
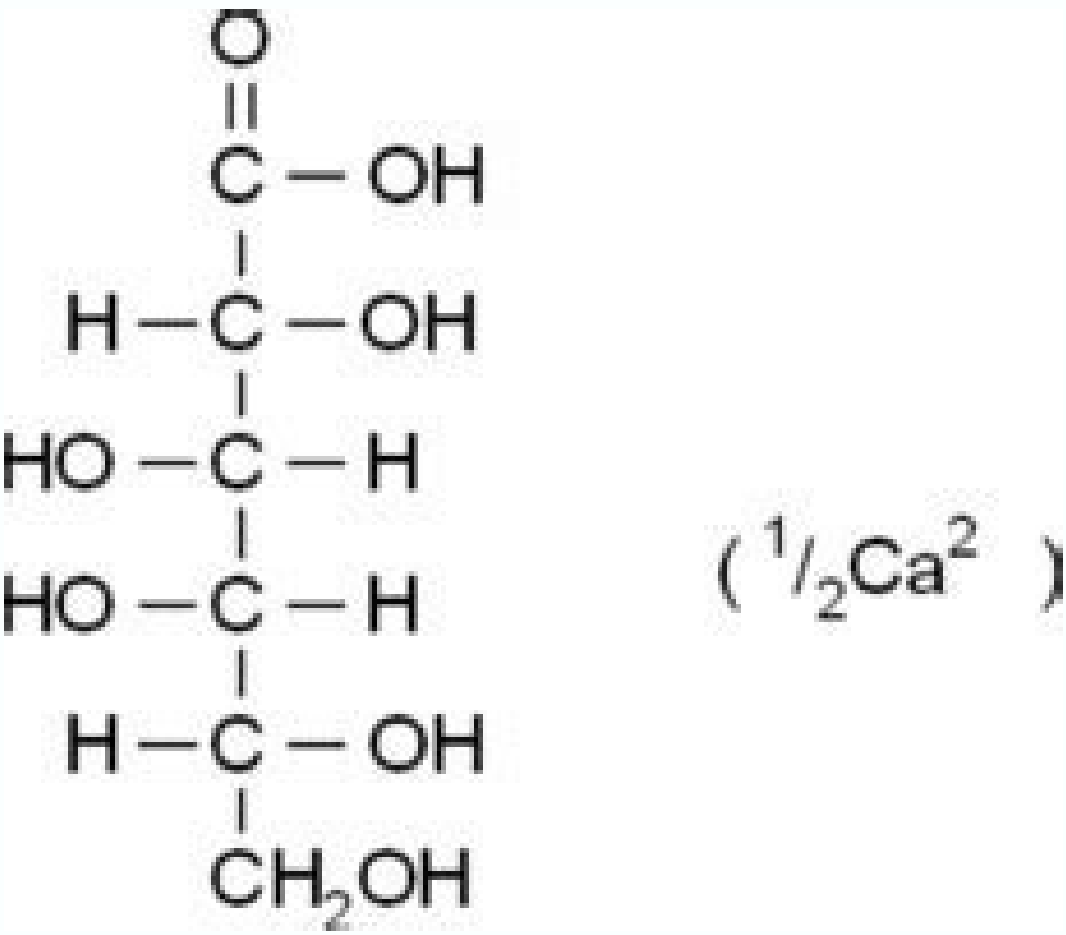
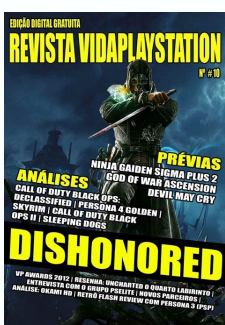


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Review

Game Theory for Wireless Sensor Networks: A Survey

Hai-Yan Shi ^{1,2}, Wan-Liang Wang ^{1*}, Ngai-Ming Kwok ³ and Sheng-Yong Chen ^{1*}

¹ College of Computer Science and Technology, Zhejiang University of Technology, Hangzhou 310023, China; E-Mail: eshy@iitax.edu.cn

² School of Computer Science and Technology, Shaoying 312000, China

³ School of Mechanical and Manufacturing Engineering, The University of New South Wales, Sydney, NSW 2052, Australia; E-Mail: nmkwok@unsw.edu.au

* Authors to whom correspondence should be addressed; E-Mails: wwl@zjut.edu.cn (W.-L.W.); sy@ieee.org (S.-Y.C.); Tel./Fax: +86-571-8529-0309.

