Top30

1. [ ] [Kurup2012] (/top30/01\_Kurup2012/)

2. [ ] [Morse2011] (/top30/02\_Morse2011/)

3. [ ] [Bar-Cohen2006] (/top30/03\_Bar-Cohen2006/)

4. [ ] [Krichmar2011] (/top30/04\_Krichmar2011/)

5. [ ] [Taylor2006] (/top30/05\_Taylor2006/)

6. [ ] [Strauss2012] (/top30/06\_Strauss2012/)

7. [ ] [Beer1997] (/top30/07\_Beer1997/)

8. [ ] [Breazeal2005] (/top30/08\_Breazeal2005/)

9. [ ] [Bar-cohen2003] (/top30/09\_Bar-cohen2003/)

10. [ ] [Pfeifer2007] (/top30/10\_Pfeifer2007/)

11. [ ] [Taylor1999] (/top30/11\_Taylor1999/)

12. [ ] [Newell1992] (/top30/12\_Newell1992/)

13. [ ] [Thrun2010] (/top30/13\_Thrun2010/)

14. [ ] [Liu2003] (/top30/14\_Liu2003/)

15. [ ] [Milford2004] (/top30/15\_Milford2004/)

16. [ ] [Milford2007] (/top30/16\_Milford2007/)

17. [ ] [Wyeth2009] (/top30/17\_Wyeth2009/)

18. [ ] [Wyeth2011] (/top30/18\_Wyeth2011/)

19. [ ] [Maddern2012] (/top30/19\_Maddern2012/)

20. [ ] [Hengel2012] (/top30/20\_Hengel2012/)

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23. [ ] [Spencer2012] (/top30/23\_Spencer2012/)

24. [ ] [Sandamirskaya2011] (/top30/24\_Sandamirskaya2011/)

25. [ ] [Zibner2011] (/top30/25\_Zibner2011/)

26. [ ] [Hosoda2010] (/top30/26\_Hosoda2010/)

27. [ ] [Hosoda2012] (/top30/27\_Hosoda2012/)

28. [ ] [Krichmar2012] (/top30/28\_Krichmar2012/)

29. [ ] [Richter2012] (/top30/29\_Richter2012/)

30. [ ] [Maniadakis2012] (/top30/30\_Maniadakis2012/)

# What can cognitive architectures do for robotics?

Authors: Unmesh Kurup, Christian Lebiere

Publication:

Biologically Inspired Cognitive Architectures, Volume 2, October 2012, Pages 88–99

http://dx.doi.org/10.1016/j.bica.2012.07.004

Keywords: Cognitive architecture principles; Cognitive Robotics; Requirements for cognitive robotics

Citations: 1

Abstract:

Research in robotic systems has traditionally been identified with approaches that are characterized by the use of carefully crafted representations and processes to find optimal solutions. The use of such representations and processes, which we refer to as the algorithmic approach, is uniquely suited for problems requiring strong models, i.e., tasks and domains that are well defined, and/or involve close interaction with the environment. These problems have historically been the focus of robotics research because they exercise perceptual, motor and manipulation capabilities that form the basic foundational abilities required for every robotic agent. Recent work (for example ROS and Tekkotsu) on the abstraction and encapsulation of perception and motor functionality has standardized the above mentioned foundational abilities and allowed researchers to study problems in less clearly defined and open-ended domains: problems that have previously been considered the province of AI and Cognitive Science. In this paper, we argue that the study of these problems (examples of which include multi-agent interaction, instruction following and reasoning in complex domains) referred to under the rubric of Cognitive Robotics is best achieved via the use of cognitive architectures – unified computational frameworks developed specifically for general problem solving and human cognitive modeling. We lay out the relevant architectural concepts and principles and illustrate them using nine cognitive architectures that are under active development – Soar, ACT-R, CLARION, GMU-BICA, Polyscheme, Co-JACK, ADAPT, ACT-R/E, and SS-RICS.

