

Dan Saxon

Leiden University College, The Hague

dansaxon1@gmail.com

IN THE CONTEXT OF THE DESIGN AND USE OF AUTONOMOUS WEAPON
SYSTEMS, WHAT IS JUDGMENT?

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Judgment is the combination of knowledge, experience, talent, reflection, intent and instinct that allows us to assess, and react to, complex situations. Human Judgment includes the ability to decide *when* to let a machine operate autonomously - in other words, to forfeit your Judgment, at least temporarily -- and when to maintain your control over the machine.

In the context of autonomous weapons, computers and the artificial intelligence that drives them may be more efficient than humans in deductive tasks such as filtering information and making calculations. Human judgment, however, is superior in situations requiring inductive reasoning. In other words, human judgment is better and faster for decisions that require analysis of context, conditions and circumstances,¹ because humans have greater ability to apply inductive reasoning for creative thinking.² In addition, via experience, humans also develop instincts (our 'sixth sense') that often assist them to navigate difficult situations where strict rules may not suffice.³ Perhaps ironically, the development of

¹ Author interview with Dr. M Johnson, 10 June 2014, Leiden, Netherlands.

² M Cummings, 'Man Versus Machine or Man + Machine?' unpublished draft, p. 12, copy in Author's possession. Research efforts are underway to mimic human reasoning and judgment processes in machines. One example is KEEL Technology.' KEEL stands for Knowledge Enhanced Electronic Logic,' electronic mail message from Tom Keeley, 2 and 13 June 2014. See 'Keel Technology for Complex Problems,' available online at www.compsim.com/.

³ For example, human soldiers can enter an environment and 'get a feeling about it' that often is correct. Machines cannot do that. Interview with Captain (ret.) Alan Borelli, U.S. Army, The Hague, 15 July 2015.

‘good’ human judgment often requires divergence from absolute values to find solutions to value-based problems.⁴

With respect to the need for human judgment during the use of autonomous weapon systems during armed conflict, I would include here, just as examples, decisions about complex values such as military necessity and advantage and decisions about the command and control of subordinates. Outside of armed conflict situations, I would include complex decisions– governed by human rights law – by law enforcement officers to use lethal force in situations where they believe that it is “absolutely necessary.” Thus, under this perspective of judgment and autonomy, it is shortsighted to suggest that the importance and input of human judgment can be minimised in the design and fielding of autonomous weapon systems.⁵ Where complex (and sometimes conflicting) values are at stake, priority should be given to the reinforcement of human-machine teamwork rather than separation of duties between humans and machines.⁶ Both human judgment, and autonomous technologies, are tools. Thus, autonomy can be viewed, not as an end in itself, but as a tool to accomplish particular objectives,⁷ with the input and assistance of human judgment when necessary.

The increasing speed of communications, data processing and autonomous weapon technology shortens the time available for manned and unmanned weapon systems to react to events and, when necessary, attack enemy combatants and objectives. The inevitable velocity of autonomous military engagements will obstruct the development (as well as the use) of

⁴ H Kelsen, ‘What Is Justice?’ in *What Is Justice: Justice, Law and Politics in the Mirror of Science: Collected Essays by Hans Kelsen*, Berkeley, University of California, 1957, p. 10.

⁵ J Bradshaw, et. al. ‘The Seven Deadly Myths of “Autonomous Systems,”’ *Human - Centred Computing*, May/June 2013, p. 57, available online at: www.jeffreybradshaw.net/publications/IS-28-03-HCC_1.pdf.

⁶ *Ibid*, pp. 58 – 60. As a team, humans and computers are far more powerful than either alone, especially under uncertainty. M Cummings, ‘Man Versus Machine or Man + Machine?’ *supra* note 96, p. 12. For example, if autonomous weapon systems can exercise ‘self-recognition,’ i.e. the capacity to detect that it is operating outside the conditions for which it was designed, the machine will call on humans for increased supervision. Author interview with M Johnson, *supra* note 96.

⁷ Author Interview with Gianfranco Visentin, Head, Automation and Robotics Section, European Space Research and Technology Centre, European Space Agency, Noordwijk, The Netherlands, 4 November 2013.

sound human judgment that arises from opportunities for human reflection on one's own important experiences and those of others.