1. F. Zambonelli, N. Bicocchi, G. Cabri, L Leonardi and M. Puviani

On Self-Adaptation, Self-Expression, and Self-Awareness in Autonomic Service Component Ensembles

2011 Fifth IEEE Conference on Self-Adaptive and Self-Organizing Systems Workshops (SASOW), oct 2011, p 108 - 113

DOI 10.1109/SASOW.2011.24

This paper presents a seminal work about the self-expression, i.e. the capability of changing the collaboration pattern in order to let a system adapt to changing execution conditions. This is interesting because it does not imply a single-component adaptation, but the adaptation is at system level.

2. Mariachiara Puviani, Giacomo Cabri, and Franco Zambonelli

A Taxonomy of Architectural Patterns for Self-adaptive Systems

In Sixth International C* Conference on Computer Science & Software Engineering, pages 77–85, Porto (P), July 2013. ACM, ACM

DOI 10.1145/2494444.2494470

The idea of classifying the collaboration patterns that make systems adaptive is very interesting, and this paper addresses collective systems. Besides the taxonomy proposed in the paper, the exploited classification criteria can be useful also independently of the taxonomy, to reason about the fundamental adaptation mechanisms and architectures for collective systems.

3. Roberto Bruni, Andrea Corradini, Fabio Gadducci, Alberto Lluch Lafuente, and Andrea Vandin

Modelling and Analyzing Adaptive Self-assembly Strategies with Maude

In Proceedings of the 9th International Workshop on Rewriting Logicand its Applications (WRLA 2012), volume 7571 of LNCS, pages 18–138. Springer, 2012. (doi:10.1007/978-3-642-34005-5_7)

DOI 10.1007/978-3-642-34005-5_7

This paper presents a concrete implementation of a collective adaptive system based on a conceptual framework for adaptation centered around the role of control data. Authors exploit Maude, a reflective logical language, for programming robot swarms equipped with obstacle-avoidance self-assembly strategies.

4. John H. Holland

Signals and Boundaries - Building Blocks for Complex Adaptive Systems

MIT Press (2012) ISBN:0262017830 9780262017831

Complex adaptive systems are strictly connected with collective adaptive systems, and they can be ecosystems, governments, biological cells, and markets. The author points out that all these systems are characterized by hierarchical arrangements of boundaries and signals, and claims that understanding the origin of the intricate signal/border hierarchies of these systems is the key to steer them.. This is an interesting point of view about the fundamentals of adaptive systems.

5. Javier Cámara, Rogério de Lemos, Carlo Ghezzi, Antónia Lopes

Assurances for Self-Adaptive Systems : Principles, Models, and Techniques

ISBN: 978-3-642-36248-4 Lecture Notes in Computer Science Volume 7740 (2013)

DOI 10.1007/978-3-642-36249-1

The authors discuss what they consider a fundamental aspect of self-adaptive systems, the “assurance”, i.e. the provision of evidence that the system satisfies its stated functional and non-functional requirements during its operation in the presence of self-adaptation. In particular, this book discuss the issues related to formal verification, models and middleware, failure prediction, and assurance techniques.

6. Ferscha, A.,

20 Years Past Weiser: What's Next?

IEEE Pervasive Computing, vol.11, no.1, pp.52,61, January-March 2012

DOI 10.1109/MPRV.2011.78

This paper looks into the relevant research issues in the area of Pervasive Computing. People working in CAS can also find some of their area as specifically Pervasive Adaptations project.

7. Funk, C.; Schultheis, A.; Linnhoff-Popien, C.; Mitic, J.; Kuhmunch, C.

Adaptation of Composite Services in Pervasive Computing Environments

IEEE International Conference on Pervasive Services, pp.242,249, 15-20 July 2007

DOI 10.1109/PERSER.2007.4283922

The paper talks about adaptations of composite services in Pervasive computing environments. The paper talks about a two-level decision system for adaptation decisions based on Linear Programming and Rule Based Systems.

8. Irun Cohen

Tending Adam's Garden: Evolving the Cognitive Immune Self

Academic Press, 2000

http://www.amazon.com/Tending-Adams-Garden-Evolving-Cognitive/dp/0121783561

This paper explains how the immune system viewed as a collective of collaborating cells gives rise to cognition and adaptation.

