direct human control of weapons
autonomous weapons control

- sensors (input)
- actuators (output)
- computer (control)
PROGRAM

if heat detected on sensor
    rotate
    until both sensors detect heat
then
    fire weapons
Minimal requirements for IHL compliance

- distinguish between military and non-military persons and objects
- determine the legitimacy of targets
- make proportionality decisions
- adapt to changing circumstances
- handle unanticipated actions of an adaptive enemy
- deal with other autonomous systems controlled by unknown combat algorithms
Computers are better at

- calculating numbers
- searching large data sets
- responding quickly to control tasks
- performing repetitive routine tasks (simultaneously)
- carrying out multiple complex tasks
- sorting data
- deductive inference
People are better at

• deliberative reasoning
• perceiving novel patterns
• meta-cognition (e.g. thinking about thinking)
• reasoning inductively
• applying diverse experience to novel tasks
• making ethical decisions
• adapting to novel circumstances
human supervisory control

sensors
input

control station

actuators
output
Meaningful Human Control
minimum necessary components

there must be active cognitive participation in the attack and time for deliberation on the significance of the target in terms necessity and appropriateness of attack, and likely incidental and possible accidental effects of the attack.

a commander (or operator) has full contextual and situational awareness of the target area of a specific attack

is able to perceive and react to any change or unanticipated situation that may have arisen since planning the attack.

there must be a means for the rapid suspension or abortion of the attack.
Meaningful Human Control

Reframing autonomy as human supervisory control

Levels of targeting supervision

1. human engages with and selects target and initiates any attack

2. program suggests alternatives and human chooses which target to attack

3. program selects target and human has to approve before attack

4. program selects target and human has restricted time to veto before attack

5. program selects target, and initiates attack without any human involvement
defensive systems - supervised autonomy(?)
• fully pre-programmed to perform a small set of defined actions repeatedly and independently of external influence or control

• fixed base with humans present in the vicinity

• unable to initiate an attack or dynamically initiate a goal or change their mode of operation

• used in highly structured and predictable environments that are relatively uncluttered with very low risk to civilians

• have constant human evaluation and monitoring for rapid shutdown when there are risks of mishaps.

• used against unmanned military objects
IHL compliance with LAWS cannot be guaranteed for the foreseeable future.

The predictability of LAWS to perform mission requirements cannot be guaranteed.

The unpredictability of LAWS in unanticipated circumstances makes weapons reviews extremely difficult or even impossible to guarantee IHL compliance.

*Meaningful Human Control!*
Reframing autonomy in terms of levels of human control

- clarifies the role of the human in the kill chain
- makes the command and control structure more transparent
- makes accountability and responsibility clearer

The control of weapons should play to the strengths of both human and machine for better humanitarian effects

States need and develop similar classifications for weapons reviews.