Reading Report:

Comments: This paper is a general call for robotics researchers to look at cognitive architectures as serious solutions or alternatives to traditional algorithmic robotic solutions. I have included this paper, and placed it at the top of my list, because it provides the best overview and summaries of major cognitive architectures. Each of the architectures have been briefly explained and summarized. Details, pros and cons have been included and directed at robotics researchers with some practical examples. This papers biggest contribution is gathering all information on available cognitive architectures into one place, and then sifting through them to find commonalities, which should exist in a cognitive architecture for robotics.

Summary:

# The role of robotic modelling in cognitive science

Authors: Anthony F. Morse, Carlos Herrera, Robert Clowes, Alberto Montebelli, Tom Ziemke

Publication:

New Ideas in Psychology, Vol. 29(3), December 2011, pp. 312-324   
http://dx.doi.org/10.1016/j.newideapsych.2011.02.001

Keywords: Autonomy; Cognitive modelling; Cognitive robotics; Embodiment; Emotion; Enaction

Citations: 7

Abstract:

From the perspective of cognitive robotics, this paper presents a modern interpretation of Newell’s (1973) reasoning and suggestions for why and how cognitive psychologists should develop models of cognitive phenomena. We argue that the shortcomings of current cognitive modelling approaches are due in significant part to a lack of exactly the kind of integration required for the development of embodied autonomous robotics. Moreover we suggest that considerations of embodiment, situatedness, and autonomy, intrinsic to cognitive robotics, provide an appropriate basis for the integration and theoretic cumulation that Newell argued was necessary for psychology to mature. From this perspective we analyse the role of embodiment and modes of situatedness in terms of integration, cognition, emotion, and autonomy. Four complementary perspectives on embodied and situated cognitive science are considered in terms of their potential to contribute to cognitive robotics, cognitive science, and psychological theorizing: minimal cognition and organization, enactive perception and sensorimotor contingency, homeostasis and emotion, and social embedding. In combination these perspectives provide a framework for cognitive robotics, not only wholly compatible with the original aims of cognitive modelling, but as a more appropriate methodology than those currently in common use within psychology.

Reading Report:

Comments: This paper is not aimed at robotics researchers; it is aimed at cognitive scientists who could benefit from the current work being done in robotics. Namely, the large collections of libraries and frameworks to get started quickly, and robots are now cheaply available. Cognitive Science focuses on embedded or embodied intelligence. As robots are well suited to modeling embodied agents, because that is essentially what robots are, they are a nearly perfect test platform for cognitive scientists to implement and test their models. There is of course a small lack of out-of-the-box, plug-and-play cognitive robotics packages, but it is important for cognitive scientists to join robotics researching in developing these. The benefit, and reason this paper, is included in my top 30, is that it offers a quick look from the other side of the fence. As robotics researchers turn to biologically inspired solutions, why is it natural, cognitive and neural science researchers are turning to robotics? I believe it is important for future development that we create interdisciplinary partnerships early to converge in the long run and reach our unique goals together without duplication of work.

Summary:

# Biomimetics—using nature to inspire human innovation

Authors: Yoseph Bar-Cohen

Publication:

Keywords:

Citations: 97

Abstract:

Evolution has resolved many of nature’s challenges leading to lasting solutions. Nature has always inspired human achievements and has led to effective materials, structures, tools, mechanisms, processes, algorithms, methods, systems, and many other benefits (Bar-Cohen Y (ed) 2005 Biomimetics—Biologically Inspired Technologies (Boca Raton, FL: CRC Press) pp 1–552). This field, which is known as biomimetics, offers enormous potential for inspiring new capabilities for exciting future technologies. There are numerous examples of biomimetic successes that involve making simple copies, such as the use of fins for swimming. Others examples involved greater mimicking complexity including the mastery of flying that became possible only after the principles of aerodynamics were better understood. Some commercial implementations of biomimetics, including robotic toys and movie subjects, are increasingly appearing and behaving like living creatures. More substantial benefits of biomimetics include the development of prosthetics that closely mimic real limbs and sensory-enhancing microchips that are interfaced with the brain to assist in hearing, seeing and controlling instruments. A review is given of selected areas that were inspired by nature, and an outlook for potential development in biomimetics is presented.