9. Jeremy Pitt and Andrzej Nowak

The Reinvention of Social Capital

IEEE Technology & Society Magazine, Volume:33 , Issue: 1, Pages: 27 – 80, March 2014

DOI http://dx.doi.org/10.1109/MTS.2014.2301884

This paper explains how to interleave social and computational intelligence for successful collective action.

10. Jeremy Pitt, Julia Schaumeier and Alexander Artikis

Axiomatization of Socio-Economic Principles for Self-Organizing Institutions: Concepts, Experiments and Challenges

ACM TAAS 7(4): 39, 2012

DOI 10.1145/2382570.2382575

This paper shows how to axiomatise and operationalise Ostrom's institutional design principles for collective action.

11. Doursat, René, Hiroki Sayama, and Olivier Michel

Morphogenetic Engineering: Toward Programmable Complex Systems

Springer, 2012.

http://link.springer.com/book/10.1007%2F978-3-642-33902-8

A collection of papers regarding morphogenesis: useful for deeply understand different ways to approach the same case study in generic collective adaptive systems.

12. Nolfi, Stefano

Behaviour as a complex adaptive system: On the role of self-organization in the development of individual and collective behavior

ComplexUs 2.3-4 (2006): 195-203

http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.484.8196

A theoretical paper in which challenges for designing complex adaptive systems are very well presented.

13. Balzani, V., Vetturi, M., & Credi, A. 2003

Molecular Devices and Machines. A Journey into Nanoworld

Weinhaim, Germany: Wiley-VCH, 2003.

http://onlinelibrary.wiley.com/book/10.1002/3527601600

This paper proposes a bottom-up approach that is common in both nanotechnology and information technology. From a collective adaptive systems perspective, a large number of simple components can be integrated and an aimed behavior can emerge.

14. Bonabeau, E., Dorigo, M., & Theraulaz, G.

Swarm intelligence: from natural to artificial systems

New York: Oxford University Press, 1999

http://www.amazon.com/Swarm-Intelligence-Artificial-Institute-Complexity/dp/0195131592

A milestone in the research of swarm intelligence: how to exploit natural approaches in the modelling, engineering and development of artificial systems.

15. Ohad Ben-Shahar, Shlomi Dolev, Andrey Dolgin, Michael Segal

Direction election in flocking swarms

Ad Hoc Networks 12: 250-258 (2014)

DOI doi:10.1016/j.adhoc.2012.05.001

This paper presents a set of swarm flocking algorithms that maintain connectivity while electing direction for flocking, under conditions of no communication. An interesting situation for collective adaptive systems.

16. Shlomi Dolev, Robert Gmyr, Andréa W. Richa, Christian Scheideler

Ameba-inspired Self-organizing Particle Systems

CoRR abs/1307.4259 (2013)

http://arxiv.org/abs/1307.4259

Self-organization is an interesting aspect for collective adaptive systems. This paper proposes an approach for simple computational particles inspired by the behavior of ameba.

17. Carlo Blundo, Angelo De Caro, Shlomi Dolev, Niv Gilboa, Marina Kopeetsky, Giuseppe Persiano, Paul G. Spirakis

Innovative approaches for security of small artefacts

Computer Science Review 5(1): 47-55 (2011)

DOI 10.1016/j.cosrev.2010.09.002

Security is an issue that should be taken into consideration when building systems, collective adaptive ones as well.

18. Shlomi Dolev, Yuval Elovici, Rami Puzis

Routing betweenness centrality

Journal of ACM 57(4) (2010)

doi>10.1145/1734213.1734219

This paper presents algorithms for computing Routing Betweenness Centrality (RBC) of all the individual vertices in a network and algorithms for computing the RBC of a given group of vertices, where the RBC of a group of vertices represents their potential to collaboratively monitor and control data flows in the network.

19. Zohir Bouzid, Shlomi Dolev, Maria Potop-Butucaru, Sébastien Tixeuil

RoboCast: Asynchronous Communication in Robot Networks

OPODIS 2010: 16-31

http://arxiv.org/abs/1006.5877

Swarm robotics is a relevant case study for collective adaptive systems. In this paper a communication abstraction is introduced, in order to model the asynchronously exchange of information among simple robots.

