Philips at al. (2016) give a taxonomy and examples of human-robots collaboration. Choose 2- 3 examples, describe their levels of autonomy as described in Shneiderman (2020) and reflect on advantages and disadvantages if we decrease/increase their current level of autonomy. Reflect on their current and needed explainability (Hagras, 2018; Smith-Renner et al. 2020)

Big dog

Big Dog is a military robot, trying to emulate and enhance the physical capabilities of a dog (Philips et al., 2015). Its purpose is to carry military equipment in rough terrain to reduce the carry load for military soldiers on the ground (Philips et al., 2015). This example is categorized as replacing the physical capabilities of humans with that of robots. Factors involved in this human-robot teamwork would be the level of task interdependence, this is the degree by which the human and robot rely on one another to perform their tasks effectively (Philips et al., 2015).

I would categorize the big dog as part of a reciprocal interdependence team. In a reciprocal interdependence team, the dog and the human's collaboration is built upon multiple communication exchanges between them. The big dog would be given a task to autonomously complete (such as carrying military equipment from point A to point B) where the human would have the responsibility to oversee and make sure the task gets completed. During this task, the human would be informed periodically for new information by the robot and has to either change and adjust the task or give the robot a new task based on the information.

The two-dimensional framework Human-Centered Artificial Intelligence (HCAI) was developed to rethink automation in relation to human control (Shneiderman, 2020). On the x-axis is the level of automation from low to high and on the y-axis is the level of human control of the computer. When the context is not completely understood or there are complex tasks to be performed by the system, the level of human control and automation needs to be high (Shneiderman, 2020).

For the Big Dog to be effective in this military context it would have to be in the top right quadrant of the HCAI framework. This is because in military missions where the dog operates, the context is often unknown and tasks can be complex (such as quickly changing plans or directives of the mission). As previously discussed, the soldier and Big Dog team resemble that a reciprocal interdependence team, this creates a need for high levels of control but also high levels of automation.

Currently, in 2020 the Big Dog has been discontinued and is considered a legacy robot by the creator, Boston Dynamics (Boston Dynamics, n.d). Perhaps one of the reasons for this is the fact that the robot didn't manage to reach a high enough level of automation or human control and thus not being effective in the reciprocal interdependence team.

Paro

One area of robotics is trying to emulate the emotional level of companionship from that of animals (Philips et al., 2015). An example of this is the robotic seal called Paro, which is designed to alleviate depression specifically for elderly people (Philips et al., 2015). The robot seal responds to touch as if it's alive by moving the head and legs and making sounds that are similar to that of a baby seal. By mirroring the appearance of the robot to that of an animal, it gains some of the characteristics that humans associate with that animal, this has shown to improve the trust of the robot.

There are two significant benefits of trust in the robot-human relationship (Philips et al., 2015). First, it determines when and how much the human will rely on the system. Second, it affects the degree to which the human is willing to accept the contribution of the robot to the team. In the case of Paro, the contribution would be that of an animal partner for people who are either afraid or allergic to cats and dogs, there is also the issue of hygiene. Other medical staff, such as caretakes also rely on Paro to calm down the person with dementia or keep them entertained. Therefore trust is essential if the robot seal will be valuable in the human-robot team.

Paro is using a value-based system, if the human gently strokes the robot it will learn this behavior and act more susceptible towards more gentle strokes. However, if Paro is being hit or used roughly it will lower the score of the value-based system. The system thus has high human control over it and limited automation since it's based on human action. If the HCAI framework was used, the robotic seal would be in the top left quadrant. By increasing the automation and letting the seal act more independent outside of the human action, it would defeat the purpose of the value-based system. Thus for Paro to become more valuable in the robotic-human team it should focus on improving in other areas. Such as changing the movement to the slow-in and slow-out principle introduced by Schulz et al. (2018). By doing this the movements become more familiar and easier to understand (Schulz et al., 2018). The effect of this will increase the mirroring of an animal, as previously discussed this will improve the trust of the robot.

Smith-Renner et al. (2020) writes that instance level feedback is when the human corrects or confirmes the Ai models prediction. The Paro uses this instance level feedback when the human is gently stroking the seal to "learn" a better behavior. This way of giving feedback to a system could also be implemented into the Big Dog, since it's also using many different sensors to perform its tasks. However, the the Big Dog would have to also implement a system for explaining the changes of the AI model. Smith-Renner et al. (2020) findings show that feedback alone is not always postitive, and the system needs some way of providing explanation otherwise trust in the system could be reduced.

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