

Common Conceptions of Robots on the English Web – A Corpus Linguistic Analysis

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Abstract. To determine in what way the Web talks about robots I searched for typical collocations of the word *robot* in an English web corpus of 13 billion words. The results comprise two main understandings of robots that are markedly different from those used in social robotics.

Keywords: corpus linguistics, human-robot interaction, social robots.

Introduction. In HRI we often conceptualise robots as partners, companions and friends capable of verbal and non-verbal communication, sensing and expressing emotions, and acting as therapists, teachers or collaborators. But what are the common cultural concepts of robots, or closer to operationalisation: how does the Web conceptualise robots? What are the typical understandings of what robots are?

Methods & Results. I used sketchengine.eu on the English Web corpus enTenTen15 (13 billion words) and searched for the word *robot*, which occurred 434,123 times. Instead of just looking at frequencies to determine collocations, I used the logDice statistic that combines frequency with typicality measures. Using the corpus one can, for example, determine:

- what robots do (i.e. verbs with *robot* as subject). The most typical collocations are: *replace, review, execute, navigate, perform, interact, weld, operate, compete, detect, fight, move*
- what others do with robots (i.e. verbs with *robot* as object): *program(me), fly, control, build, weld, vex, equip, design, automate, deploy, trade*
- what or whom robots are with (i.e. *robot* and/or...): other *robot(s), human(s), drone(s), system(s), alien(s), spider(s), machine(s), monster(s), manipulators(s), cyborg(s), computer(s), zombies*
- typical characteristics (adjective predicates of *robot*): *autonomous, capable, intelligent, human, binary, cool, smart, sophisticated, incapable, programmable*

For the most typical collocations in these categories I looked at available tokens and clustered these to form cores of possible overall robot conceptualisations. Typical collocations clustered around the understanding of robots as (1) robots doing their job (or a little more) – I call it ROBOT IS A WORKHORSE and (2) ROBOT IS A KILLER. A further understanding, that of ROBOT IS A DESIGNED OBJECT, is not discussed here. In the following descriptions, I try to use the words as they appeared in the collocation analyses.

ROBOT IS A WORKHORSE. Of course, today robots are already used and deployed as machines on factory floors. Their most typical use is as welding robots. Other robots make use of their mobility and navigate and, generally, execute tasks that they are programmed to do. One important subclass of robots are the many software robots that trade autonomously at the foreign exchange or crawl the web as “spiders, robots, avatars, or intelligent agents”. Thus, the understanding of robots as software is part of many legal texts on websites trying to regulate algorithms that scrape, mine or download data.

The fear with robots as workhorses, however, is that once robots do more than welding or executing simple tasks, they might replace workers. Many jobs like those of accountants, auditors, paralegals and shelf stackers are already in danger. Even the most sophisticated jobs like those of surgeons, writers and computer programmers might be replaced by robots in the future.

ROBOT IS A KILLER. A frequent conception of robots is that of killer machines. This understanding comes in two flavours. First, there is the fear that robots are used as autonomous or remote-controlled weapons. They can come in the form of drones that can navigate difficult terrain and kill enemies. Armies of killer robots can come in swarms and drones in near-future war scenarios. Many texts conclude that autonomous killer robots need to be banned because the decision to kill should never be delegated to a machine.

Second, killer robots have a firm place in sci-fi entertainment media: novels, movies and computer games. They attack together with aliens and monsters from far away galaxies. They can also be used by the protagonists like in the movie *Pacific Rim* where people in giant killer robots fight against monsters.

Discussion. It seems that the spectrum of robot conceptions on the English Web is much smaller and more homogeneous than that of HRI. Robots are either working or killing machines. HRI conceptualisations of robots as partners, friends or companions are largely absent. If they occur, they largely stem from research sites on human-robot interaction. This discrepancy between HRI and the outside world could mean that HRI concepts are at the cutting edge of research and will only later trickle down into common language. It could also mean, however, that HRI has lost touch with common culture. Either way this discrepancy needs to be considered when communicating HRI research to the public.

Both robot conceptions are highly ambiguous. Robots as workhorses relieve us from drudgery but threaten to eventually take our jobs. Robots as killer machines might be highly entertaining in the media but a major threat when employed in the real world. We could expect that also social robots will be seen in such ambiguous ways. Then, robots as partners, companions and friends might also be conceptualised as cheaters, deceivers and traitors.

There are several limitations to this analysis. First, it represents a snapshot of robot conceptions in an English web corpus of 2015. Robot conceptualisations can change over time and it would be sensible to conduct diachronic analyses. More direct comparisons should be done with a corpus of HRI papers which would allow for more fine-grained comparisons in the future.