20. Shlomi Dolev, Nir Tzachar

Empire of colonies: Self-stabilizing and self-organizing distributed algorithm

Lecture Notes in Computer Science Volume 4305, 2006, pp 230-243

http://link.springer.com/chapter/10.1007%2F11945529_17

Self-organization organization is an interesting aspect for collective adaptive systems. In this book the authors introduce an approach to achieve also self-stabilization, which ensures automatic recovery from an arbitrary state.

21. Yoann Dieudonné, Shlomi Dolev, Franck Petit, Michael Segal

Deaf, Dumb, and Chatting Asynchronous Robots

Lecture Notes in Computer Science Volume 5923, 2009, pp 71-85

http://link.springer.com/chapter/10.1007/978-3-642-10877-8_8

This paper faces the issues of letting simple robots interact. The authors propose one-to-one deterministic movement protocols that implement explicit communication among asynchronous robots. They first show how the movements of robots can provide implicit acknowledgment in asynchronous systems. Then, they use this result to design one-to-one communication among a pair of robots.

22. Shlomi Dolev, Seth Gilbert, Nancy A. Lynch, Alexander A. Shvartsman, Jennifer L. Welch

GeoQuorums: implementing atomic memory in mobile ad hoc networks

Distributed Computing 18(2): 125-155 (2005)

http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.10.7933

GeoQuorums is an approach for implementing atomic read/write shared memory in mobile ad hoc networks, which represent in interesting case of collective adaptive systems. This approach takes into consideration also geographic locations.

23. Shlomi Dolev

Self-Stabilization

MIT Press 2000, ISBN 0-262-04178-2

http://mitpress.mit.edu/books/self-stabilization

In this book Shlomi Dolev presents the fundamentals of self-stabilization and demonstrates the process of designing self-stabilizing collective adaptive systems.

24. R. Brooks

Intelligence without Reason

Proceedings of the 12th international joint conference on Artificial intelligence - Volume 1, Pages 569-595, Morgan Kaufmann Publishers Inc. San Francisco, CA, USA, 991

This paper introduces some important concepts related to artificial intelligence and computer architecture. The author claims that the state of computer architecture has been a strong influence on our models of thought.

25. Ognen Paunovski, George Eleftherakis, Konstantinos Dimopoulos, Tony Cowling

Evaluation of a selective distributed discovery strategy in a fully decentralized biologically inspired environment

Information Sciences, Volume 180, Issue 10, 15 May 2010, Pages 1865–1875

DOI doi:10.1016/j.ins.2009.07.017

This paper builds on a very interesting idea, a selective discovery mechanism in a distributed bio-inspired multi-agent community through a simulation study. The primary focus of the study is on the impacts which death and reproduction events have on the effectiveness of the discovery process in different overlay networks.

26. Marco Conti, Sajal K. Das, Chatschik Bisdikian, Mohan Kumar, Lionel M. Ni, Andrea Passarella, George Roussos, Gerhard Tröster, Gene Tsudik, and Franco Zambonelli. 2012

Looking ahead in pervasive computing: Challenges and opportunities in the era of cyber-physical convergence

Pervasive and Mobile Computing 8, 1 (February 2012), 2-21.

DOI doi:10.1016/j.pmcj.2011.10.001

This paper presents a comprehensive survey and analysis of challenges in the field of pervasive computing, which turn out to be useful also for collective adaptive systems.

27. Huhns, Michael N. ; Li, Wei ; Tsai, Wei-Tek

Cloud-based Software Crowdsourcing

Dagstuhl Seminar 13362, 013

http://drops.dagstuhl.de/opus/volltexte/2013/4355/pdf/dagrep_v003_i009_p034_s13362.pdf

This paper analyzes the development of software in a cloud-based crowdsourcing; it considers crowd platforms, modeling, social issues, development processes, and verification.

28. Sven Tomforde, Jorg Hähner, Hella Seebach, Wolfgang Reif, Bernhard Sick, Arno Wacker, Ingo Scholtes

Engineering and Mastering Interwoven Systems

Proceedings of the 2nd International Workshop on Self-optimisation in Organic and Autonomic Computing Systems (SAOS14) in conjunction with ARCS 2014

http://link.springer.com/article/10.1007%2Fs00287-014-0827-z

This paper provides a general perspective on upcoming challenges for CAS, assembled by several authors with experience in the field.

