

# Amazing Robots 2021-22 – competition for teams of universities and universities of applied sciences

In the competition, the objective is to showcase modern technologies and creativity. The purpose of the competition is to expand the visibility and interestingness of information technology, robotics and artificial intelligence in Finland and encourage students to combine the knowledge of separate fields without prejudice. A message is also given to the industry: new technologies have to be without prejudice brought into use both in the products and in production. These rules are translated from the Finnish ones (to large extent using machine translation). If the meaning of the rule is not clear or is in contradiction to the Finnish rules, the Finnish rules are to be followed.

## General Description

The task is to make a robot, which makes something interesting. What does it do, the team must invent. The purpose is to let creativity and technical skills bloom. Little restrictions and a lot of freedom is given. The competition is for the students of universities and universities of applied sciences. The members of the competition group have to be students of the educational institution during the day of the competition. The maximum size of the group is eight students.

From the same educational institution, several teams may participate in the competition.

The competition takes place in connection with the Teknologia 22 trade fair in Messukeskus, 3.-5.5.2022, [www.teknologia.messukeskus.com](http://www.teknologia.messukeskus.com).

The competition is organised by Association of Information technology and Electronics (Tietotekniikan ja Elektroniikan Seura, TiES) in cooperation with Mikrobitti magazine and Messukeskus. This competition is in the second of its series. The next competition is arranged in connection with Teknologia 23 trade fair.

## Robot

1. The weight of the competing device may not exceed 5 kg. The device can be one robot or a swarm of several robots. If the task of the robot requires placing objects in the competition area, these are included in the maximum weight. In the following, the term 'robot' refers to all the active parts in the competition irrespective of how many separate active parts there are.
2. The robot must be independent. It must not be controlled from outside. The only exception is a compulsory cordless controller with which the competition execution is started and which can be used to stop the robot. With the controller, other controls must not be made. The weight of the controller is not included in the maximum weight of 5 kg.
3. The robot must operate with the energy stored into it. The robot must be emission-free during the competition.
4. The robot can be connected to the local network. It may open network connections and may search for information from there. The connection must not be used to control the moves of the robot. The necessary information to create the connection can be loaded in the device before the beginning of the competition. The functionality of the connection is on the competitors' responsibility.
5. If a robot consists of many active parts, these can communicate among themselves on legal radio frequencies and on radio protocols, voices, light and gestures. The voices and lights must not cause a danger to the public (strong voices, efficient lasers, strong flash lights etc).
6. The robot has to have at least one moving part. The body itself is not required to move.

7. One slide or a video lasting about one minute describing the robot is required. This material will be used in the awards ceremonies and other communications relating to the contest. The competitors can use this same material for describing their robot (look at `Competition Area and Situation, Article 3`) during the competition.

## Some Seed Ideas

*The organisers hope to get a good number of teams to participate in the contest. This is also reflected in the rules. Advanced technology is only one of the six assessment criteria and there will be specific prizes in different categories. Making an amazing robot can be amazingly easy!*

Here are some seed ideas for the teams for making their own robot. You are free to use them the way you will. However, the main purpose of the seed ideas is to open your mind to think broadly about alternative ways to construct the robot. The six assessment criteria in the rules also give valuable guidance on what kind of ideas are worth pursuing. We have added short notes after some of the ideas. They bring up some aspects or interpretations of the rules that can be of help while you plan your robot.

### Musician

The robot can produce sounds by playing an instrument mechanically. Here it is worth noticing that the instrument is not necessarily a standard musical instrument. It can be developed for this purpose or simplify an existing instrument. The main thing is that the robot can play.

*Notice: if you intend to use a wind instrument, the rules allow an air pressure tank from which air is obtained to the system (the robot must operate with the energy that has been stored to it but the form of the energy has not been limited as long it is emission-free in the situation).*

### Exerciser

The robot invites the audience to participate in a physical exercise under its guidance.

### Acrobat

The robot or the robots make amazing tricks. Notice: the robots may also jump (or even fly) as long as they do not exceed the upper limit of two meters.

### Dancers

The robot consists of several smaller robots, which move together in the desired way. These carry out choreography with the music. Additional development: the robots have hands that also move according to the choreography".

### Team game

A game arena can be made of for example 10 cm high walls and of two goals or baskets. On both sides there are one or more robots, which try to score goals by poking the game tool. The rules and tools of the game can be innovated freely. *Notice: the rules allow these margin fences and targets or other such instruments but they are included in a total weight.*

### Mirror

The robot imitates the movements, gestures or expressions of the human being within the constraints of its mechanics. *Notice: this idea is in line with the evaluation criteria number 6 in the rules.*

### Make-up artist

The robot (or the robots) makes up the face of a normal sized head. The make-up can be designed in advance, or it will be given as a photograph to the robot.

### Artist

The robot draws or makes a painting of a picture or a volunteer.

*Notice: A relatively simple mechanics can be enough. The main emphasis can be in producing (painting) the picture in a simple way, or make the picture according to a specific painting style.*

## Games or plays

Games, which in some way contain movements. The mechanics may or may not be simple. The main emphasis can be on the game strategy (artificial intelligence), in the interaction with the human player, in the creation of the atmosphere (music) etc.

