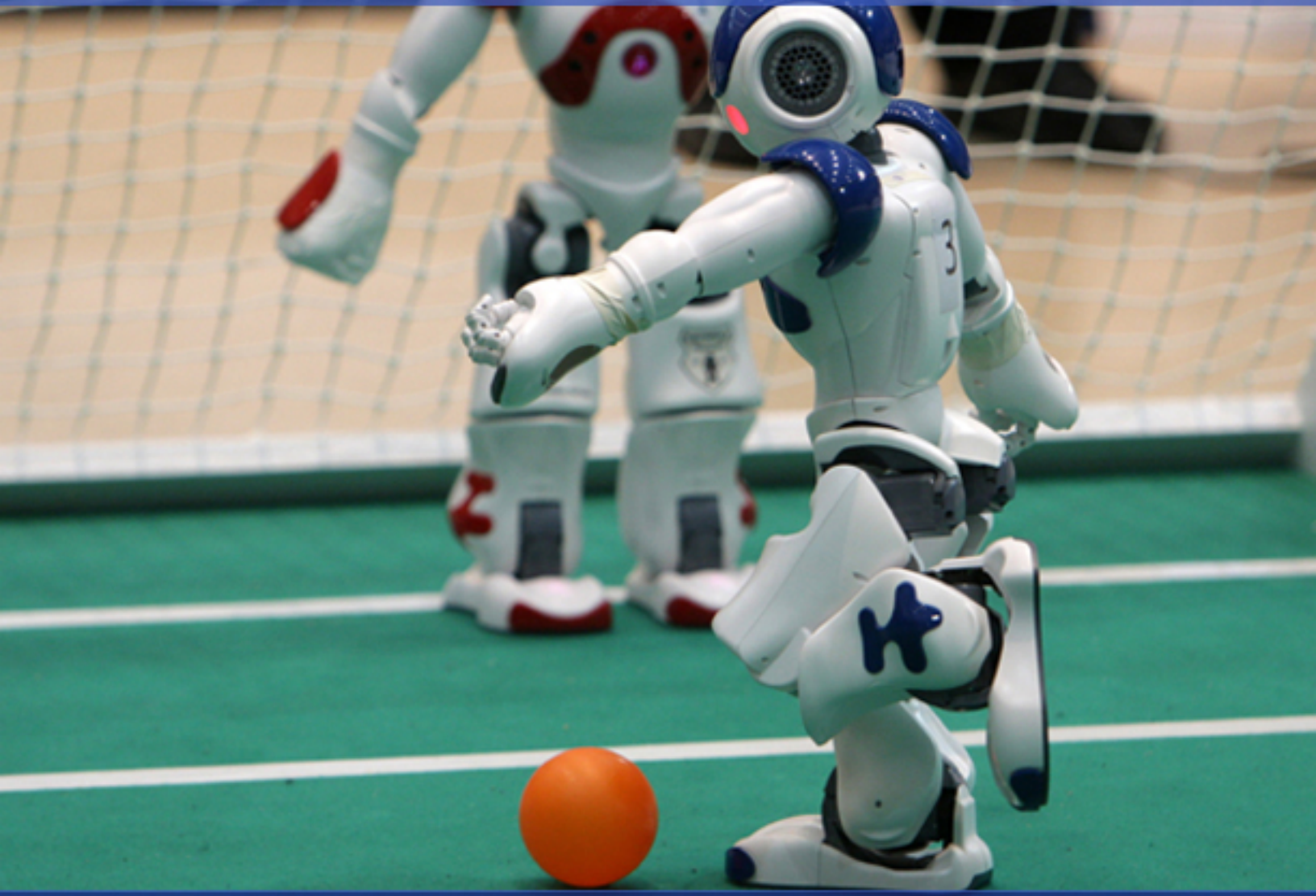
Encyclopedia of Robotics Contests and Competitions



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Robot Competition

A **robotic competition** is an event where robots have to accomplish a given task. Usually they have to beat other robots in order to become the best one.

