

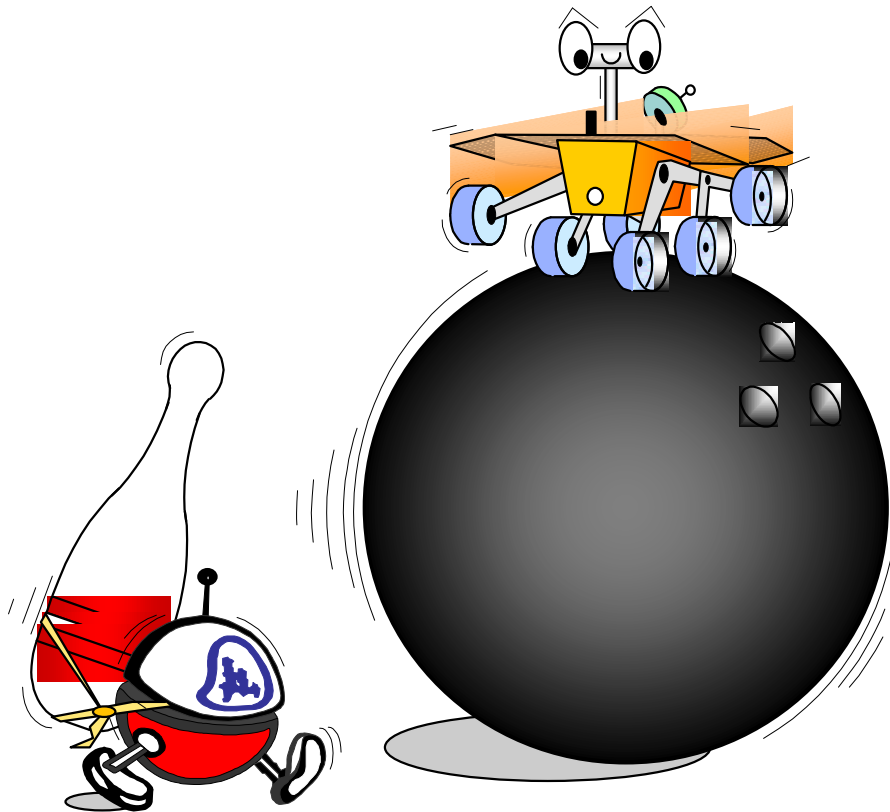


Eurobot^{open} 2005
"Bowling"



Rules... Rules... Rules... Rules... Rules... Rules...

Bowling



Robots in a skittle game!

The team which will count the largest number of skittles of its colour laid down at the end of the match, will be the winner.

But be careful: it seems easy and quick to lay down its own skittles, however this is also possible to set up the ones of the opponent. With one or two robots per team, this is probably where is the challenge...

Which strategy your robot is going to choose ?





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1. Scope

The following game rules are applicable to all the national qualifications and the final of EUROBOT 2005 autonomous robot contest.

EUROBOT is a amateur robotics contest open to world-wide teams of young people, organised either in student projects, in independent clubs, or in an educational project. A team is composed of several people.

The contest aims at interesting the largest public to robotics and at encouraging the hands on, group practice of science by young people. EUROBOT and its national qualifications are intended to take place in a friendly and sporting spirit.

More than an engineering championship for young people, EUROBOT is a friendly pretext to free technical imagination and exchange ideas, know-how, hints and engineering knowledge around a common challenge. Creativity is at stake and interdisciplinarity requested. Technical and cultural enrichment is the goal.

Participation to the competitions assumes full acceptance of these principles as well as the rules and any interpretation of them that will be made by the refereeing committee (throughout the year) and by the referees (during the matches). The referees' decisions are final and may not be challenged, unless an agreement is reached between all the parties involved.

EUROBOT is a contest taking place in Europe, but is open to other countries. The countries presenting more than three teams shall organise a national qualification (or national cup), in order to select three teams among them. The selection will typically include the two most competitive teams. But it is left to each national organisation committee to agree on a possible alternative to competitiveness for selecting its last team. For example, the third team can be chosen by a jury according to other qualities valued by the contest as: best-concept, creativity, fair-play, etc.

EUROBOT values, fair play, solidarity, technical knowledge sharing and creativity both through techniques and project management more than competition.

The happy selected teams during the national robotics cups of Austria, Belgium, Czech Republic, Germany, France, Serbia-Montenegro, Spain, Swiss, and any 2005 new selection will meet their international counterparts in May 2005 from Thursday 19th to Sunday 22nd, in YVERDON LES BAINS (Switzerland) to compete for the EUROBOT final.