Reading Report:

Comments: Biomimetics, the synthetic replication of nature’s procedures and approaches, is discussed in very general terms with examples to when biomimetics has both succeeded and failed in engineering history. This paper’s contribution to biologically inspired robotics is through its attempt to categorize types of biological inspiration, and find an analogy between biological and engineered systems. This paper does a very good job providing examples that have been successfully re-engineered, some of which I had taken for granted and did not consider biologically inspired. It is stresses the importance of abstraction when looking at nature’s solutions. Through categorizing biologically influenced solutions by how they were abstracted from the underlying biological mechanisms perhaps patterns will emerge, allowing for generalizations and guidelines which can be used when searching for future solutions.

Summary:

# Neuromorphic and Brain-Based Robots

Authors: Jeffrey L. Krichmara, Hiroaki Wagatsuma

Publication:

Keywords: Brain-based robots, cognitive robots, computational neuroscience, machine ethics, neuromorphic engineering, neurorobots.

Citations: 5

Abstract:

Neuromorphic and brain-based robotics have enormous potential for furthering our understanding of the brain. By embodying models of the brain on robotic platforms, researchers can investigate the roots of biological intelligence and work towards the development of truly intelligent machines. This paper discusses the history of the field and its potential. We give examples of biologically inspired robot designs and neural architectures that lead to brain-based robots. Looking to the future, we consider the development of cognitive, or even conscious, robots that display the adaptability and intelligence of biological organisms.

Reading Report:

Summary:

Comments:

# A Basis for Cognitive Machines

Authors: J.G. Taylor, S. Kasderidis, P. Trahanias, and M. Hartley

Publication:

http://dx.doi.org/10.1007/11840817\_60

Keywords:

Citations: 6

Abstract:

We propose a general attention-based approach to thinking and cognition (more specifically reasoning and planning) in cognitive machines as based on the ability to manipulate neural activity in a virtual manner so as to achieve certain goals; this can then lead to decisions to make movements or to no actions whatever. The basic components are proposed to consist of forward/inverse model motor control pairs in an attention-control architecture, in which buffers are used to achieve sequencing by recurrence of virtual actions and attended states. How this model can apply to various reasoning paradigm will be described and first simulations presented using a virtual robot environment.

Reading Report:

Summary:

Comments:

# A robotics-based approach to modeling of choice reaching experiments on visual attention

Authors: Soeren Strauss, Dietmar Heinke

Publication:

http://dx.doi.org/10.3389/fpsyg.2012.00105

Keywords:

Citations: 0

Abstract:

The paper presents a robotics-based model for choice reaching experiments on visual attention. In these experiments participants were asked to make rapid reach movements toward a target in an odd-color search task, i.e., reaching for a green square among red squares and vice versa (e.g., Song and Nakayama, 2008). Interestingly these studies found that in a high number of trials movements were initially directed toward a distractor and only later were adjusted toward the target. These “curved” trajectories occurred particularly frequently when the target in the directly preceding trial had a different color (priming effect). Our model is embedded in a closed-loop control of a LEGO robot arm aiming to mimic these reach movements. The model is based on our earlier work which suggests that target selection in visual search is implemented through parallel interactions between competitive and cooperative processes in the brain (Heinke and Humphreys, 2003; Heinke and Backhaus, 2011). To link this model with the control of the robot arm we implemented a topological representation of movement parameters following the dynamic field theory (Erlhagen and Schoener, 2002). The robot arm is able to mimic the results of the odd-color search task including the priming effect and also generates human-like trajectories with a bell-shaped velocity profile. Theoretical implications and predictions are discussed in the paper.