Most competitions are for schools but as time goes by, several professional competitions are arising.

There is a wide variety of competitions for robots of various types. The following examples describe a few of the higher profile events.

Outdoor unmanned ground vehicle competitions

DARPA Grand Challenge

The DARPA Grand Challenge is a competition for driverless cars to traverse, in the shortest time possible, a path of pre-defined start and finish points. The unclaimed 2004 prize for navigating through the Mojave Desert was $1,000,000. The farthest any participant got was only 7.4 miles. However, the 2005 prize of $2,000,000 was claimed by Stanford University. In this race, four vehicles successfully completed the race. The 2007 competition pitted the vehicles against a mock-urban course with live traffic obstacles.

AUVSI Foundation's Intelligent Ground Vehicle Competition (IGVC)

Held annually since 1992, The IGVC challenges college student teams to evelop an autonomous ground vehicle that must navigate a complicated obstacle course, complete with an extensive list of mobility and design requirements. Partnerships between students and industry leaders enable the competition to not only serve as a unique educational experience, but also a way to get an inside view of design challenges and establish connections with potential mentors or future employers.

European Land Robot Trial

The European Land-Robot Trial is a demonstration of the abilities of modern robotics. Its directed towards security and defence robots and aimed at European participants from both academic and commercial backgrounds. Its held annually alternating between a civilian and a military version each year on different places around Europe.

OFF Road Robotics Competition

The competition is organized by the Robot Association of Finland. The goal is to build a robot which is able to move without human help off road. The competition is held annually at the mid-summer Jämi Fly In air show in Finland. The competition track is randomly selected 10 minutes before competition by the judge, marked with four wooden sticks to make a 200 meter track. The track consists of sand roads and fields containing bushes and rocks. The robots must run outside the sticks from start to finish without human assistance as fast as possible. Youtube movies and pictures from the 2007 and 2008 competitions are available.

Centennial Challenges

The Centennial Challenges are NASA prize contests for non-government funded technological achievements, including robotics, by US citizens.

International Autonomous Robot Racing Challenge (IARRC) 2010

Student teams from around the world compete head-to-head in an outdoor racing competition, where small-scale robots race against other robots to the finish line, without any human guidance or control. Their skills are put to test in a static judging event, a drag race and a circuit race event, where these autonomous vehicles try to navigate around obstacles and obey the traffic rules. These robots are finding their way in applications such as space exploration, mining, search and rescue, remote sensing and automotive inspection. Some are even becoming common around the home for routine tasks, such as vacuuming and mowing lawns. In the future, these robots may even park and drive cars!

Robot Racing is an effort to promote research in autonomous mobile robotics technology in a structure that is challenging and exciting, for both the competitors and spectators. The competition provides students with real-world, hands-on engineering design challenges, including components of mechanical, computer, control software, and system integration. Students work together to design and build robotic vehicles that can navigate twisting, obstacle-filled courses without any human guidance or control. Everyone must work together to design and build a robot that integrates advanced control theory, machine vision, and electronics into a vehicle designed to handle rough terrain.

Robot Racing 2010 will take place on July 24, 2010 from 9am to 7pm at the St. Denis Stadium, University of Windsor, 2555 College Ave., Windsor, ON N9B3P4. Up to CAD $5000.00 in awards are offered. Compete or come take part in the action! Admission is free.

Indoor unmanned ground vehicle competitions

RoboGames

Recognized by the Guinness Book of World Records as the "World's Largest Robot Competition", the RoboGames (formerly ROBOlympics) host over 70 different events and are modeled on the human Olympics. Robot soccer, sumo, combat, android wrestling, maze solving, fire-fighting, biped races, balancer races, and exoskeletons are a few of the events held. Teams compete from around the world, and RoboGames has no prerequisites for contestants, it is open to anyone regardless of age or affiliation.