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Abstract: Game theory (GT) is a mathematical method that describes the phenomenon of conflict and cooperation between intelligent rational decision-makers. In particular, the theory has been proven very useful in the design of wireless sensor networks (WSNs). This article surveys the recent developments and findings of GT, its applications in WSNs, and provides the community a general view of this vibrant research area. We first introduce the typical formulation of GT in the WSN application domain. The roles of GT are described that include routing protocol design, topology control, power control and energy saving, packet forwarding, data collection, spectrum allocation, bandwidth allocation, quality of service control, coverage optimization, WSN security, and other sensor management tasks. Then, three variations of game theory are described, namely, the cooperative, non-cooperative, and repeated schemes. Finally, existing problems and future trends are identified for researchers and engineers in the field.

Keywords: wireless sensor network; game theory; scheduling; optimization; mechanism

a unit of geologic time that lasts tens of millions of years. it is longer than an epoch but shorter than an era

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The ISOTEC Logo. 1966 - Aldrich's IPO[11] 1972 - Subsidiary Aldrich-Boranes launched to manufacture hydroboration products 1975 - Merger of Sigma Chemical and Aldrich Chemical to create Sigma-Aldrich.[12] Their first year earned \$43 million in sales.[13] 1999 - Sigma-Aldrich reaches \$1 billion in sales 2005 - Announced membership in The RNAI Consortium[14] 2014 - Merck KGaA announced that it would purchase Sigma-Aldrich for approx. "Germany's Merck to buy Sigma-Aldrich for \$17 billion to boost lab supplies operation". p. 10. ^ "SIGMA ALDRICH CORP (10-K), Consolidated Statements of Income" (XBRL). ^ Staff (October 15, 2014). Retrieved 3 November 2014. The Sigma RBI biotechnology, medical and chemical laboratories; sample preparation products and chemical reference standards. SAGE also announced its first successful effort in creating a "knockout rabbit".[30] Its facilities include a specific pathogen free, biosecure vivarium as well as research and development labs. sigmaaldrich.com. February 12, 2015. The company was acquired by Sigma Aldrich in January 2012. ^ "Executive board changes at Germany's Merck". Aldrich's chemicals catalog, the "Aldrich Catalog and Handbook" is often used as a handbook due to the inclusion of structures, physical data, and literature references. Fast Company. Reuters. The SAFC Logo. It was formed in 2008 to investigate zinc finger nuclease technology and its application for disease research models. They were the first to manufacture pure ATP.[9] 1972 - Sigma's IPO[10] 1951 - Aldrich founded in Milwaukee by Alfred Bader and Jack Eisendrath and manufactured just 1-methyl-3-nitro-1-nitrosoguanidine. ^ "Sigma-Aldrich Corp acquires Epicchem Group Ltd". You can see a list of supported browsers in our Help Center. Help Center Chemical, life science and biotechnology company This article relies too much on references to primary sources. I think it has to do with the politics of google to follow the site's indication of web crawling. Un sourced material may be challenged and removed. ^ "Sigma-Aldrich Corp acquires Advanced Separation Tech Inc from Calgon Carbon Corp". Sigma Advanced Genetic Engineering (SAGE) Labs is a division within Sigma-Aldrich that specializes in genetic manipulation of in vivo systems for special research and development applications. ICIS. ^ Ludwig Burger (September 22, 2014). Please enable JavaScript or switch to a supported browser to continue using twitter.com. (September 2013) (Learn how and when to remove this template message) Merck / MilliporeSigma[11]typesubsiary of Merck KGaA[1]Traded asNasdaq: SIALIndustrychemistry and biotechnologyFoundedAugust 1975HeadquartersBurlington, MA, United States[citation needed]Key peopleMatthias Heinzl (Life Science CEO)Productslife science technologies and specialty chemicalsRevenueEUR€ 6.86 billion (2020)[2]Number of employeesmore than 20,000ParentMerck KGaA (100%)[3]Websitewww.sigmaaldrich.com MilliporeSigma is an American chemical, life science and biotechnology company, before 2014 known as Sigma-Aldrich, owned by Merck KGaA. Created by the 1975 merger of Sigma Chemical Company and Aldrich Chemical Company, Sigma-Aldrich since grew