EUROBOT is born in 1998, in the wake of the French Cup of Robotics, following the constitution of a similar competition in Switzerland. Today, to stand with the international spreading of the contest, and to structure the spirit of exchange and co-operation that exists between the different organisers, all have gathered into a European association.





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The association, officially born on May 2004, is named EUROBOT. You can find its statutes on our website: www.eurobot.org . All individuals and structures sharing our values are very welcome, either to support, or join as volunteers in the different organising groups.

It shall be noticed that most of the national qualification are open to foreign teams but in the limit of their resources, and that many teams organise their own friendly tournaments. It shall be finally noticed that multinational teams are welcome.

EUROBOT and its national selections are attended mostly by volunteers of all nationality who believe in the educational value of the experience, and are for most former participants themselves.

Welcome!

And have a nice adventure!



YVERDON-LES-BAINS





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Rules... Rules... Rules... Rules... Rules... Rules...

1. <i>Scope</i>	2
2. <i>Rule basics</i>	6
3. <i>Playing area and element definition</i>	7
3.1. Generalities	7
3.1.1. Playing area overview	7
3.1.2. Tolerances	8
3.2. The playing area floors	8
3.3. The ditch	8
3.4. The fixed bridge	9
3.5. The random bridges	9
3.6. The skittles	10
3.6.1. Skittle description	10
3.6.2. Skittle initial positioning	11
3.7. The skittle stands	12
3.8. Bowls	12
4. <i>The robots</i>	13
4.1. Generalities	13
4.2. Limitations and safety issues	13
4.2.1. Fair-play...	13
4.2.2. ...and safety	13
4.3. Balls	14
4.4. Mandatory equipment	14
4.5. Recommended equipment	15
4.6. Robot spatio-temporal limitations	15
4.7. Energy sources	16
4.8. Control systems	16
4.9. Robot localisation beacon support	17
5. <i>Beacon</i>	18
5.1. Generality	18
5.2. Robot localisation beacons	19
5.3. Fixed beacons	19
5.4. Design requirements	19





Eurobot^{open} 2005 "Bowling"



Rules... Rules... Rules... Rules... Rules... Rules...

5.5.	Communication signals	19
6.	Match timeline	20
6.1.	Playing area and robot identification	20
6.2.	Start procedure	20
6.3.	Match sequence	21
6.4.	Score calculation	21
6.4.1.	Points	21
6.4.2.	Penalties	22
6.4.3.	Scratching	22
7.	Contest master timeline	23
7.1.	Approval	23
7.2.	Qualification rounds	23
7.3.	Final round	24
8.	Appendixes	25
8.1.	Playing area drawing	25
8.2.	Skittle drawings	26
8.3.	Painting references	27
8.4.	Technical file	27
8.5.	Safety instructions	28
8.5.1.	On-board voltage	28
8.5.2.	Compressed-air systems	28
8.5.3.	Lasers	28
8.5.4.	Powerful light	28





Eurobot^{open} 2005 "Bowling"



Rules... Rules... Rules... Rules... Rules... Rules...