BEST Robotics

BEST, ***B**oosting **E**ngineering, **S**cience, and **T**echnology*, is a national 6-week robotics competition in the United States held each fall, designed to help interest middle school and high school students in possible engineering careers. BEST is the only robotics competition for students in this age group that requires no entry fees or kit costs for participation.

International METU Robotics Days

The International METU Robotics Days event is hosted annually by the Middle East Technical University in Ankara, Turkey. The Robotics Days include competitions as well as lectures and workshops designed to bring professionals, academics and amateurs together.

IEEE Micromouse competition

In Micromouse competitions, small robots try to solve a maze in the fastest time. The current format involves the "mouse" finding its way to the centre of a 16x16 maze. The competitions have been held since 1979 and are conducted in countries around the world.

FIRST competition

Dean Kamen, Founder of FIRST (***F**or **I**nspiration and **R**ecognition of **S**cience and **T**echnology*), created the world's leading high school robotics competition in 1992. FIRST provides a varsity-like competitive forum that inspires in young people, their schools and communities in an appreciation of science and technology.

Their robotics competition is a multinational competition that teams professionals and young people to solve an engineering design problem in an intense and competitive way. Their outreach includes the original FIRST Robotics Competition (FRC) and the newer FIRST Vex Challenge (FVC or FTC) for ages 14–18, the FIRST Lego League (FLL) for ages 9–14, and Junior FIRST Lego League (Jr.FLL) for ages 6–9. In 2007, there were over 130,000 students and 37,000 adult mentors from around the world involved in at least one of FIRST's competitions. FIRST encourages teams to find adults from outside

of the school environment who can pass on their knowledge as mentors. There are thousands of scholarships available to students who participate.

The FLL robots are entirely autonomous; the FVC competition involves separate autonomous and driver control matches; and the FRC competition involves an initial autonomous period (10 or 15 seconds) followed by tele-operated driver control.

RoboCup

RoboCup (robocup.org) is a competitive organization dedicated to developing a team of fully autonomous humanoid robots that can win against the human world soccer champion team by the year 2050. There are many different leagues ranging from computer simulation, to full-size humanoid robots.

It contains three competitions:

- soccer - two+ robots per team play autonomously in a game of soccer
- rescue - an obstacle course in which a robot must follow a line to retrieve an object, and bring it back to safety as fast as possible
- dance - robots are designed to dance to music and are judged on criteria such as creativity and costumes

As is the case with RoboCup, all robots are designed and developed solely by the students and act autonomously without any form of remote control or human intervention.

RoboCupJunior - RCJ (rcj.robocup.org) is the grade-school level from this world renounced A.I intensive RoboCup game which launched its first official competitive game in 1997. This initiative is to foster the learning in artificial intelligence and robotics research by providing a standard problem where a wide range of technologies can be integrated and examined.

RCJ's game environment is filled with variable elements. In other words, dimensions and locations of objects are unknown in the most part of the game. Therefore, participants must focus on robot's self-awareness of the environment with various sensors and needs very robust programming skill.

Even though RCJ is a grade-level participation game, it demands high aptitude in abstract thinking, especially in programming the robot's intelligence to handle variable elements on the game. It allows its students to refine project outcomes over time with more sophisticated algorithms and hardware improvement without performing similar routines every year.

SAURO

Sakarya University Robotics Competition(SAURO) is a robotics competition hosted by Sakarya University since 2009. The organization is open to undergraduates, graduates and high school students.

Botball Educational Robotics

Botball is a robotics competition for middle and high school students. Organized by the KISS Institute for Practical Robotics, Botball encourages participants to work constructively within their team building basic communication, problem solving, design, and programming skills. Each team builds one or more (up to four) robots that will autonomously move scoring objects into scoring positions.

Mobile Autonomous Systems Laboratory competition (Maslab)

The Mobile Autonomous Systems Laboratory, or Maslab, is a university-level vision-based autonomous robotics competition. The competition is open to students of the Massachusetts Institute of Technology (MIT) and requires multithreaded applications of image processing, robotic movements, and target ball deposition. The robots are run with Ubuntu Linux and run on an independent OrcBoard platform that facilitates sensor-hardware additions and recognition.

