

Offenburg's Robo Kickers off to Robot World Championships in Canada

The University's teams Magma and Sweaty are optimistic about this year's RoboCup in Montreal, Canada. The two vice world champions made intensive use of the preparation time.

Ten heavy crates full of robots and tools, plus their own suitcases and backpacks – Offenburg University teams Magma and Sweaty, consisting of 24 students, staff members and professors from Offenburg University, carry plenty of material from the Ortenau district to Canada. They are traveling to the megacity of Montreal, where the 22nd edition of the Robot Soccer World Cup will be held from 17 to 22 June, 2018.

The RoboCup is one of the largest competitions for autonomous robots in the world. As an important technology event in the field of research and teaching, it has been held annually at various venues since 1997. More than 4000 participants from all over the world and around 5000 robots will take part in the multi-day tournament, with an accompanying conference and ensuing publications. The competition is held in different categories: RoboCupJunior, RoboCupIndustrial, RoboCup@Home, RoboCupRescue, and RoboCupSoccer. Only in the RoboCupSoccer category do machines compete that stand on two legs like humans. The vision is that by 2050, the robots will have been developed far enough to compete against – and defeat – the reigning soccer world champions.

Excellent preparation

The Offenburg teams will start into the competition as vice world champions in their respective leagues and with much ambition. In preparation, the Magma team already won the Robot Soccer Tournament of the Simulation League at the Robotica in Portugal in April. In Montreal, as the reigning vice world champion, the team wants to at least reduce the gap to the overwhelming team from the USA, says team leader Professor Klaus Dorer: "Our goal is to halve the gap so that a 2019 World Cup is within reach." However, Dorer reveals that the progress made in the preparations is "quite positive." In recent weeks, the simulated robots have learned to shoot at full speed, which makes Magma Offenburg the first robot team in the league to master this ability.

"There is going to be a goalie challenge in our league this year, as our own little competition". All goalkeepers must parry 15 identical shots at the goal from all positions. The goalkeeper allowing the fewest goals wins. In recent years, such 'competitions within a competition' have been held in various disciplines. So far there has been a "running challenge", a "racing challenge", a "4-on-1 challenge" and a "passing challenge" for ball relays to promote team play. Team Magma consists of Dorer and seven students, who are responsible for programming the simulation software.

Tough competition

Sweaty, Offenburg University's now famous soccer-playing humanoid robot, took part in the RoboCup World Championship for the first time in 2014. In 2016, Sweaty won vice world champion and was able to defend the title in 2017. The team around Professor Ulrich Hochberg is striving to achieve this goal again this year.

Technologically, the robot now stands on firmer footing in every sense, as explained by Professor Ulrich Hochberg, who heads the project: "Sweaty got new feet! This allows for better, human-like movements. The new feet can roll off the forefoot, and the toe area is flexible. We want to walk like a king, not sneak like a reptile." However, the software had to be adapted after a shin fracture caused some worries in the run-up to the competition (but has since been corrected). The preparation time was also used to practice more targeted shots. At the University's Science Slam in May, Sweaty already shone with a magic trick on the stage of the indoor riding arena, which also served as further preparation for the RoboCup.

"The competition is well positioned again this year," explains Professor Michael Wülker, "but Sweaty has the potential for at least third place – and of course we are striving for more." Robot "NimbRo" from the University of Bonn is considered a favorite. "IRC" from Azad University in Iran, which Sweaty had to admit defeat to last year, will also compete again. What is more, a new competitor, "Walker" from Beijing University in China, is still an unknown variable: "From the images available so far, he could win a beauty contest," says Wülker: "After Sweaty, that is. We haven't been able yet to find out anything about his behavior on the field, though. In any case, their efforts should be at least as great as that of the Bonn team." Similarly, it is difficult to estimate how strong an opponent the team "HERoEHS" from Hanyang University, South Korea will be: In their application video, you only see "HERoEHS" skiing.

Sweaty's chances for a title?

"However, these teams also draw from far more financial and human resources than ours. Naturally, the fact that we can keep up with them anyway makes us a little proud," says Hochberg. "The mechanical structure of Sweaty is fundamentally different from that of the other robots and still has a lot of potential." The Sweaty project manager is

confident that the potential is far from exhausted. "Still, we probably won't be able to clinch the world championship title until next year."

Sweaty starts in the "adult size" league. The competition is divided into the actual tournament, a "technical challenge," and a "drop-in challenge". In the tournament, the robot will play autonomously against its respective opponents in the preliminary round, quarter and semi-finals and hopefully also in the final. For each game, two halves of for ten minutes each are played. Intervention by the rest of the team is not permitted, except that one member can stay behind the robot and catch it in the event of an incident. If the robot is touched, however, there is a penalty time, so that the opponent can aim at the goal unchallenged. The winner proceeds to the next round.

In the Technical Challenge, individual tasks have to be solved, such as kicking a rolling ball or "push recovery," where the robot should remain standing after a push.

Team Sweaty and Team Magma basically share the same decision software. But while Sweaty competes live in flesh and blood – or let's say in steel, engines and processors –, Magma works with simulated Nao robots. In the simulation, the players can even move their toes, and thus kick much farther than robots with fixed feet. Analogous to classic soccer, they compete in teams of eleven players.

Last year, Sweaty's failure in the final was partly due to interference in the WiFi; referee orders were not transmitted correctly. "The cause of the problems at that time has not been identified," according to Wülker; "the problems have never occurred again, neither had they occurred before the competition." Against this background, a second, redundant network will be used to try to receive the referee commands, and sufficient measuring equipment will be taken along to identify the problem if it recurs.

Team members

Team Sweaty: Professors Ulrich Hochberg, Michael Wülker, five staff members and six students

Team Magma: Team leader Professor Klaus Dorer and seven students.

Sightseeing with Sweaty

Also on board will be a group from Offenburg's media department. They will help bring the events in Montreal closer to the Offenburg University community and will provide those who stayed at home with photos, films, updates, and a daily compilation of the highlights of the competition.

In addition to the competitions, the two teams from Offenburg are also looking forward to a rather unofficial event: Like last year in Nagoya in Japan, they plan to take Sweaty for a ride and hit the streets of Montreal, engage with the locals and amaze street audiences. Hopefully, some snapshots will come out of it, too.

Stay wired!

Continuously updated news about the RoboCup 2018 in Montreal can be found at:

www.facebook.com/SweatyMagma

[instagram.com/sweatyhsog/](https://www.instagram.com/sweatyhsog/)

<https://youtu.be/pXVKck9MBHQ>