29. Danny Weyns, Sam Malek and Jesper Andersson

FORMS: Unifying Reference Model for Formal Specification of Distributed Self-Adaptive Systems

ACM Transactions on Autonomous and Adaptive Systems (ISSN 1556-4665)

DOI 10.1145/2168260.2168268

This paper provides a formal model, called FOrmal Reference Model for Self-adaptation (FORMS), to reason about underlying principles of self-adaptive systems.

30. Saray Shai and Simon Dobson

Coupled adaptive complex networks

Physical Review E 87(4). April 2013.

DOI 10.1103/PhysRevE.87.042812

An example of complex network analysis applied to coupled networks that could be used to represent real phenomena.

31. Ozalp Babaoglu, Geoffrey Canright, Andreas Deutsch, Gianni A. Di Caro, Frederick Ducatelle, Luca M. Gambardella, Niloy Ganguly, Márk Jelasity, Roberto Montemanni, Alberto Montresor, Tore Urnes

Design patterns from biology for distributed computing

ACM Transactions on Autonomous and Adaptive Systems 1(1), pp.26-66. September 2006.

DOI 10.1145/1152934.1152937

This paper presents a comprehensive review of bio-inspired computing.

32. Witold Kinsner

Challenges in the design of adaptive, intelligent and cognitive systems

International Journal Software Science & Computational Intelligence, vol. 1, no. 3, pp. 16-35, July-Sept. 2009.

http://www.irma-international.org/viewtitle/34086/

Mono and collective adaptive systems are not easy to model and implement. Perhaps "adaptive" is too narrow to solve difficult problems.

33. Artikis, Alexander, Marek Sergot, and Jeremy Pitt

Specifying norm-governed computational societies

ACM Transactions on Computational Logic (TOCL) 10.1 (2009): 1.

DOI 10.1145/1459010.1459011

The area of normative systems where norms are shaped by an agent's internal influences (values) and external pressures (sanctions, rewards) is a good example of collective adaptive research.

34. Savarimuthu, Bastin Tony Roy, Stephen Cranefield, Martin K. Purvis, and Maryam A. Purvis

Norm emergence in agent societies formed by dynamically changing networks

Web Intelligence and Agent Systems 7, no. 3 (2009): 223-232.

DOI 10.3233/WIA-2009-0164

The area of normative systems where norms are shaped by an agent's internal influences (values) and external pressures (sanctions, rewards) is a good example of collective adaptive research.

35. Coates, A., Huval, B., Wang, T., Wu, D. J., Ng, A. Y., & Catanzaro, B.

Deep learning with COTS HPC Systems

Stanford, CA: Stanford University Computer Science Dept., 2013

http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.308.9984

This paper addresses the parallelization of AI techniques in order to improve performance; these techniques could be used within collective adaptive research.

36. Grazia, M. D., Stoianov, I., & Sorzil, M. (2012).

Parallelization of Deep Networks

ESANN 2012 proceedings, European Symposium on Artificial Neural Networks, Computational Intelligence

http://ccnl.psy.unipd.it/publications/publications_folder/parallelization-of-deep-networks/view

This paper addresses the parallelization of AI techniques in order to improve performance; these techniques could be used within collective adaptive research.

37. S.Bouarfa, H.A.P.Blom, R.Curran and M.H.C.Everdij

Agent-based modeling and simulation of emergent behavior in air transportation

Complex Adaptive Systems Modeling, 1:15, 2013

http://www.casmodeling.com/content/1/1/15

This is an interesting example of using multi-agent modelling of planes taxiing at an airport, which discovers the possibility of critical incidents not anticipated by the designers of airport safety systems and safety protocols.