Annual fire-fighting home robot contest

Trinity College (Connecticut) also has an annual firefighting robot contest which is participated by high schools and colleges from around the world including from countries like Israel and China. This is the largest, public robotics competition held in the U.S. that is open to entrants of any age, ability or experience from anywhere in the world . The 14th Annual Trinity College Fire-Fighting Home Robot Contest was held on the Trinity campus in Hartford, Connecticut on April 14–15 in 2007. One new event in the concept division was added to the 2007 competition, which is the baby-finding contest. Participants will have to find both the flame and the simulated baby, extinguish the former and announce (or bring it to people's attention somehow) when it finds the latter in the expert division. In the concept division, simply finding the baby and notifying the people is sufficient. Check the event website for contest details.

Duke Annual Robo-Climb Competition (DARC)

Hosted by Duke University, the Duke Annual Robo-Climb Competition (DARC) challenges students to create innovative wall-climbing robots that can ascend vertical surfaces. The competition, which will be held on Duke's campus in Durham, North Carolina, will allow students to showcase their wall-climbing technology in an international forum and encourage students to network with industry leaders.

AAAI Grand Challenges

The two AAAI Grand Challenges focus on human robot interaction, with one being a robot attending and delivering a conference talk, the other being operator-interaction challenges in rescue robotics.

ITURO

Istanbul Technical University Robot Olympics (abbreviated as ITURO) is a robotics Olympics hosted by Istanbul Technical University since 2007. The organization is open to undergraduates, graduates and high school students.

Robofest

Robofest is an annual robotics competition originated at Lawrence Technological University in 2000 for students in grades 5 to 12. Robofest challenges student teams, to design, build, and program fully autonomous robots. The aim is to promote student mastery of mathematics and science through enjoyable activity. The competition categories in junior and senior age divisions in Robofest are games, creative exhibitions, pentathlon, sumo, and fashion show. The Robofest name is also used by several other organizations worldwide.

Collegiate Robofest

The Collegiate Robofest is also organized by Lawrence Technological University and is open to professionals, hobbyists, college students and advanced high school students. The current competition category is the "Mini Urban Challenge" using a PC-based robot with a camera called L2Bot.

International Robot Olympiad (IRO)

Robot game for children ages 9 – 17. Split essentially to the standard category (building robot from scratch and solve a problem within 2–3 hours) and the creative category (project based, bring your design, reports, and research and show it - exhibition style). The committee are experts from various universities around the world, with the purpose of promoting innovation and education.

Rat's Life robot programming contest

This contest is organized to promote research results and stimulate further interest in bio-inspired robotics control. The participation to the contest is open to anyone and free of charge. Contestants can download a free version of the Webots software for simulating a robotic scenario where two rat robots compete for survival in a maze-like environment. The developed robot controllers can be transferred in real e-puck robots roaming an interactive LEGO maze. This competition is now widely used for teaching.

ABU RoboCon

An annual robot contest which started in 2002 for university, college and polytechnic students in the Asia-Pacific region. Under a common set of rules, participants compete with their peers from other countries with hand-made robots. This contest aims to create friendship among young people with similar interests, as well as help advance engineering and broadcasting technologies in the region. The event broadcasts in countries/region through ABU member broadcasters.

The contest is hosted by a different broadcaster/country every year.

Defcon Robot Contest (DefconBots)

The DEF CON, world's largest hacker convention hosts a robotic competition called DefconBots. This competition's objective has changed a couple of times. From 2006 to 2008 the goal was to build an autonomous stationary robot to shoot down the targets. Previous competitions included line following and transporting ping-pong balls across the arena. The contest is open to everyone.

Eurobot

Eurobot is an annual robot contest taking place in Europe. The teams must build autonomous robots, that collect elements on a given playing area with new rules every year.