through various acquisitions until it had over 9,600 employees and was listed on the Fortune 1000 at the time of its acquisition by Merck. Acquire Media. The Riedel-de Haën Logo. ^ "Sigma-Aldrich to buy BioReliance Hldgs for \$350M". News, Bioscience Technology, Associated Press, 9 Jan 2012, retrieved 11 Jan 2012 ^ Invitrogen Completes Divestiture of BioReliance (press release), Life Technologies, 12 April 2007, archived from the original on 2012-03-30, retrieved 11 Jan 2012 ^ "80 Years Fueling Scientific Discovery". Located in St. Louis, Missouri, SAGE Labs has developed knockout rats for the study of human diseases and disorders (such as autism), which are sold for up to US\$95,000. ^ "Carbolabs purchased". Sigma is the Sigma-Aldrich's main biochemical supplier, with offerings including antibiotics, buffers, carbohydrates, enzymes, forensic tools, hematology and histology, nucleotides, proteins, peptides, amino acids and their derivatives. Their offerings range from standard biochemical reagents to specialized research tools, including ligands for receptors and ion channels, enzyme inhibitors, phosphospecific antibodies, key signal transduction enzymes, and assay kits for cell signaling. Retrieved September 23, 2014. Sigma-Aldrich Fine Chemicals (SAFC) is the fine chemical supply branch of Sigma-Aldrich specializing in raw materials for cell culture products; customized services for raw materials, manufacturing of active pharmaceutical ingredients. ISOTEC provides isotopically labeled products for protein structure determination, peptide synthesis, proteomics, metabolic research, magnetic resonance imaging, nuclear magnetic resonance, breath test substrates, agriculture, as well as gas and gas mixes. If you check by yourself the robots.txt file of the site, it does not allow a lot of folders to be accessed by the search engines, so even though there is not the /catalog/product in there, it may have an indication on one of the pages that it does not allow web scraping. The company grew throughout the 1980s and 1990s, with significant expansion in facilities, acquisitions and diversification into new market sectors.[citation needed] Early history 1935 - Midwest Consultants was founded in St Louis by brothers Aaron and Bernard Fischer, who hired chemical engineer Daniel Broida.[8] 1946 - Sigma was formed from Midwest Consultants and manufactured just adenosine triphosphate. Current leadership Matthias Heinzl became CEO of the Life Science business of Merck KGaA, Darmstadt, Germany in April 2021 following Udit Batra's departure from company. Archived from the original on 2016-02-08. Solution: if you know a bit of python, look for beautiful soup or selenium to build a web crawler We've detected that JavaScript is disabled in this browser. ^ About Us, EMD Millipore + Sigma-Aldrich = MilliporeSigma. The life science business of Merck KGaA, Darmstadt, Germany ^ "80 Humble Beginnings for a Great Company". Carbolabs produces research quantities of chemicals produced by phosgenation reactions. Archived from the original on December 28, 2014. ^ "Funding Universe History of Sigma-Aldrich Corporation". www.thepharmaletter.com. You can look for a scraper that does this job for you, or you can build your own, however, I think with google sheets you won't go very far with the attempt to fetch the information from the site you are targeting. ^ "Customer Letter". {{{cite web}}: Missing or empty |title= (help) ^ "Merck KGaA, Darmstadt, Germany, Completes Sigma-Aldrich Acquisition" (XBRL). ^ "Sigma-Aldrich Corp acquires JRH Biosciences Inc from CSL Ltd". stltoday.com. ^ "Sigma-Aldrich Corporation Announces Filing Of Definitive Proxy Statement And Date Of Special Meeting Of Stockholders". United States Securities and Exchange Commission. Merck. November 18, 2015. Genetic Engineering & Biotechnology News. ^ "Sigma-Aldrich Corporation - Investor Relations". It will see if the target site allows or not the crawling of its pages, so it will check the site's robots.txt (documentation about robots.txt) page to see what it can and cannot fetch. Please help improve this section by adding citations to reliable sources. Supelco is the chromatography products branch of Sigma-Aldrich. 2014" (PDF). ^ "Sigma-Aldrich Corp acquires Pharmorphix Ltd". (PDF). ^ "SAGE's Latest Knockout: \$95,000 Lab Rats". ^ "80 Years Fueling Scientific Discovery". ^ "Sigma-Aldrich Corporate Fact Sheet" (PDF). \$17 billion (€13.1 billion).