38. V.Capraro

A Model of Human Cooperation in Social Dilemmas

PLOS One, vol.8 issue 8, August 2013

DOI: 10.1371/journal.pone.0072427

For many simple games and social interactions, standard game theory techniques (such as analysis of Nash equlibria) lead to predictions that are substantially different from those observed in practical experiments. In particular, co-operation is observed much more often than theory predicts. Various paramaterised theories have been developed to explain that. This is perhaps the first paper that proposes a non-parameterised theory capable of predicting co-operation; and unlike many others, its predictions seem to agree fairly well with observations. Briefly, it proposes that agents imagine taking part in various coalitions rather than acting as independent agents, and choose to act so as to agree with optimistic forecasts from those coalitions.

39. Antonio Bucchiarone, Martina De Sanctis, Marco Pistore

Domain Objects for Dynamic and Incremental Service Composition

ESOCC 2014, LNCS Volume 8745, 2014, pp 62-80.

http://link.springer.com/chapter/10.1007%2F978-3-662-44879-3_5

This paper presents a way to model heterogeneous entities in a CAS in a uniform way and to combine them in collective through dependency and incremental service composition.

40. Vasilios Andrikopoulos, Antonio Bucchiarone, Santiago Gomez Saez, Dimka Karastoyanova, Claudio Antares Mezzina

Towards Modeling and Execution of Collective Adaptive Systems

ICSOC Workshops 2013: 69-81

http://link.springer.com/chapter/10.1007%2F978-3-319-06859-6_7

This paper presents the general definition of collective adaptive systems in the ALLOW Ensembles Project.

41. Benedikt Eberhardinger, Hella Seebach, Alexander Knapp, and Wolfgang Reif

Towards Testing Self-Organizing, Adaptive Systems

Proceedings of the 26th IFIP WG 6.1 International Conference (ICTSS 2014), Lecture Notes in Computer Science, Springer. (2014)

http://link.springer.com/chapter/10.1007%2F978-3-662-44857-1_13

Testing is required for bringing collective adaptive systems into Real Life Applications and therefore taking the next step in CAS research. This paper introduces a research road map for a complete approach on testing systems during and after development.

42. Javier Cámara, Rogério de Lemos, Carlo Ghezzi, Antónia Lopes

Assurances for Self-Adaptive Systems: Principles, Models, and Techniques

Lecture Notes in Computer Science Volume 7740 (2013)

DOI 10.1007/978-3-642-36249-1

This book provides a good overview on quality assurance and its diversity in applicable methods and tools.

43. Viroli M, Damiani F, Beal J.

A Calculus of Computational Fields

In: Canal C, Villari M, editors. Advances in Service-Oriented and Cloud Computing. vol. 393 of Communications in Computer and Information Sci. Springer Berlin Heidelberg; 2013. p. 114–128.

http://link.springer.com/chapter/10.1007%2F978-3-642-45364-9_11

This paper addresses the field calculus and the composable self-organization primitives in collective adaptive systems.

44. Fernandez-Marquez J, Marzo Serugendo G, Montagna S, Viroli M, Arcos J.

Description and composition of bio-inspired design patterns: a complete overview

Natural Computing. 2013;12(1):43–67

http://link.springer.com/article/10.1007%2Fs11047-012-9324-y

This paper addresses the field calculus and the composable self-organization primitives in collective adaptive systems.

45. Beal J, Viroli M.

Building blocks for aggregate programming of self-organising applications

In: Workshop on Foundations of Complex Adaptive Systems (FOCAS); 2014.

This paper addresses the field calculus and the composable self-organization primitives in collective adaptive systems.

46. Peter Wegner (1997)

Why interaction is more powerful than algorithms

Communications of the ACM, Volume 40 Issue 5, May 1997, Pages 80-91

http://dl.acm.org/citation.cfm?id=253801

Reason in interaction is a fundamental issue to consider when engineering collective adaptive systems, thus we must understand in which ways the quality and quantity of interactions of CAS components affect CAS evolution.

47. Cristiano Castelfranchi, Giovanni Pezzulo, Luca Tummolini (2010)

Behavioral implicit communication (BIC): Communicating with smart environments

International Journal of Ambient Computing and Intelligence, Volume 2, Issue 1, 2010

http://www.igi-global.com/article/behavioral-implicit-communication-bic/40346

In the age of social networks, embracing "humans-in-the-loop" is fundamental to effectively design socio-technical CAS; thus, understanding how to model humans and humans' actions and how the CAS can observe and exploit such actions to self-sustain is crucial as well.