to answer the question.



III. Introduce to the NivTA

NivTA: Naturally Interactable Virtual Teaching Assistant

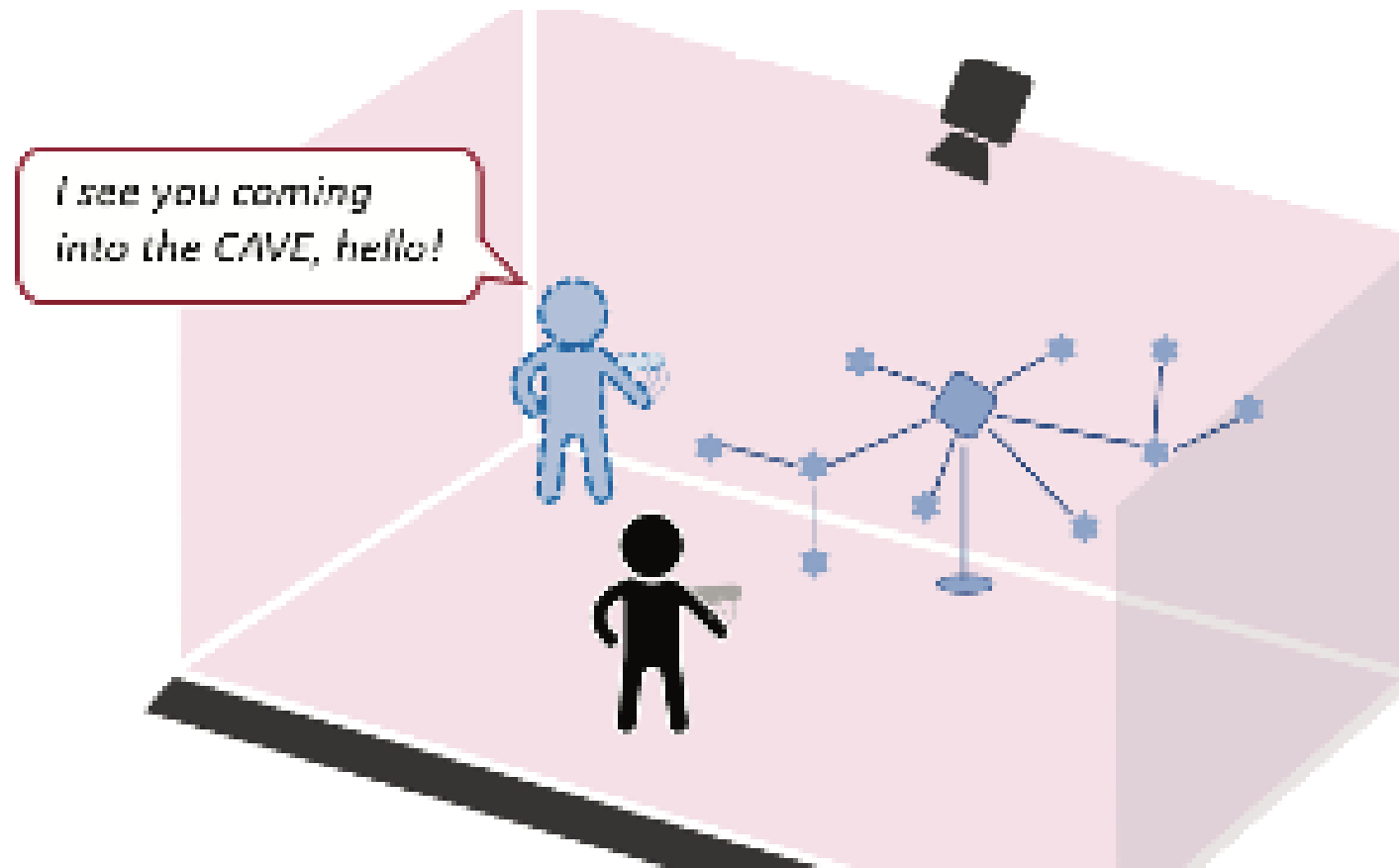
c) Gaze: NivTA is aware of the user's position and occasionally looks at the users to make the conversation between NivTA and the users more authentic.