Here are just some examples that can be further developed:

- Stone, paper and scissors game with human being.
- Whac-A-Mole Game (<https://www.amazon.com/Hasbro-40509-Whac-A-Mole-Game/dp/B0001GDP00>).
- In principle mechanically quite simple, but requires quick and exact mechanics, is a labyrinth game (for example <https://www.adlibris.com/fi/tuote/labyrinttipeli-alkuperainen-brio-23389978> ).
- To build as high a tower as possible from given pieces of different shapes (chosen by a representative of the public). The pieces can be different kinds of rectangles, cones, balls, cups etc. The robot should be able to recognize the impossible pieces and not to try to use them.

## Historical example

In 1980 The Midnight Sun Mikrohiiri (Micromouse) from Finland won the European championship in the "Virtuoso" competition. In the competition, the robot was placed on a 1x1 meters cardboard sheet to which it drew the picture of a big Sun and wrote under the Sun its name "Midnight Sun". Then it went in the middle of the Sun and started to rotate and play the Beatles song "Yesterday" (N.B.: the turning loudspeaker creates the "Leslie" effect). With this show, the competition was won. The team and their robot got nation wide coverage both in BBC radio and TV broadcasts.

Additional information for example: <http://davidbuckley.net/RS/mmouse/micromouse80.htm>

## Robotic competition 2019 participants and results

You can find information on the first-year participants, results, pictures etc. from TiES pages:

<https://www.ties.fi/arkisto/llistyttvt-robotit-kilpailu>

## Competition Area and Situation

It must be possible to follow the robot's performance in the competition arena. The performance is videoed and shown on the screens to the audience.

1. The competition arena is a cube having the sides of 2 meters. The floor is even and matte black. The limits have been marked with a 5 cm wide white painting or tape. The outer edges of the white lines mark the limits of the arena. The walls and the roof have not been marked. No part of the robot may exceed the limits.
2. The robot is placed anywhere on the competition arena by the competing team.
3. Next the team briefly describes the robot and the task it is going to perform.
4. After the judge's permission, the robot is started. It has the maximum of four minutes to present its program. The robot has to stop by itself when the program ends.
5. The ability to halt the device by the controller shall be used only if the robot is damaged or it is in a dangerous situation. The use of the emergency stop leads to rejection from the contest. The functionality of the emergency stopping feature has to be proven to the organizers before the competition by starting the robot and stopping it at a random part of its performance.
6. Placing of the robot, description of the performance the robot is going to do, the performance itself and the removal of the robot from stage altogether can take at most ten minutes. The objective time is shorter than this, eight minutes.

The steps described above are of such nature that failing to implement any one of them results in rejecting the performance.

## Assessment

The following criteria are used in the evaluation of the robot's performance. The relative importance of these criteria is not given. It is up to the judges to make their own assessments. Criteria #1, Movement or gestures, is the only compulsory function of the robot. The other functionalities are taken into account in the rating only if they are a natural part of the performance.

1. Moving of the robot or its gestures.
2. Visual appearance of the robot.
3. Voice world of the robot.
4. Technical challenges and the actual implementation of the robot.
5. Cooperation between the active functionalities of the robot.
6. How the robot reacts to its environment. (Does it understand or react to gestures, speech, music, to the public etc.).

In addition, the evaluation takes into account the basic idea of the robot, and how well the robot reflects that idea. This is related to the short introductory presentation of the robot that was given at the beginning of the performance.

## Jury and Prizes

The jury contains the experts from different fields. In addition to technical and business experts, the jury will also contain expertise from the arts sector.

*All teams who have passed to the Finals of the competition get a 500€ participation prize unless winning a better prize. The first prize is 10000 €, second 5000 €, and third 2000 €. Other prizes will be announced later. The jury has the right to adjust the criteria and the prizes if there are special justifiable reasons.*

## Time of the Competition

*Free practicing and Semifinals to screen participants to the Finals will be arranged on Tuesday 3.5 in Messukeskus, when each team must show that their robot fulfills criteria set in these rules and that it works. The Finals are held on Wednesday 4.5, also in Messukeskus.*

There is the possibility to partially cover travel expenses for competitors coming from outside the Metropolitan area. Our aim is to provide space for showing the robots in action, and at the same time give positive visibility to the participating schools during the exhibition at the TiES booth.

## Registration to the competition

It is highly recommended to register for the competition immediately after the team has been formed. This way the group gets real-time information about the competition. After registration, the team members will start receiving the Mikrobitti magazine free of charge for 2021/22. This magazine covers the competition among other interesting topics in Finnish.

The team members will also be registered as student members to TiES, [www.ties.fi](http://www.ties.fi) without having to pay membership fee for 2021/22. This entitles participation in TiES activities like industry visits and seminars.

Registration to the competition is completed by providing the following information to Mauri Inha at [mauri.inha@ties.fi](mailto:mauri.inha@ties.fi) :

1. The name of the team (self invented) and leader/main contact person of the team
2. For each member of the team the name, University whose student the member is, telephone number, e-mail address and postal address are compulsory.

The registrations made already for 2021 (before delay of competition to 2022) remain valid.