IMPLEMENTATION OF ROBOTIC INTELLIGENCE AND COMMUNICATION

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Abstract

Several novel contentions are made in this study. First, it proposes a theoretical approach, even if the theory comes with a clear methodology and execution, so that we know what to do, how to do it, and why. Secondly, it promotes HARMS communication using everyday language and provides justification for why this is preferable. way. Third, it is adamant that the semantic approach be used so that all HARMS agents "understand" (or at least comprehend) what is and is not occurring. The fourth, and possibly least relevant, suggestion is that one specific approach, with a veiled suggestion that certain of its tenets are inextricable.

1. Introduction

Humans and computers have been interacting since since the first command was entered into a computer. Code is used for communication, albeit it often includes natural-sounding phrases and even whole sentences. However, there is a limited number of possible symbol–word pairings. Indeed, this is a description of human interaction. Also serves as a means of communication, right? Exactly how unlike are our interactions with machines and other humans? Or is there no difference at all? Or, to rephrase, should there be a distinction?
There is, or rather, there was in the 1980s, a large body of academic and professional literature devoted to the often maligned Turing test, which purportedly reveals whether my unknown interlocutor is human or a computer, and it was all about intelligence. The remarkable progress made in mapping the human genome and in mapping out the human brain since then has not considerably increased our comprehension of our own thoughts. In reality, a well-informed, thoughtful person would name language, culture, and humour if pressed to name a human mental capability that a robot or computer cannot replicate. While the computer may be able to name all 37,000 or so human ailments off the top of its head, I, a hereditary hypochondriac, could struggle to come up with a hundred. In its memory, it stores every single component for every single General Motors car ever made, in the same number brackets. As a seasoned driver of these vehicles, I can definitely name at least 30 of them. IBM Watson has defeated human Jeopardy! Champions, but the only people who think it is intelligent are the readers of the New York Times' Tuesday Science section. You may be wondering what advantages I have over IBM Watson. As a huge plus, I don't experience as many crashes since I'm not using IBM-produced or -purchased code. In addition, I keep a number of lists, none of them very long, but covering a wide range of topics: persons I know and have remembered, places I have been or know about,

Authors whose works I have read, dishes I have tried, and so on. However, my recall of all those lists is fallible and not as accurate as a computer's; I do forget, misunderstand facts, and make mistakes. Also, if I have to make a list, I can just type it right into the computer. As a matter of fact, I can speak, comprehend, write, and read not just English but also numerous other languages, which is becoming more unusual. Even while it can generate a large amount of text in response to commands, the computer is unable to comprehend them. For example, it cannot grasp my request to print out a list of all human illnesses, but it can print out whatever other text I give it. But I can write poetry, so yes! So can a computer, given the right instructions. This study will discuss robotic intelligence as a kind of AI (Section 2), argue for the use of natural language in CHARMS with the ability to comprehend by non-humans (Section 3), and briefly describe Ontological Semantic Technology as an advanced implementation of this method (Section 4). (Section 4). This study is founded on two non-machine learning principles: it is rule-based rather than statistical, and it is meaning-based rather than bag-of-words-based. A semantically naive robotics, particularly one indoctrinated by machine-learning-only schooling, should grasp this. It is also not meant to be seen as an effort to bring human cooperation into CHARMS, but rather as a declaration that both can and should be grounded in computational semantics.

2. Robotic intelligence kind of AI

The rising ability of computer programs at mimicking human behaviour has obscured the significant gaps between human intelligence and artificial/computer/robotic intelligences. Will the robots and agents behave like humans while collaborating with humans in a CHARMS team? All the setup leading up to this point was for this purpose. First, however, let's clarify the differences and similarities between human intelligence, artificial intelligence, computers, the Internet, agents, and the topic at hand, robots.