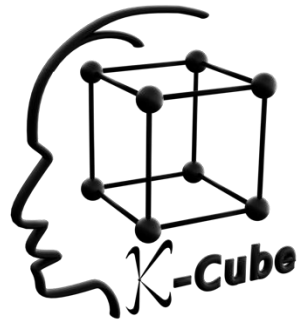
III. Introduce to the NivTA

NivTA: Naturally Interactable Virtual Teaching Assistant

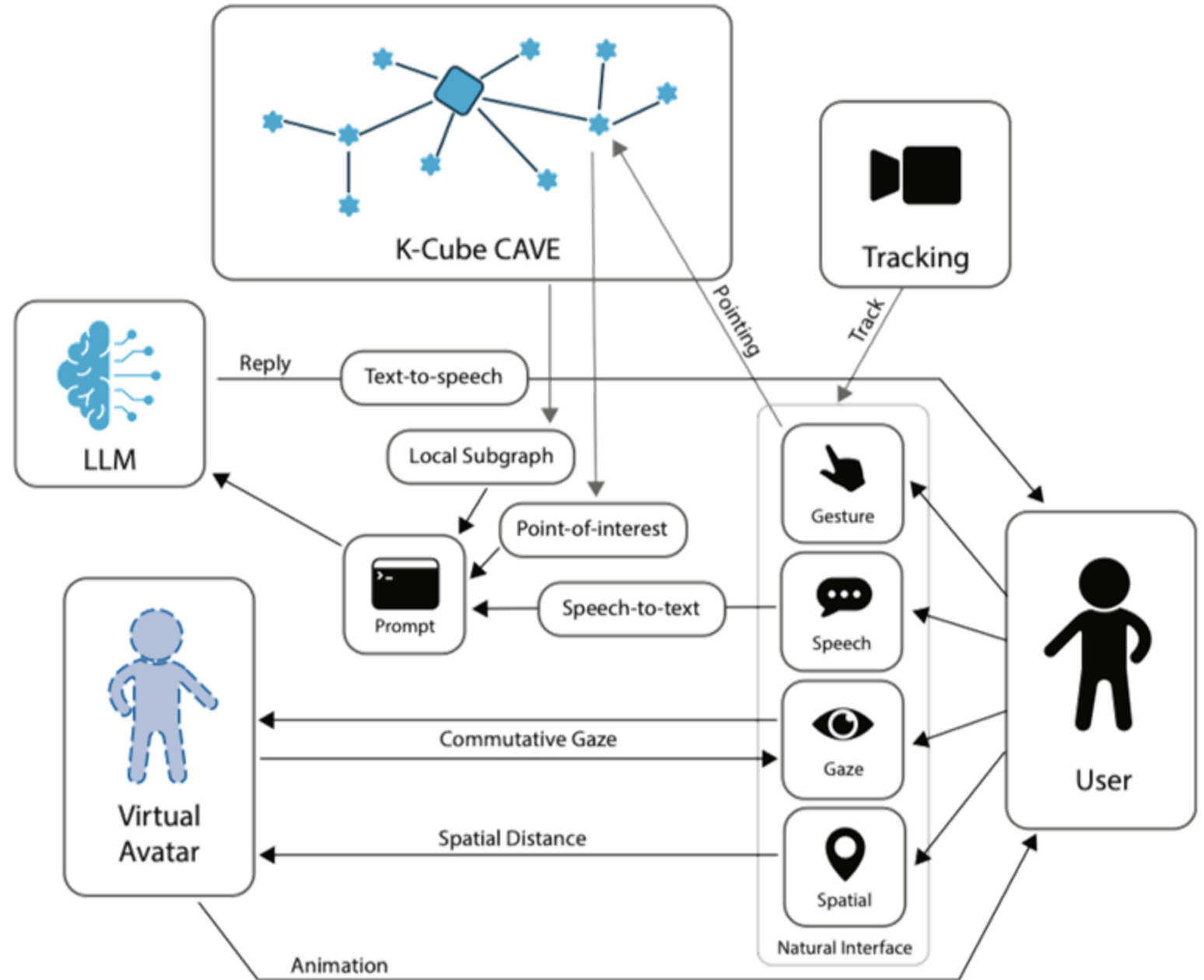
d) Spatial: NivTA can also take into consideration the spatial location of the user to determine what interaction to perform.



