# Enabling rapidly formed human-agent coalition teams through extensible information exchange

Military / Coalition Issue

There is much potential power to be gained from human-machine teams working together on a variety of situation awareness or problem-solving/understanding tasks. The ability to rapidly introduce, understand, interact with, and configure machine agents is critical, especially in a coalition setting where the machine agents may be unfamiliar. Can we create an approach that enables an efficient and productive human-agent collaborative environment? Can we do so in a way that does not require expensive and time-consuming support from technical specialists and integrators?

Core idea and key achievements

Definition Human-Agent Knowledge Fusion (HAKF) as an underpinning principle for building such systems, defining the *tellability* and *explainability* flows that can enable inter-agent communication and support performance improvement and improved trust.
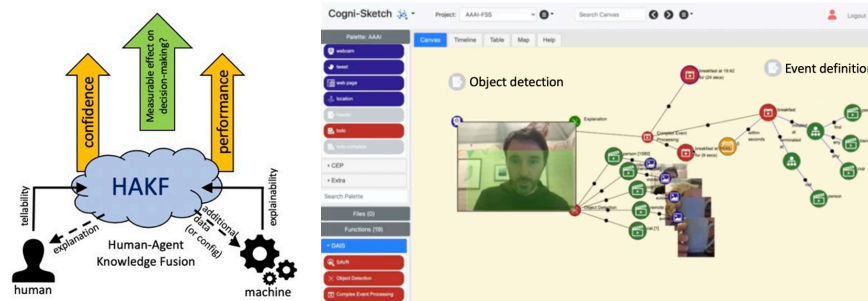
Creation of an experimental embodiment of the HAKF principle as an extensible platform named Cogni-sketch to allow information and knowledge sharing between human and machine agents, with each being able to read and write their knowledge to the environment, extend the schema and provide explanations or new local knowledge.

Implications for Defence

An experimental platform to explore options for human-agent teaming and different techniques for interactions. Plug-in architecture supports many forms of extensions, with new machine agents, visualisation types, reasoning systems, import/export and pluggable processes to support or observe team behaviour such as problem solving.

Can be immediately used for proof-of-concept work to explore different human-agent team compositions, and through hardening could become a more permanent capability for specific tasks such as intelligence analysis or situation awareness, and the creation of institutional repositories of task-relevant information.

Readiness & alternative Defence uses

TRL 3/4. The Cogni-sketch code is under active development by IBM UK and has been used in several experiments and use-cases ranging from open-source intelligence analysis to information fusion and agent integration. A secure cloud-based version is available for use on request by DAIS collaborators. Will be released as open-source on github before the end of DAIS in Sep-2021 and support multiple showcase demos.

Resources and references

- Braines, D., Cerutti, F., Vilamala, M. R., Srivastava, M., Preece, L. K. A., & Pearson, G. (2020). "Towards human-agent knowledge fusion (HAKF) in support of distributed coalition teams". *AAAI FSS 2020*.
- Braines, D., Preece, A. Roberts, C., & Blasch, E. (2021). "Supporting Agile User Fusion Analytics through Human-Agent Knowledge Fusion" in press
- Numerous videos/demos available

Organisations

IBM UK, Cardiff University