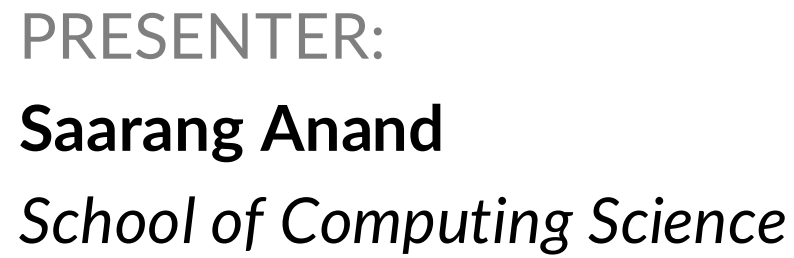
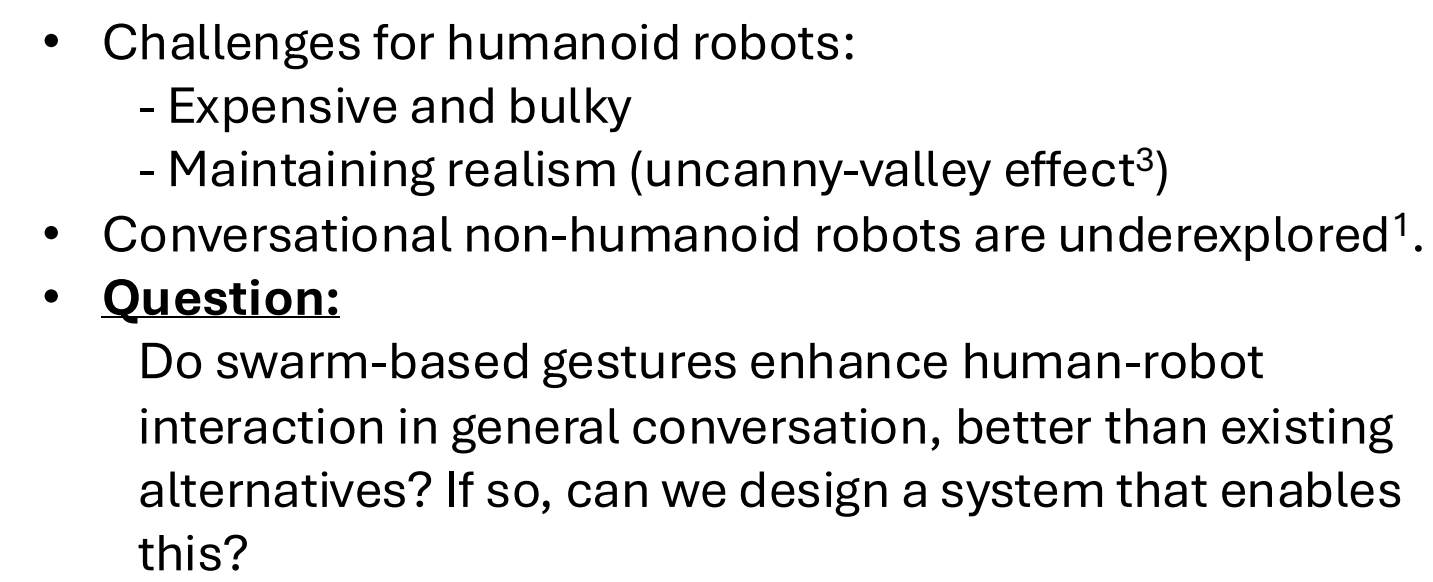


We designed a system that enhances conversational agents (better than existing alternatives) by using **expressive Swarm Robot gestures**. Applications include voice assistants, storytelling, accessibility and education.

