

"Multi-agent computing" in simple terms

Asked 16 years, 3 months ago Modified 13 years ago Viewed 2k times



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I've encountered the term "multi-agent computing" as of late, and I don't quite get what it is. I've read a book about it, but that didn't answer the fundamental question of what an agent was.

Does someone out there have a pointer to some reference which is clear and concise and answers the question without a load of bullshit/marketing speak? I want to know if this is something I should familiarise myself, or whether it's some crap I can probably ignore, because I honestly can't tell.

agent-based-modeling

multi-agent

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edited Dec 9, 2011 at 16:40



Grant Cavanaugh

29 ● 4

asked Aug 30, 2008 at 5:26



Rob

48.4k ● 5 ● 75 ● 93

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In simple terms, multiagent research tries to design system composed of autonomous agents. That is, you have a bunch of robots/people/software-agents around, each of which can take its own actions but can only "see" stuff that is around him, how do get the system to behave as you want?

Example,

Given a bunch of robots with limited sensing capabilities, how do you get them to monitor a field for enemies? to find all the mines in a field?

Given a bunch of people, how do you get them to maximize the happiness of the least happy person? without taking away their freedom.

Given a group of people, how do you set up a meeting time(s) that maximizes their happiness? without revealing their private information?

Some of these questions might appear really easy to solve, but they are not.

Multiagent research mixes techniques from game theory, Economics, artificial intelligence, and sometimes even Biology in order to answer these questions.

If you want more details, I have a free textbook that I am working on called [Fundamentals of Multiagent Systems](#).

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Jose M Vidal

9,142 ● 7 ● 47 ● 51



5



A multi-agent system is a concept borrowed from AI. It's almost like a virtual world where you have agents that are able to observe, communicate, and react. To give an example, you might have a memory allocation agent that you have to ask for memory and it decides whether or not to give it to you. Or you might have an agent that monitors a web server and restarts it if it hangs. The main goal behind multiagent systems is to have a more Smalltalk-like communication system between different parts of the system in order to get everything to work together, as opposed to more top-down directives that come from a central program.

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Kyle Cronin

79k ● 45 ● 151 ● 167



5



"Agents" are another **abstraction** in software design. As a crude hierarchy;
Machine code, assembly, machine-independent languages, sub-routines, procedures, abstract data types, objects, and finally agents.
As **interconnection** and **distribution** become more important in computing, the need for systems that can co-

operate and reach agreements with other systems (with different interests) becomes apparent; this is where agents come in. Acting independently agents represent your best interests in their environment.

Other examples of agents:

- Space craft control, to make quick decisions when there's no time for craft-ground crew-craft messaging (eg [NASA's Deep Space 1](#))
- Air traffic control (Systems over-riding pilots; this is in place in most commercial flights, and has saved lives)

Multi-agent systems are related to;

- Economics
- Game theory
- Logic
- Philosophy
- Social sciences

I don't think agents are something you should gloss over. There's [2 million hits on google scholar](#) for "multi agent" and [more on CiteSeer](#); it's a rapidly evolving branch of computer science.

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edited Aug 5, 2009 at 2:37

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There are several key aspects to multi-agent computing, distribution and independence are among them.

4



Multi-agents don't have to be on different machines, they could as @Kyle says, be multiple processes on a single chip or machine, but they act without explicit centralised direction. They might act in concert, so they have certain synchronisation rules - doing their jobs separately before coming together to compare results, for example.



Generally though the reasoning behind the segmentation into separate agents is to allow for differing priorities to guide each agent's actions and reactions. Perhaps using an economic model to divide up common resources or because the different functions are physically separated so don't need to interact tightly with each other.

<sweeping generalisation> Is it something to ignore? Well it's not really anything in particular so it's a little like "can I ignore the concept of quicksort?" If you don't understand what quicksort is then you're not going to fail to be a developer because most of your life will be totally unaffected. If you have more understanding of different architectures and models, you'll have more knowledge to deploy in new and unpredictable places. **<sweeping generalisation>**

Ten years ago, 'multi-agent systems' (MAS) was one of those phrases that appeared everywhere in the academic literature. These days it is less prevalent, but some of the ideas it represents are **really** useful in some places. But totally unnecessary in others. So I hope that's clear ;)

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answered Aug 30, 2008 at 6:45



Unsliced

10.5k ● 8 ● 52 ● 81



2



It is difficult to say what multi-agent computing is, because the definition of an agent is usually very soft surrounded by marketing terms etc. I'll try to explain what is it and where it could be used based on the research of manufacturing systems, which is the area, I am familiar with.



One of the "unsolved" problems of modern manufacturing is scheduling. When the definition of the problem is static, an optimal solution can be found, but in reality, people don't come to work, manufacturing resources fail, computers fail etc. The demand is changing all the time, different products are required (i.e. mass customization of the product - one produced car has air conditioning, the next one doesn't, ...). This all leads to the conclusions that a) manufacturing is very complex, b) static approaches, like scheduling in advance for a week, don't

work. So the idea is this: why wouldn't we have intelligent programs representing parts of the systems, working the way out of this mess on their own? These programs are called agents. They should communicate and negotiate amongst themselves and make sure the tasks are done in due time. By using agents we want to lower the complexity of the control system, make it more manageable, enable better human - machine interaction, make it more robust and less error prone and very importantly: make the control system decentralized.

In short: agents are just a concept, but they are a concept everyone can intuitively understand. Code still needs to be written, but it is written in a different way, one abstraction higher than OOP.

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supermedo

582 ● 2 ● 5 ● 16



2



There was a time when it was hard to find good material on software agents, primarily because of the perception of marketing potential. The bloom on that rose has diminished so the signal to noise ratio on the Internet has improved vis-a-vie software agents.

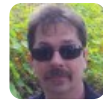


Here is a good introduction to [software agents](#) on this blog post of an open source project for software agents. The term **multi-agent systems** just means a system where multiple software agents run and communicate and delegate sub tasks to each other.

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Glenn

8,022 ● 3 ● 31 ● 39



2



According to Jennings and Wooldridge who are 2 of the top Multi-agent researchers an agent is an object that is reactive to its environment, proactive and social. That is an agent is a piece of software that can react to its environment in real time in a way that is suitable to its own objective. It is proactive, which means that it doesn't just always wait to be asked to perform a task, if it sees a chance to do something that it feels would be beneficial to its objectives it does it. And that it is social, ie that it can communicate with other Agents, doesn't necessarily ever have to do any of these things in meeting its own objectives but it should be able to do these if the situation arose. And thus a multi-agent system is just a collection of these in a distributed system that can all communicate and try to perform their own personal goals that normally lead to an overall achievement of the system goal.

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pie154

613 ● 4 ● 10 ● 28



You can find a concentration of white papers concerning agents [here](#).

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answered Jul 21, 2009 at 20:30



Todd Stout

3,717 ● 3 ● 25 ● 29