The final round is hosted by different countries every year. The best three teams from every country may take part in the international final.

UBBOTS competition

UBBOTS is an annual robot exhibition taking place at Babes-Bolyai University, Cluj-Napoca, Romania. The teams have to create a robot that helps humans and simplify their life.

National Engineering Robotics Contest

Every year, hundreds of robots from institutions Pakistan-wide gather at the College of Electrical and Mechanical Engineering,NUST Islamabad,Pakistan to participate in the National Engineering Robotics Contest (NERC). The Contest provides a platform to students to come forth with novel engineering ideas. Over 155 teams participating in NERC 2010. Contestants have to fabricate their robot right from the scratch according to the theme provided.

Underwater robotic vehicle competitions

AUVSI Foundation and ONR's 13th International Autonomous Underwater Vehicle (AUV) Competition

Launched in 1997 and co-sponsored by the Office of Naval Research (ONR), the goal of this competition is to advance the development of Autonomous Underwater Vehicles (AUVs) by challenging a new generation of engineers to perform realistic missions in an underwater environment. This event also serves to foster ties between young engineers and the organizations developing AUV technologies. Open to high school and college teams.

AUVSI Foundation and ONR's 3rd International Autonomous Surface Vehicle (ASV) Competition

The Autonomous Surface Vehicle Competition (ASVC) is a student competition based around unmanned boats operating under rules of the waterway. This includes littoral area navigation, channel following and autonomous docking. This is typically done with computer vision, multi-sensor fusion techniques, proactive and reactive path planning, and machine learning approaches using embedded systems within the vehicle. Open to high school and college teams.

Marine Academy of Technology and Environmental Sciences Competition

The Marine Academy of Technology and Environmental Sciences (MATE) sponsors an annual international ROV competition currently in its eighth year. The competition is open to colleges and high schools globally, however, the college teams are limited to undergraduate students.

Aerial robotic vehicle competitions

AUVSI Foundation's International Aerial Robotics Competition (IARC)

The AUVSI Foundation's International Aerial Robotics Competition is the longest running aerial robotic event, held annually since 1991. This competition involves fully autonomous flying robots performing tasks that, at the time posed, are undemonstrated anywhere world wide. The competition is open to universities and has had missions involving ground object capture and transfer, hazardous waste location and identification, disaster scene search and rescue, and remote surveillance of building interiors by fully autonomous robots launched from 3 km. In 2008 an $80,000 prize was awarded. Typically a prize of $10,000 is offered, and increases by $10,000 for every year that the competition challenge goes uncompleted.

AUVSI Foundation's Student Unmanned Air System (SUAS) Competition

The SUAS Competition, aimed at stimulating and fostering interest in unmanned air systems, technologies and careers, is focused on engaging students in a challenging mission. It requires the design, integration and demonstration of a system capable of conducting air operations to include autonomous flight, navigation of a specified course and use of onboard payload sensors. Additionally, students are required to submit technical journal papers and make oral presentations.

UAV Outback Challenge

The UAV Outback Challenge has been running since 2007. There are multiple events for different competitor levels. The open category competition is an autonomous search and rescue mission with a large target area and tens of kilometers of required flight range. It is an annual event that is held in Australia and is organized by Australian Research Centre for Aerospace Automation, Queensland Government and Boeing Australia Limited. The 2009 prize fund is AU$70,000 with a AU$50,000 grand prize for the open category, making it the biggest current unmanned aerial robot competition.

Micro Air Vehicle Events

A series of micro air vehicle (MAV) events have been sponsored by various organizations including the University of Florida, the U.S. Army, French DGA, Indian Ministry of Defense, and others over the past decade. For example, the International Micro Air Vehicle conferences (IMAVs) always includes various competitions in which specific capabilities are demonstrated and missions are performed. The goal of most competitions is to stimulate research on full autonomy of the micro air vehicles. Prizes range up to an aggregate value of $600,000 in 2008.