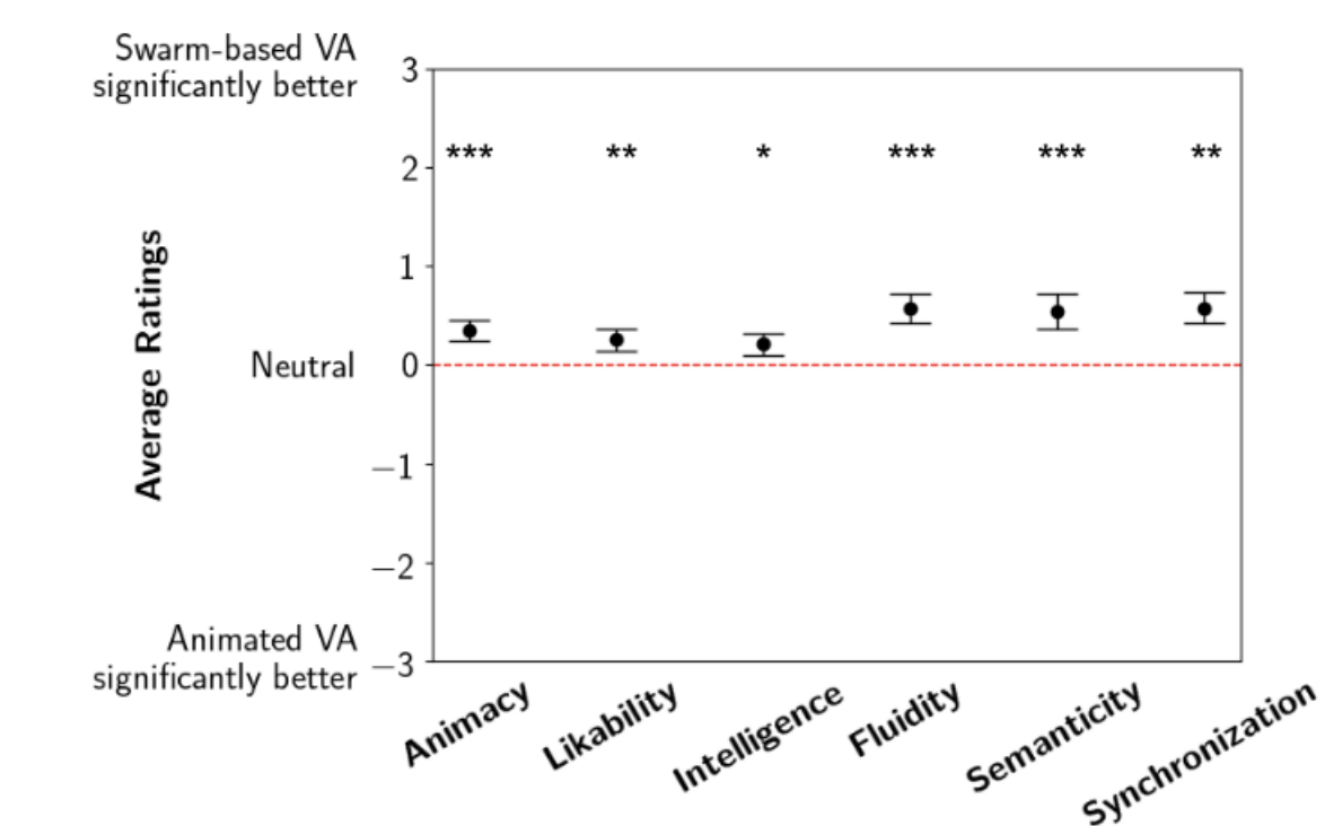


- What are Co-Speech Gestures?

