Example Critical Barrier to Assurance and Regulation

Addressing a C-BAR for Assurance of Human-Robot-Interaction in Social Care

The following example is for illustrative purposes only. As well as illustrating a C-BAR, it shows how the problem/principle/practice distinctions in the BoK might be interpreted in defining a demonstrator project.

Assurance of Human-Robot-Interaction in Social Care

This demonstrator uses humanoid robots to care for the elderly and infirm in a domestic environment. These robots will interact physically with people, enabling them to stand and walk, or to carry them, see Figure 1. The robots are capable of lifting weights up to 100kg, thus they can pose a risk of harm to the individual.

Figure 1: Robot lifting a teenager

The challenge is:

- To demonstrate that a robot cannot interact with the human they are supporting in a way that will cause harm, including bruising.

The principles to be adopted are:

- The robot assesses manoeuvres, and doesn't attempt them if unsafe, e.g. a lift would interact with a bandaged limb;
- The force applied is distributed, so pressure never exceeds a given threshold;
- Impact velocity is always below a specified threshold.

The practices to be explored and validated are:

- Use of simulation to compute maximum forces in challenging manoeuvres, for representative physiological types;
- Validation of simulation through use of dummies with pressure and impact sensors;
- Trials with humans, including "emergency" response, e.g. trips.

The demonstrator would deliver a method for assessing safe physical interaction with humans, and a data set from the trials that might assist other projects.