Facilitating Citizen Science and Enhancing CCC Workshop using Conversational Swarm Intelligence

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Citizen science projects involve diverse stakeholders—including volunteers, scientists, policymakers, and community groups—collaborating to tackle complex challenges. These projects benefit from deliberative processes where participants not only collect and analyze data but engage in discussions that shape research goals, methodologies, and policy implications. Herzog & Lepines call for a more empowered approach to citizen science that shifts citizens from "data drones" to fuller participants who help shape goals and policy [1]. However, large-scale deliberation faces significant barriers, such as limited participation and dominance by certain voices, which prevent the integration of diverse views [1].

Citizen science projects would benefit from conversational deliberation among diverse stakeholders. Research shows that deliberating groups can solve problems with creativity and accuracy that exceed the abilities of any individual member [2]. This "amplification effect" is called Collective Intelligence and is well known to scale with the group size and diversity (i.e., many minds are better than one). However, real-time conversational deliberation does not scale effectively. Small groups of 4 to 7 people are optimal for productive discussions, providing sufficient speaking time and minimal wait time per person. As group size increases, discussions often degrade into monologues or presentations, limiting the value of deliberation. Other methods like voting rely on statistical aggregation, which works for narrow tasks but are inadequate for addressing complex, open-ended problems common in citizen science projects.

In 2023, a technology called Conversational Swarm Intelligence (CSI) was developed, inspired by biological systems such as fish schools, bee swarms, and bird flocks [2]. CSI combines the adaptability of Large Language Models (LLMs) with the principles of Swarm Intelligence, enabling large groups to hold effective conversational deliberations at scale. Recent studies show that CSI enables productive real-time deliberation among networked groups of up to 400 participants and amplifies collective intelligence [3-5].

CSI scales up the deliberative process by dividing large groups into a network of overlapping subgroups, each containing 4 to 7 members for optimal conversational interaction. Each subgroup is facilitated by a "Surrogate Agent," an AI-powered entity that observes the local deliberation, distills the salient content, and passes critical insights to other subgroups [2-6]. This weaves the local conversations into a single unified discussion, allowing content to propagate efficiently and enabling large-scale deliberation without losing the depth and richness of smaller group discussions. To make this clear, Figure 1 shows an example CSI structure in which 100 participants are divided into 14 interconnected subgroups, each including a single AI-powered Surrogate Agent. This structure is inherently scalable which means it could be used to connect hundreds or even thousands of participants in real-time large-scale conversation.

The distributed CSI structure also suppresses social influence biases (e.g., groupthink), which plagues traditional online discussion forums and chat rooms. CSI also promotes greater dialog per person than

large groups. In one study, groups of 35 individuals were tasked with answering IQ test questions from a standard battery. The average individual scored an IQ of 100 (50th percentile). The groups using CSI significantly outperformed, averaging IQ scores of 128 (97th percentile) which is considered "gifted" by most criteria [6]. The overlapping subgroup model promotes high participation while minimizing the dominance of powerful voices, making it particularly suitable for diverse citizen science initiatives. CSI is also well suited for large-scale brainstorming, making it an ideal tool for collective visioning activities.
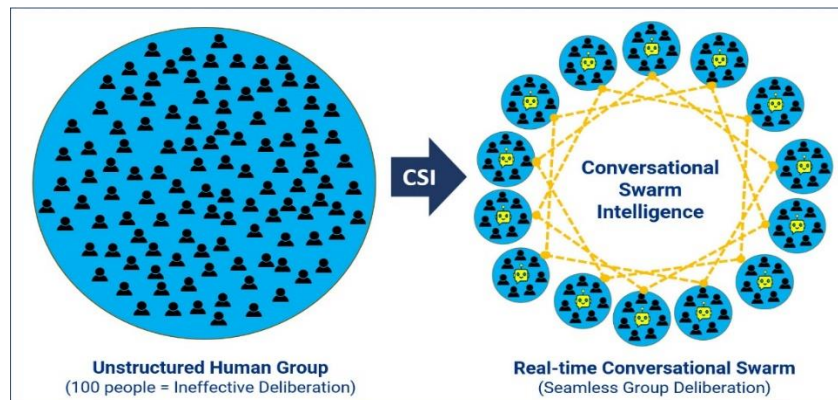
A new software platform called Thinkscape was recently developed by Unanimous AI to leverage the power of CSI technology, enabling groups as large as 400 people to hold real-time conversational deliberations. It could empower large groups of citizen science stakeholders to collaboratively discuss project goals, interpret findings, and make decisions in a democratic and inclusive manner. This approach ensures that diverse voices contribute meaningfully, integrating scientific, experiential, and local knowledge to address complex societal challenges while reducing epistemic injustices [1]. Thinkscape is also well-suited for pre- and post-workshop virtual discussions in the CCC workshop. By facilitating effective deliberation in these workshop sessions, Thinkscape sets the stage for productive in-person discussions and synthesizes outcomes for further exploration. We would welcome the opportunity to bring Thinkscape into these virtual sessions to enrich the workshop.

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[2] Rosenberg, L., Willcox, G., Schumann, H., and Mani, G., "Conversational Swarm Intelligence (CSI) Enables Rapid Group Insights," 14th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference, New York, NY, USA. October 2023. (UEMCON 2023). 10.1109/UEMCON59035.2023.10316130

[3] Rosenberg, L., Willcox, G., Schumann, H. and Mani, G., "Conversational Swarm Intelligence (CSI) Enhances Groupwise Deliberation." 7th International Joint Conference on Advances in Computational Intel. (IJCACI 2023). Oct 14, 2023. New Delhi.

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[5] Rosenberg, L., Willcox, G., Schumann, H., "Towards Collective Superintelligence, a Pilot Study," 2023 Human-Centered Cognitive Systems (HCCS), Dec 16, 2023. Shanghai, China, 2023. doi: 10.1109/HCCS59561.2023.10452485.

[6] Rosenberg, L., Willcox, G.; Schumann, H. and Mani, G. (2024). Towards Collective Superintelligence: Amplifying Group IQ Using Conversational Swarms. In Proceedings of the 26th International Conference on Enterprise Information Systems - Volume 1: ICEIS; ISBN 978-989-758-692-7; ISSN 2184-4992, SciTePress, pages 759-766. DOI: 10.5220/001268750000369