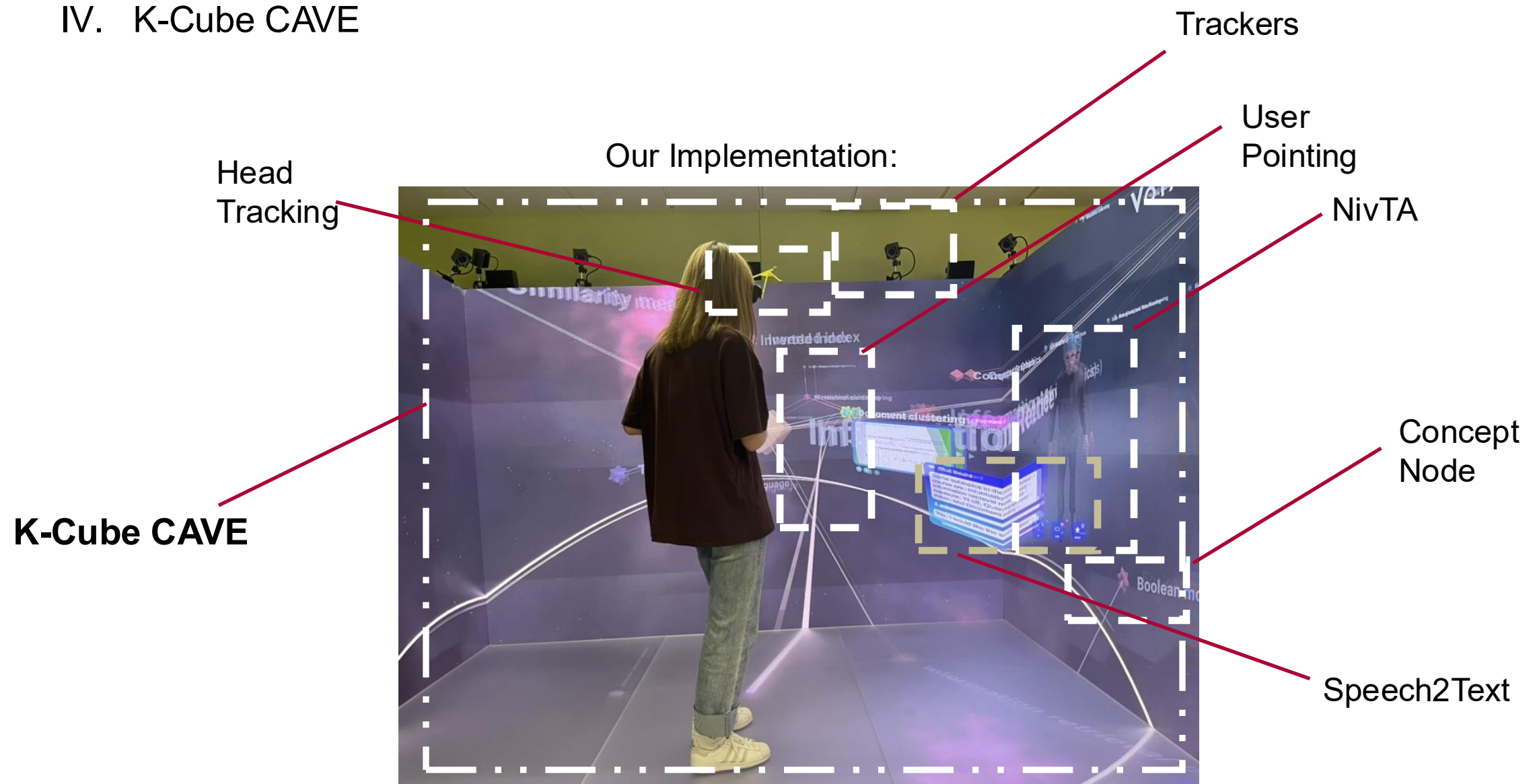
IV. K-Cube CAVE



K-Cube CAVE's Structure



IV. K-Cube CAVE



V. Pilot User Study

Objective:	To provide us the feedback from the user as well as the system's usability.
Independent Variable:	Two user input formats, one with only current selected node, another with the itself name and child and parent node.
Participants:	Four participants with expertise in VR and E-learning were invited to attend this user study.
Measures:	The System Usability Scale (SUS)
Focus Group:	Semi-structured focus groups were conducted to collect the participants' personal feelings about the content and presentation.