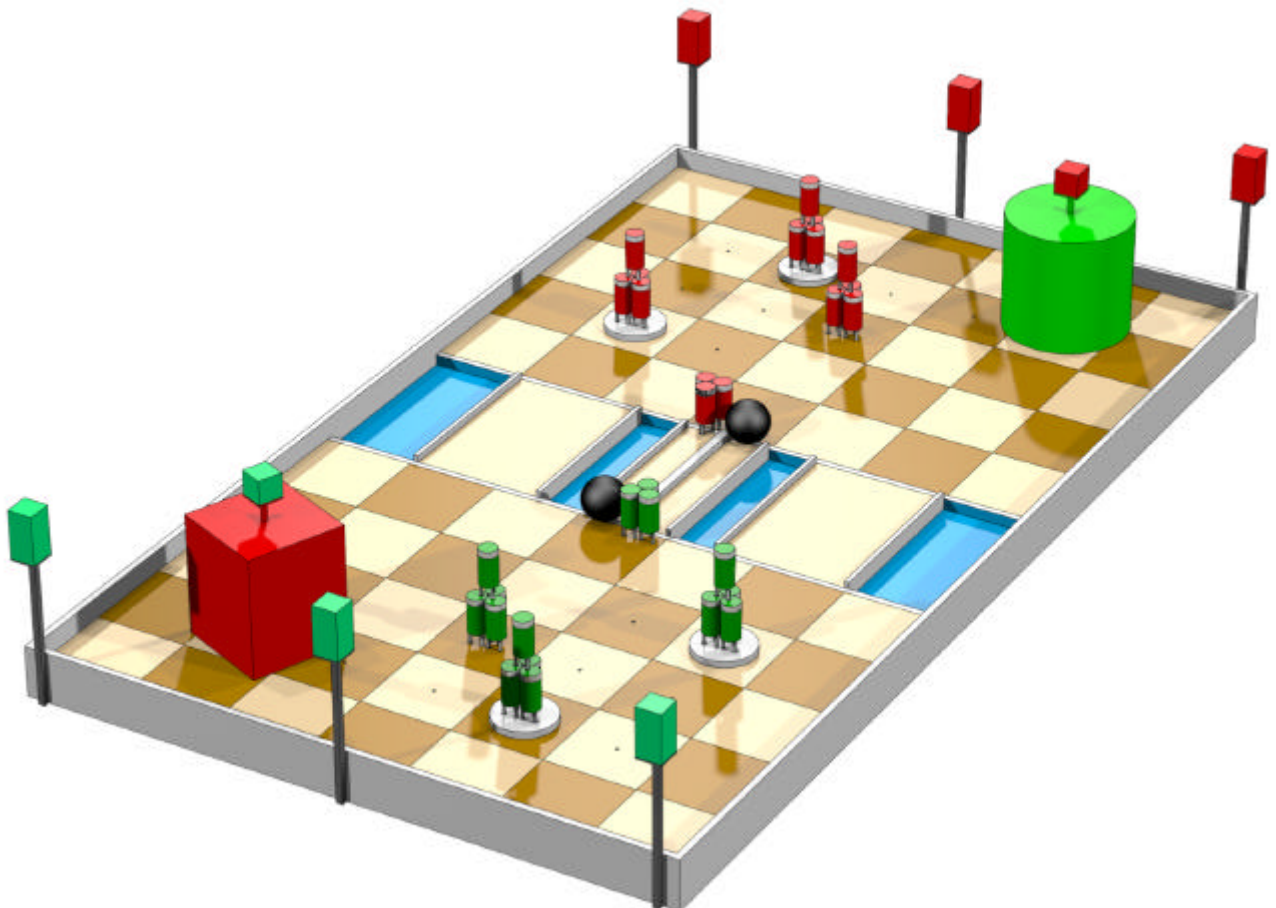
2. Rule basics

This year, the robots are going to play bowling.

Each team shall design and build either a robot for single operation, or a pair of robots. The matches oppose two teams at once and last for one and a half minute.

To win a match, the robots shall lay down their skittles. These ones await them on the other side of a ditch with respect to the robot start up position. The robots may also set upright the skittles of the other colour, laid down by the opponent team, to reduce its score.

The team that will count the largest number of skittles of its colour laid down at the end of the match, will be the winner.



Rules... Rules... Rules... Rules... Rules... Rules...

3. Playing area and element definition

3.1. Generalities

Part reference used for the game components design is placed as an appendix at the end of this document.