Reading Report:

Summary:

Comments:

# Biologically inspired approaches to robotics: what can we learn from insects?

Authors: Beer, Randall D; Quinn, Roger D; Chiel, Hillel J; Ritzmann, Roy E

Publication:

<http://dx.doi.org/10.1145/245108.245118>

Keywords:

Citations: 165

Abstract:

When it comes to autonomous robots, the contrast between fantasy and reality is really quite striking. On the one hand, we have the fantasy of such anthropomorphic robots as C3PO from Star Wars and Commander Data from Star Trek: The Next Generation which, despite their endearing quirks, negotiate complex physical and social environments with essentially the skill of a human being. On the other hand, we have the reality of industrial robots that can efficiently carry out such highly specialized tasks as painting and welding only in environments carefully constrained to minimize complications. Or, to consider a second example, we have Dante II, the semi-autonomous robot that had to be lifted out of a volcano it was exploring with a crane when it overturned. Far from being a limitation unique to the Dante II project, which should be applauded for confronting such a difficult environment, this brittleness in the face of unanticipated contingency is in fact typical of the state of the art in autonomous robotics.

Reading Report:

Summary:

Comments:

# Socially intelligent robots

Authors: Breazeal, C

Publication:

[http://dx.doi.org/10.1145/1052438.1052455](http://dx.doi.org/10.1145/245108.245118)

Keywords:

Citations: 26

Abstract:

WHAT IS A SOCIALLY INTELLIGENT ROBOT? It is a difficult concept to define, but science fiction offers many examples. There are the mechanical droids R2-D2 and C-3PO from Star Wars. There are many wonderful examples in the short stories of Isaac Asimov, such as Robbie. And more recently, there is Teddy from the movie Artificial Intelligence. Science fiction illustrates how these technologies could enhance our lives and benefit society, but it also warns us that this dream must be approached responsibly and ethically, as portrayed in Blade Runner.

Reading Report:

Summary:

Comments:

# Biologically inspired intelligent robots using artificial muscles

Authors: Yoseph Bar-Cohen

Publication:

[http://dx.doi.org/10.1109/ICMENS.2003.1221956](http://dx.doi.org/10.1145/245108.245118)

Keywords:

Citations: 15

Abstract:

Humans throughout history have always sought to mimic the appearance, mobility, functionality, intelligent operation, and thinking process of biological creatures. This field of biologically inspired technology, having the moniker biomimetics, has evolved from making static copies of human and animals in the form of statues to the emergence of robots that operate with realistic appearance and behavior. Technology evolution led to such fields as artificial muscles, artificial intelligence, artificial vision and biomimetic capabilities in materials science, mechanics, electronics, computing science, information technology and many others. One of the newest fields is the artificial muscles, which is the moniker for electroactive polymers (EAP). Efforts are made worldwide to establish a strong infrastructure for this actuation materials ranging from analytical modeling and comprehensive understanding of their response mechanism to effective processing and characterization techniques. The field is still in its emerging state and robust materials are still not readily available however in recent years significant progress has been made. To promote faster advancement in the field, in 1999, the author posed a challenge to the research and engineering community to develop a robotic arm that would wrestle against human opponent and win. Currently, he is considering setting up the first competition in 2005. This paper covers the current state-of-the-art and challenges to making biomimetic robots using artificial muscles.

Reading Report:

Summary:

Comments:

# Self-Organization, Embodiment, and Biologically Inspired Robotics

Authors: Pfeifer, Rolf

Publication:

http://dx.doi.org/10.1126/science.1145803

Keywords:

Citations:

Abstract:

Robotics researchers increasingly agree that ideas from biology and self-organization can strongly benefit the design of autonomous robots. Biological organisms have evolved to perform and survive in a world characterized by rapid changes, high uncertainty, indefinite richness, and limited availability of information. Industrial robots, in contrast, operate in highly controlled environments with no or very little uncertainty. Although many challenges remain, concepts from biologically inspired (bio-inspired) robotics will eventually enable researchers to engineer machines for the real world that possess at least some of the desirable properties of biological organisms, such as adaptivity, robustness, versatility, and agility.