VI. Findings & Future Work

Findings

- NivTA is acknowledged for its proficiency in summarizing content within the Edu-Metaverse. The prompt structure can potentially largely affect the learning experience in Edu-Metaverse.
- NivTA facilitates users' engagement within the virtual environment.
- Four participants particularly emphasized that the interaction with the virtual agent feels very natural and realistic
- The average SUS score of NivTA is 60, which indicates that our proposed prototype offers a fair level of usability.

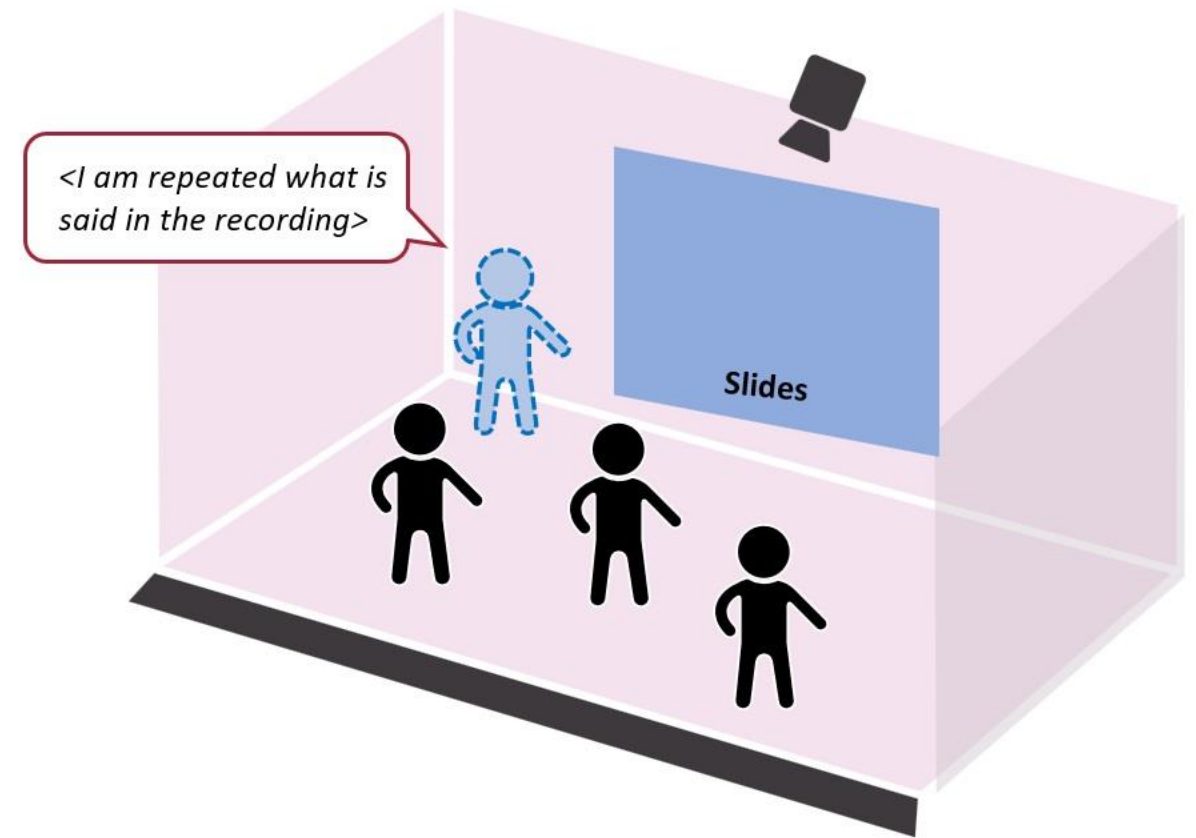
VI. Findings & Future Work: Potential Application

Lecture Reenactment

NivTA can be fed with a recording of the lecture and reenact past lectures, replicating both pose and speech.

This will provide a more immersive experience compared to videos of the recorded lecture.

Further, the students can also ask questions about the reenacted lecture, and NivTA, again, should be able to answer them based on the context provided by the recorded lecture and the K-Cube KG



VI. Findings & Future Work

Future Work:

- In the future, we plan to utilize RGBD tracking cameras such as Azure Kinect to better track the pose of the user in a CAVE-VR environment.

MetaCom 2024

Hong Kong | 12 – 14 | August 2024

Department of Computing
電子計算學系

Thank you for listening!

Contact:

Ye Aimmeng Jia

ye-aimmeng.jia@connect.polyu.hk