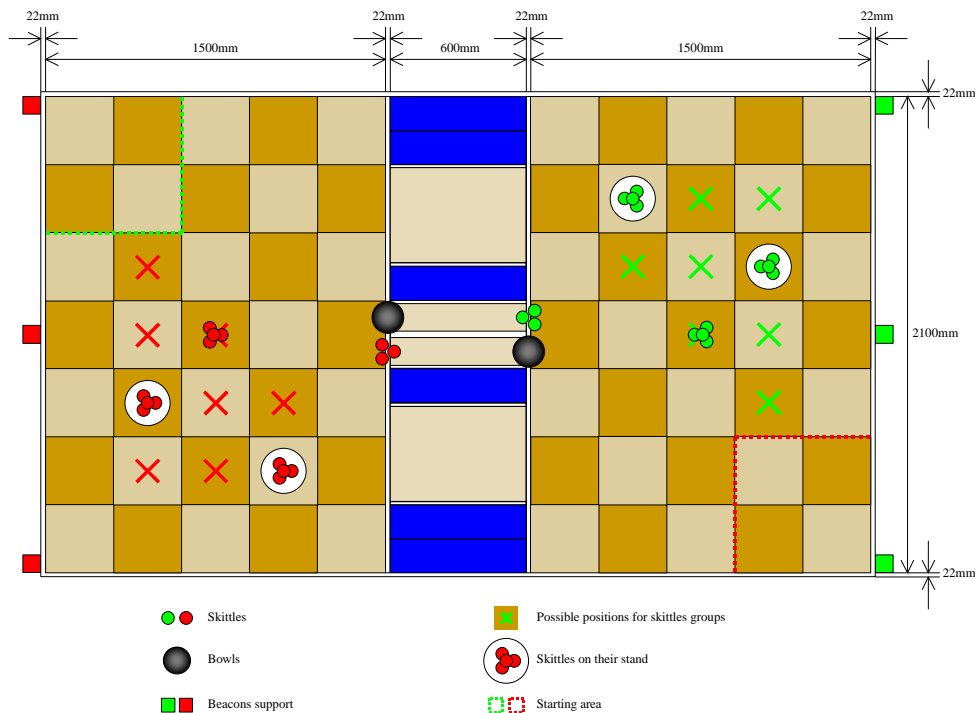
3.1.1. Playing area overview

The playing area is made of:

- Two rectangular floors painted with a chessboard pattern. The two floors are separated by a ditch.
- Three bridges link the two floors. A central one is fix in position. The two other ones are randomly positioned at the beginning of the match.

Skittles as well as bowls are placed on the playing area. Some of the skittles is placed on stands.

The playing area is surrounded by a wooden border. It is 22mm wide, and 70mm high with respect to the floors. It is uniformly painted in mat white (see the appendix). This border is considered as outside the playing area. Hence, it is not taken in account in the above floor dimensions.





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Rules... Rules... Rules... Rules... Rules... Rules...

3.1.2. Tolerances

The organisers commit themselves to build the playing area to the highest degree of accuracy. But they do allow themselves the following fabrication tolerances:

- 2% with respect to the playing field realisation,
- 5% with respect to the paying element construction and,
- 10% with respect to painted markings.

No protest will be accepted regarding any fabrication variations observed within these margins.

The teams are warned that the glossy finish for the colour, may vary in aspect from one playing area to the other and degrades during the competition.

In case of major problems, some elements in the following definitions could be possibly modified along the year. We advice teams is to keep themselves aware of rule changes on the forum and look for possible official revisions in the "FAQ" issued on the web site : www.eurobot.org .

Note : the above tolerances do not concern in any case the dimension limits, which apply to the robots and the possible localisation beacons prepared by the participating teams.

3.2. The playing area floors

Each floor is 1.522m long and 2.10m wide.

They are painted as a chessboard pattern of mat finish brown and glossy finish beige squares. Each square size is 300 x 300mm. The corner squares are beige (see appendix).

At some square centre, up to 10mm diameter holes are present as part of a fastening system for skittle stands (see detailed drawing in the appendix). The robots are not allowed to use those holes in any way.

A 22mm strip also extends each floor between the chessboard and the ditch edge. This strip is painted in glossy white.

The robot starting area is located at the left back corner of each floor.

The start area is defined as a 600x600mm square (the chessboard four squares corner). (See drawings in appendix.)

3.3. The ditch

The ditch is 600mm wide, and spans the full 2100mm width of the playing area (see drawings in appendix).

The ditch is 36mm deep with respect to the two floors. Its bottom is flat.

The ditch bottom and sides are painted mat finish blue.

8 to 16 holes, up to 10mm in diameter in the ditch floor serve as part of the fastening system for the variable position bridges. Their detail number and position may vary from one playing area realisation to the other. The robots are not allowed in any no case, and for any purpose, to use these holes.



Rules... Rules... Rules... Rules... Rules... Rules...

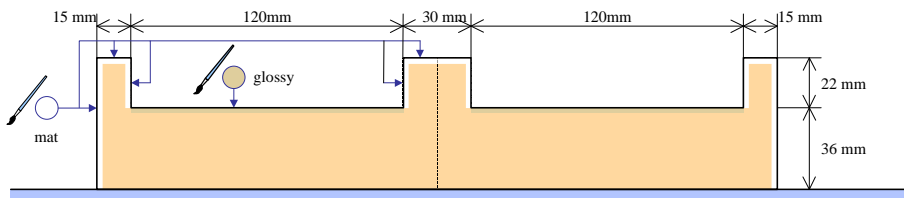
3.4. The fixed bridge

The fixed bridge is permanently positioned at the centre of the playing area and its causeway is at level with the two playing area floors and joins them up. The fixed bridge has an overall width of 300mm and is 600mm long.