Connect with one another Human intelligence encompasses the whole range of mental processes necessary for human survival. Foremost among them is fluency in at least one native language, a level of mastery enough for each person's chosen way of life. We have a good understanding of the world and can see and react to its most recent changes, so the thinking goes. We may use our native language to convey any of these to other native speakers, including ourselves. The fact that something has never occurred or will never happen because of our ability to convey it is not a barrier to its possibility. It's important to remember that words can't fully capture our experience of the world and that there are many things we can only understand by looking at them like (likea map of Albania or a photograph of a person's face, for example). The term "artificial intelligence" (AI) refers to the use of software designed to mimic human intelligence in situations where the program is tasked with performing an intellectual activity normally performed by a person. The early AI community's too optimistic and naive attitude was that if such an application were even somewhat effective, we'd finally figure out how human intelligence works since we'd be the ones to create the computer algorithm. In the course of the field's development — I hesitate to use the word "maturation" — it became apparent that the computer might use approaches different from those used by humans to get outcomes that looked convincing. Since humans do not think statistically, all the ongoing and expanding machine learning initiatives cannot legitimately claim the AI status. These efforts also fall short in natural language processing (NLP) applications due to the fact that even at their enhanced precision rate of 80% (actually, about 60%), it is still much below than the human user's expectation of accuracy (95+%) (Make it a maximum 5% error tolerance). To rephrase: who wants a computer program that is incorrect once every five times, or even twice?! Simply said, no one should have faith in a program that attempts to change a text without first trying to figure out what it's about.

Computer intelligence and web intelligence are largely interchangeable in the general sense, and hence of little interest to us here save as identifiers of membership in certain academic circles. It deviates from the preceding two bullet points, which belong squarely in CHARMS. The HARMS hybrid includes both intelligent agents and robots as equal members. Group efforts, with the primary goal of the CHARMS system being to improve the intelligence and savvies of its computing parts by increasing their degree of independence from the rest of the system. Robots' cyber physicality, in which they have dimensions, are constrained by time, and can feel pain, is an intriguing addition to the field of robotics intelligence. Mobility, agility, etc. Physical sensors, such as distance to another item or ambient temperature, may also be manipulated by the robotic intelligence.

3. Working together

Clearly, HARMS wants to make the most of its resources, and that requires everyone involved to provide their very best. Humans, agents, and robots should all chip in with their smarts as we upgrade the machines and sensors to state-of-the-art mechanical, optical, etc., standards. Communication, it means constantly improving the robots' independence, IQ, and output. Because robots should know their jobs, the circumstances for their performance, and all the relevant situations of their life, such as recharging and self-checking, this implies the decrease and, ultimately, removal of frequent instructions to robots. Previous work of ours has revealed that the region in which CHARMS exists is defined by a number of factors; Control (both human and non-human), Division of Labour, Specialization, Optimization, and Avoidance of Duplicate Efforts, Transcending linguistic barriers via effective reporting and mutual comprehension.

Related research in organization of work

These topics have been researched in depth before, but never in the manner that CHARMS can utilize them. This is despite the fact that they span disciplines as varied as control theory, ergonomics, corporate and industrial communication, and neuron-linguistic programming. Human-human cooperation, as opposed to hybrid human-robot-agent collaboration, has proven more successful in the past. Researched extensively from the viewpoints of sociology, management, industrial engineering/ergonomics, human factors, and rhetoric/usability, but not readily adaptable to the machine language algorithmic context since, unavoidably, such studies rely on human perception and intellect. Relevant to this study are the belief-desire-intention (BDI) investigations of intelligent agents1, 2; based on prominent scholarship3 on plans and intentions—see also Wooldridge4; which generalize certain features of human cooperation to artificial intelligence. Joint intentions5, 6, 7, shared plans8, 9, 10, and other facets of the design and execution of intelligent agents 11, 12, 13 were the primary foci of BDI research involving hybrid teams. The formality (no human intellect required), complexity, and upward scalability that CHARMS requires are not present in even those, much alone the COIN clique's attempts

.Related research in work communication

The gap between what CHARMS requires and what NLP has made accessible outside of our organization with regard to coordinating and optimizing real communication among the HARMS partners is substantially larger. In spite of the fact that it seems that nobody has ever tried to transfer Natural Language Processing (NLP) technology, much alone succeeded, however, there have been some relevant efforts in natural language processing (NLP) involving intelligent agents, for example25, 26. These efforts incorporate Computational Semantic technology, or any meaning processing technology, into facilitating robot/agent communication beyond the confines of predefined commands and menus. By simulating computer involvement in a conversation with a single human, they have gained some useful insights, but they have nothing to do with genuine robotic agents or their native systems of communication (or with completely semantic approaches). Since, outside of CHARMS, there hasn't been much active cooperation between agent and NLP research groups, this work may pave the way for more interdisciplinary explorations of robot-human communication. One possible explanation is that the prevalent non-representative, non-rule-based, non-semantic approaches to the issue of the communication system among humans, robots, and agents lack key premises and components, such as enormous corpora of linked texts.

