

### Short summary from the Cyber-Physical Human systems theme (by Vladimir Cvetkovic and Martin Törngren)

Inspiration and initial questions for this theme were provided by Vladimir Cvetkovic, see the [presentation here](#).

- There is considerable emphasis in the CPS community on the CPS communication, however mainly referring to communication between technical CPS entities (hereafter referred to as agents). This should be extended to include the communication between CPS and human-social agents, which leads to the notion of cyber-physical-human (CPH) systems. We note that most of the recent CPS agendas/roadmaps, [REF], emphasize the importance of humans as part of CPS. However, it is our understanding that rather few projects and efforts are addressing this gap. CPS that directly involve humans, constitute a special class of CPS, see Figure 1.
- The key notion for the communication between CPSs as well as CPS and human-social agents is intent, i.e. the understanding of what drives the actions or inactions of an agent. There is a clear need to develop methods for intent identification and specification, as well as to develop intent communication protocols.
- There is a need to broaden the education and training with respect to human-nonhuman agent interaction and communication. Regardless of type of systems and e.g. levels of automation, humans as developers, operations, users, maintainers etc. will increasingly have to deal with CPS. As such interaction and communication is foreseen to become increasingly dominant in the future, educational content should be developed for all levels.
- There is a need to identify deviations from normal behaviour of human-social agents, in particular behaviour that leads to decisions/actions of significance for the functioning of CPS.

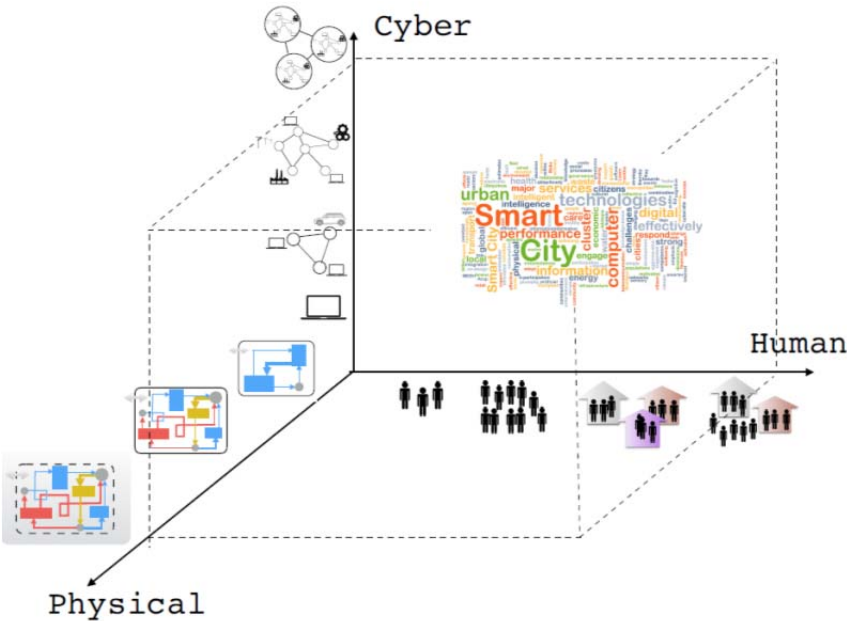


Figure 1: CPS as consisting of engineered cyber and physical components as well as of humans