The bridge is bordered by two handrails. They are 22mm in height and 15mm wide. At the centre of the bridge, another handrail is set. It is 22mm high and 30mm wide. It cuts the bridge in two 120mm wide causeways. The causeways are at level with the two playing area floors and joins them up.

This bridge causeway is uniformly painted in beige with a glossy finish. The handrails and side walls are painted mat finish white (see the appendix).

Fixed bridge with its two corridors.



3.5. The random bridges

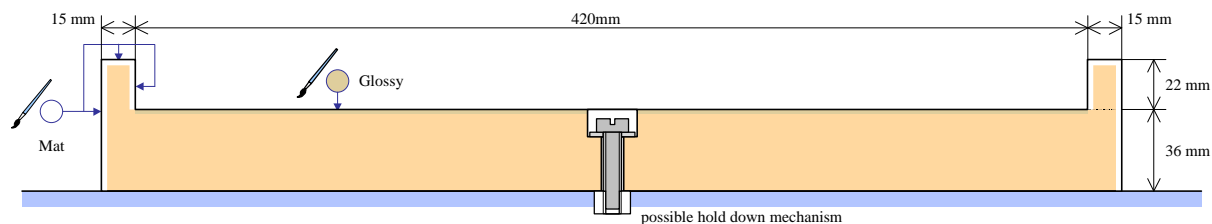
The two random bridges are identical. Their causeway is at level with the two playing area floors and joins them up. They are 450mm wide in overall and 600mm long.

The bridges are bordered by handrails 22mm in height and 15mm in width. This leaves a 420mm wide causeway.

The two bridges are positioned symmetrically on each side of the central bridge. But their position is randomly chosen, at the match beginning, between 4 possibilities. These ones correspond to a translation by a multiple of 150mm.

To prevent the bridges for moving during the match, they are fastened to the ditch floor. For this purpose, the bridges floor may be accommodate with one or two holes to embed a fastener head. Their diameter and position may vary from one design to the other.

The bridge causeways are fully painted in beige with a glossy finish. The handrails and side walls are painted mat finish white (see the appendix).



Important notice: the robots are allowed to cross the ditch outside the bridges. However they are not allowed to use the table borders to help them for this purpose.

Rules... Rules... Rules... Rules... Rules... Rules...

3.6. The skittles

3.6.1. Skittle description

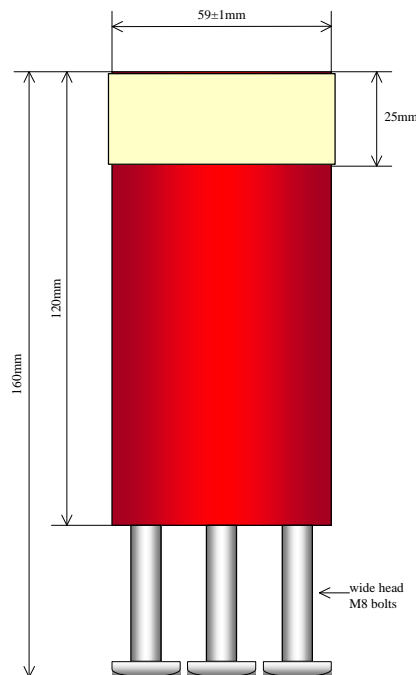
A skittle is made of a wooden cylinder piece, which is painted red or green, with a mat finish. This cylinder is 59mm in diameter, and 120mm high. It is set at its base with 3 metallic legs. These legs are made out of screws, 8mm in diameter, which extend for 40mm out of the cylinder. The overall height of one skittle is 160mm.

The feet are screwed in the cylinder, 10mm from the edge. The three of them are equally spaced in order to form an equilateral triangle base.

The upper edge of the skittle is circled with a yellow reflective tape. This tape is 20mm wide.

The metal legs of the skittles are ferromagnetic. They can be attracted with a magnet.

See appendix.