Reading Report:

Summary:

Comments:

# Neural 'bubble' dynamics in two dimensions: foundations

Authors: Taylor, J

Publication:

http://dx.doi.org/10.1007/s004220050534

Keywords:

Citations: 137

Abstract:

An extension to two dimensions of recent results in continuum neural field theory (CNFT) in one dimension is presented here. Focus is placed on the treatment of receptive fields and of learning on afferent synapses to obtain topographic maps.

Reading Report:

Summary:

Comments:

# You can’t play 20 questions with nature and win: Projective comments on papers of this symposium

Authors: Newell, Allen

Publication:

http://repository.cmu.edu/compsci/2033/

Keywords:

Citations: 647

Abstract:

Reading Report:

Summary:

Comments:

# Toward robotic cars

Authors: Sebastian Thrun

Publication:

http://dx.doi.org/10.1145/1721654.1721679

Keywords:

Citations: 21

Abstract:

This article advocates self-driving, robotic technology for cars. Recent challenges organized by DARPA have induced a significant advance in technology for autopilots for cars; similar to those already used in aircraft and marine vessels. This article reviews this technology, and argues that enormous societal benefits can be reaped by deploying this emerging technology in the marketplace. It lays out a vision for deployment, and discusses some of the key remaining technology obstacles.Reading

Report:

Summary:

Comments:

# Toward robotic cars

Authors: Sebastian Thrun

Publication:

http://dx.doi.org/10.1145/1721654.1721679

Keywords:

Citations: 21

Abstract:

This article advocates self-driving, robotic technology for cars. Recent challenges organized by DARPA have induced a significant advance in technology for autopilots for cars; similar to those already used in aircraft and marine vessels. This article reviews this technology, and argues that enormous societal benefits can be reaped by deploying this emerging technology in the marketplace. It lays out a vision for deployment, and discusses some of the key remaining technology obstacles.Reading

Report:

Summary:

Comments:

# Results for outdoor-SLAM using sparse extended information filters

Authors: Y Liu, S Thrun

Publication:

http://dx.doi.org/10.1109/ROBOT.2003.1241760

Keywords:

Citations: 111

Abstract:

In Thrun, S., et al., 2001, we proposed the sparse extended information filter for efficiently solving the simultaneous localization and mapping (SLAM) problem. In this paper, we extend this algorithm to handle data association problems and report real-world results, obtained with an outdoor vehicle. We find that our approach performs favorably when compared to the extended Kalman filter solution from which it is derived.

Report:

Summary:

Comments:

# 15. RatSLAM: a hippocampal model for simultaneous localization and mapping

Authors: Milford, M., Wyeth, G. and Prasser, D.

Abstract: The paper presents a new approach to the problem of Simultaneous Localization and Mapping - SLAM - inspired by computational models of the hippocampus of rodents. The rodents hippocampus has been extensively studied with respect to navigation tasks, and displays many of the properties of a desirable SLAM solution. RatSLAM is an implementation of a hippocampal model that can perform SLAM in real time on a real robot. It uses competitive attractor network to integrate odometric information with landmark sensing to form a consistent representation of the environment. Experimental results show that RatSLAM can operate with ambiguous landmark information and recover from both minor and major path integration errors.

# 16. Learning spatial concepts from RatSLAM representations

Authors: Milford, M., Schulz, R., Prasser, D., Wyeth, G. and Wiles, J.

17. [ ] [Wyeth2009] (/top30/17\_Wyeth2009/)

18. [ ] [Wyeth2011] (/top30/18\_Wyeth2011/)

19. [ ] [Maddern2012] (/top30/19\_Maddern2012/)

20. [ ] [Hengel2012] (/top30/20\_Hengel2012/)

21. [ ] [SandamirskayaROMAN2010] (/top30/21\_SandamirskayaROMAN2010/)

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