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Human intelligent Machine Team collaboration

towards single pilot operations

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Content

During a flight, pilots must master complex situations, while facing increasing system complexity due to the amount and type of information available. As part of the Horizon 2020-funded programme of work, Clean Sky 2, Co2Team (Cognitive Collaboration for Teaming) pursues the idea that a system based on artificial intelligence can effectively support the pilot using cognitive computing towards single pilot operations.

To create collaboration between the pilot and the intelligent agent, an innovative bi-directional communication paradigm and an intelligent allocation of roles and tasks are needed, based on the concept of keeping "pilot in the loop". In this way it is possible to benefit and enhance the most effective skills of pilots, such as decision-making, to achieve flight objectives and guarantee a maximum level of safety and better acceptability.

In our state of the art, we examine the different human factors identified in the literature that are involved in the integration of an intelligent agent for cockpit operations with all that this implies in terms of complexity.

We consider that the Human intelligent Machine Team (HiMT) will operate in a cockpit and will therefore deal with the automated systems of the aircraft. We examine the advantages and weaknesses of automation of the avionics and how Cognitive Computing could address them or help manage them. We are interested in the interactions between man and machine and how these interactions would be with a Cognitive Computing Teammate (CCT). The objective being to form a hybrid HiMT, we study the different aspects of communication in order to keep the most familiar way of collaboration for the pilot (i.e. Human-human). And it’s through this bi-directional verbal and non-verbal communication that this man-agent collaboration will be possible. Because this team will operate in a fast-evolving, risky and uncertain environment with high level of responsibility in terms of safety issues, the cultural effect and context on communication in a small-group are considered, based on what is already applied, such as Crew Resource Management and how to adapt it to a HiMT.

We address one further interesting issue: teaming from a cognitive point of view, for each individual and as a team. Team cognition is a dynamic team activity inextricably linked to context that applies to the team (i.e. shared mental model). This implies that the CCT must also be endowed with the ability to deduce certain elements from a real situation (i.e. theory of mind).

The use of AI does not escape the need for mutual trust between the pilot and the CCT, nor the trust the team will establish in the avionics. Therefore, we explore how trust is created and maintained at the right level, to avoid under and over trust. We examine decision making and risk management to understand how the CCT may assist the pilot, using the same schemas as the human, and avoiding some cognitive biases.

Thus, by taking human factors into account, the power of human-machine symbiosis can be enhanced as pilots and CCT collaborate by doing what they do best.

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