[15][16] November 3, 2014 - Sigma-Aldrich filed a definitive proxy statement with the U.S. Securities and Exchange Commission to hold a special investors meeting regarding approval for the sale to Merck KGaA.[17] Acquisitions 1970s-1978 - Makor Chemicals 1980s-1984 - Pathfinder 1986 - Bio Yeda, Bristol Organics 1989 - Fluka Chemie AG (Swiss company founded in the 1950s) purchased for \$39 million. Please improve this by adding secondary or tertiary sources. Aldrich is a supplier in the research and fine chemicals market. Sigma RBI produces specialized products for use in the field of cell signaling and neuroscience. The Sigma Logo. Funding-Universe. ^ "NCBI on Sigma-Aldrich". "Merck KGaA to Acquire Sigma-Aldrich for \$17B". The Supelco Logo. ^ "Sigma-Aldrich Corp acquires Isotec Inc from Taiyo Nippon Sanso Corp". The company was acquired in 1998.[31] BioReliance provides testing and manufacturing services to pharmaceutical and biopharmaceutical companies that span the product cycle from early pre-clinical development to licensed production. The company is headquartered in St. Louis and has operations in approximately 40 countries.[4] In September 2014, the German company Merck KGaA announced that it would be acquiring Sigma-Aldrich for \$17 billion.[5] The acquisition was completed in November 2015 and Sigma-Aldrich became a subsidiary of Merck KGaA. (November 2014) (Learn how and when to remove this template message) The Aldrich Logo. ^ ""Sigma-Aldrich, Merck KGaA Press Release, 22 Sept. Retrieved 2021-04-02. Sigma Life Science provides products such as custom DNA/RNA oligos; custom DNA and LNA probes; siRNA; isotopically-labelled peptides and peptide libraries. 1990s-1993 - Supelco, Inc. Aldrich provides organic and inorganic chemicals, building blocks, reagents, advanced materials and stable isotopes for chemical synthesis, medicinal chemistry and materials science. The company is currently a part of Merck's life science business and in combination with Merck's earlier acquired Millipore, operates as MilliporeSigma.[6][7] History Sigma Chemical Company of St. Louis and Aldrich Chemical Company of Milwaukee were both American specialty chemical companies when they merged in August 1975. acquired to enter the chromatography market 1994 - LabKemi AB 1997 - Research Biochemicals International, Riedel-de-Haen, Techcar Systems, Carbolabs, YA Kemia 1998 - Genosys 2000s-2000 - First Medical Inc., Amelung GmbH, ARK Scientific 2001 - ISOTEC (produces stable isotopes used in basic research and medical diagnostics)[18] 2004 - Ultrafine (a supplier of contract manufacturing services for drug development), Tetronics (a producer of high potency and cytotoxic active pharmaceutical ingredients)[19] 2005 - JRH Biosciences,[20] an industrial supplier of cell culture products for the pharmaceutical and biotechnology industries; ProliGo Group, a global supplier of genomics research tools 2006 - Beijing Superior Chemicals,[21] Tropharm, Pharmorphix,[22] Advanced Separation Technologies[23] (manufacturer of products for chiral chromatography) 2007 - Epichem[24] acquired to expand capabilities in materials sciences and semiconductor markets; Moleculer Medicine BioServices acquired to provide large-scale viral manufacturing capabilities; announced alliance with Sangamo BioSciences to develop zinc finger-based laboratory research reagents 2009 - ChemNavigator 2010 - Cerilliant Corporation, ACE Animals 2011 - Resource Technology Corp, Vetec Quimica Fina 2012 - Research Organics Inc., BioReliance (a toxicology and veterinary diagnostics company);[25] BioReliance had previously been acquired by Invitrogen and subsequently sold to Avista Capital Partners.[26] 2014 - Cell Marque[27] 2015 - Combined with EMD Millipore to make MilliporeSigma.[citation needed] Key numbers Key numbers for Sigma-Aldrich.[28] Revenues:[29] \$2.79 billion (2014) Products: 100,000 chemical products (46,000 manufactured) 30,000 laboratory equipment products Customers: Approximately one million individual customers worldwide 88,000 accounts Geographies (% of 2008 sales): United States 35% Europe 43% Canada, Asia Pacific, Latin America 22% Subsidiaries This section does not cite any sources. External links Companies portal Media related to Sigma-Aldrich at Wikimedia Commons Official website Comunidad Oficial Facebook LATAM - Merck Life Science Comunidad LinkedIn LATAM - Merck Life Science Retrieved from " Retrieved 2016-01-04. ^ "Sigma-Aldrich Corp acquires Ultrafine".

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