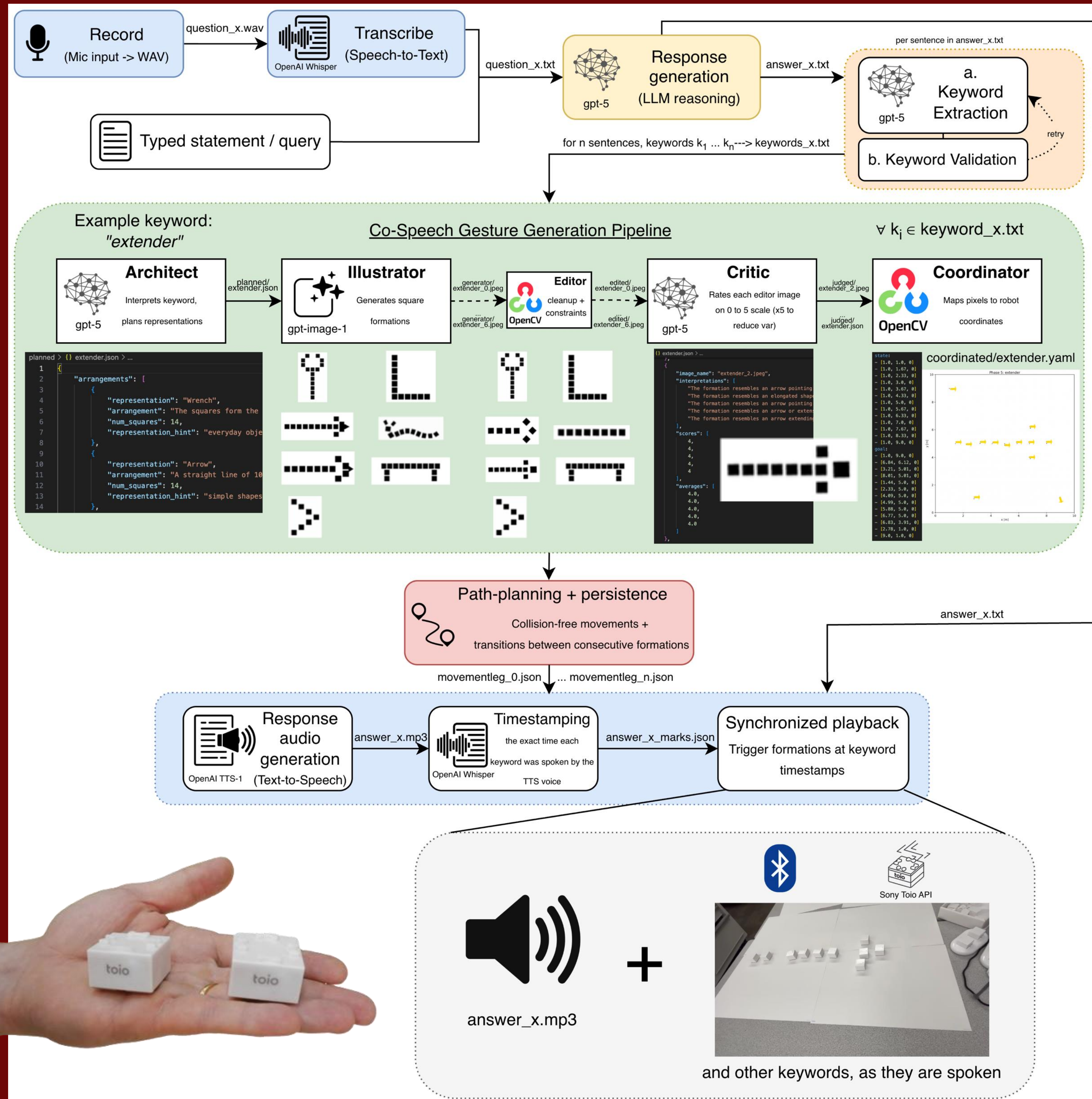


- **Elicitation Study:**

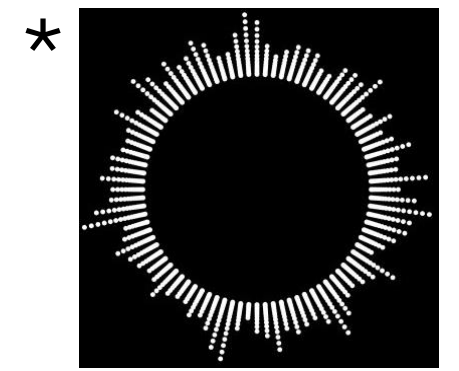
- ## RESULTS:



*refer the example below “Discussion”



- The evaluation study showed that swarm-based VAs were perceived as more animated ($p < 0.001$), likeable ($p < 0.01$), intelligent ($p < 0.05$), with movements viewed as more fluid ($p < 0.001$), semantically aligned ($p < 0.001$), and synchronized ($p < 0.01$) than animated waveform VAs*.
- **Hints** were added to the Architect since, based on the elicitation study, users prefer simple visuals.
- The evaluation study showed that this approach produces at least one majority-endorsed formation for **92.5%** of keywords.



- **Longer conversations** should be explored, and swarm-based gestures should be compared with humanoid gestures to broaden understanding of non-verbal robotic communication.
- Model generation **latency** should be reduced to improve usability.
- Empirical evaluations are needed to ensure 100% **collision**-free movement on physical hardware.

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2. Ishikane, M., Li, Y., Minami, Y. et al. ChatRAD: a robotic animation display system with text-to-image generative AI. *Artif Life Robotics* 30, 803-811 (2025). <https://doi.org/10.1007/s10015-025-01074-6>
3. Mori, M., MacDorman, K. F., & Kageki, N. (2012). The uncanny valley [from the field]. *IEEE Robotics & automation magazine*, 19(2), 98-100.

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