For many years, natural language processing (NLP) has been dominated by syntax-, statistics-, and machine-learning-based approaches that have made great strides in text classification and clustering without actually understanding the texts or investing in acquiring resources like human-traceable repositories of meaning. The development of Pidgin English in the 19th century to ease English-Chinese communication in seaports, or the creation of Esperanto, a naive attempt to create the "easiest" natural language that combines the features of the "most efficient languages" so that it could be adopted as the international language, are two examples of the radically different approaches that have been tried to improve robot-human communication.

Both of these claims are made about ROILA27, a spoken language designed for communicating with robots. While the language is advertised as simple, straightforward, and exception-free, it is also completely unfamiliar to both humans and robots and must be learnt from scratch. It also doesn't provide a path to understanding.

The desire to program in natural language is a persistent one that appears in practically every new approach to NLP; for the most recent attempts in this area, see, for example, 28, 29. This proposal is the closest NLP has ever gone to tackling difficulties like those we deal with. Not to be confused with Computing with Words initiative30, which focuses on precise computational interpretations of a small set of words, largely secularized quantifiers.

4. The Ontological Semantic Technology (OST) component of CHARMS

In this paper, we argue that the hybrid communication does not need to, and indeed should not, produce multimillion-word corpora, and instead focuses on situations where the job itself necessitates thorough and direct meaning access. Corpus suitable for the statistical techniques. It's not like a text clustering or data mining program, where some degree of error is acceptable, but rather one where every order, report, or direction must be understood instantly and precisely. As useful as rule-based techniques are when applied to areas in which we already possess the necessary information, they are not without their own set of restrictions. Machine learning may still be required for concerns of reasoning, notably abduction, even after they have provided meaning-based outcomes. Since all the necessary tools already exist and we demonstrated the mechanics of semantic interpretation earlier24, we will spend as little time as possible on the actual process of implementing the OST part of CHARMS. This technology has been around for a while, having been developed in the 1990s31 using high-risk NSA funds by Ruskin and Taylor with assistance from Kiki Hempelmann, Max Petrenko, and other past and present Ph.D. students at Purdue University32, 33, 34. In its most recent form, the language-specific ontology seen in Fig. 1 is a massive connected graph, where ideas serve as nodes and characteristics as connections. As many other ideas as attributes a given concept possesses are connected to it directly. The OST ontology is property-rich, unlike many commercial and government ontology's, which often feature few more properties beyond pure subsumption (e.g., the Linnaean zoology: cat is feline). It was intended to be an Interlingua, a language that may be spoken by people of different native tongues. Each individual natural language defines its words and word-like things (including phrasal verbs) via a concept and its attributes with their values as other concepts or such literals as integers.

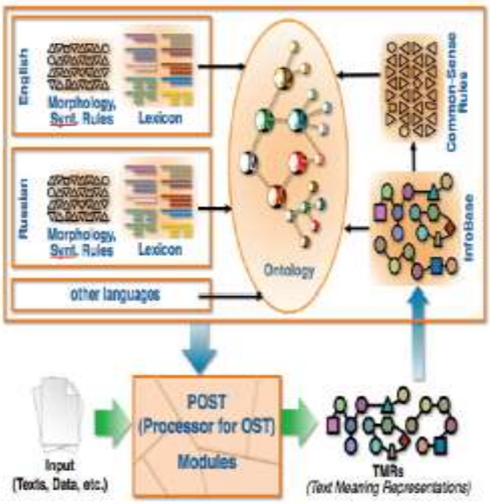

Fig. 1. OST Architecture

It was during Eric Matson's 2011 First Summer School on Humanoid Robotics at Purdue that Julia Taylor and I had the epiphany that our ontology was non-language-specific, meaning that it underlay not only formal languages and robotic systems but also all natural languages, databases, images, and other forms of communication. Related to data. Simply said, an ontology-enabled robot "understands" the meaning of sensor in the same way that its human partner does when they use the English word or its equivalent in any other language: by making an ontological connection between the two. For our robots, the sensor's code is equivalent to yet another foreign word. An intriguing new study35 claims that since the mechanical industrial robot is able to self-check some aspects of it, it has achieved self-awareness. What was often lacking from this pioneering effort was making sure the robot was aware that it was checking itself (since it lacks the ontology to do so). The OST ontology provides the CHARMS robots with a strong feeling of their: location in the environment, partners, physical parameters, position, motions, repertoire of functions, and many other aspects of information that robot designers and users may be unaware of.

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