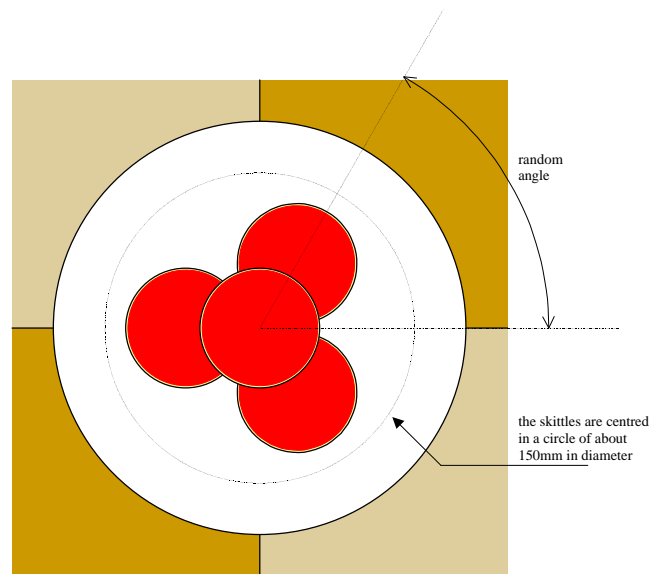
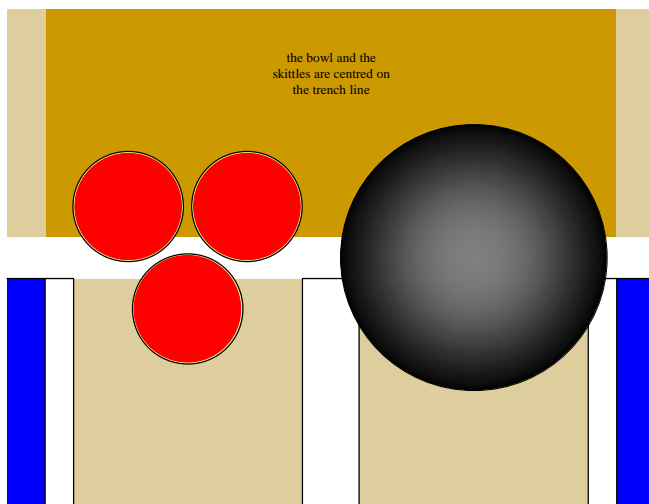
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3.6.2. Skittle initial positioning

30 skittles are spread over the playing area : 15 red ones on one floor, and 15 green ones on the other floor (see the appendix). Their placement is symmetrical about the centre of the playing area. The skittles stand on their feet (screws).

On each floor, the skittles are initially arranged in the following way :

- One group of 3 skittles has a fixed location. That is placed in front the right entryway of the fixed bridge. One of the skittles is placed directly on the fixed bridge floor. The two other ones are placed behind to form an equilateral triangle with the first one (see the drawing bellow).



- Two groups of 4 skittles are positioned on circular stands. The stand placement is random (tossed, see the drawing in the appendix, for possible configurations).
 - Among random placements, stands will never be placed on side by side squares.
 - One group of 4 skittles is positioned directly on the playing area floor (no stand). This group placement is also random (tossed, see the drawing in the appendix, for possible configurations).
- The groups of 4 skittles are built in pyramid, with 3 skittles grouped together on top of which, the 4th one is placed in equilibrium (see the illustration below).

Important notice: robots are not allowed to use skittle to lay down other skittles.

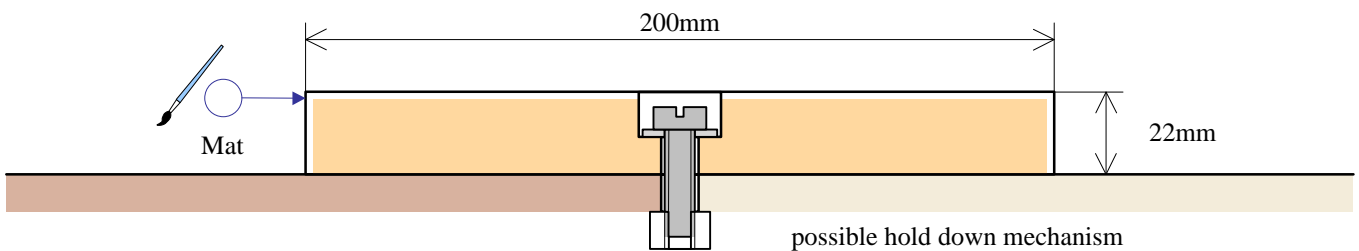


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3.7. The skittle stands

Stands are randomly laid on the playing area floor before the beginning of each match. Their position is tossed. Groups of 4 skittles are initially laid on those stands.

The stands, painted white with a mat finish, are circular, 200mm in diameter and 22mm in height. Those stands are fastened on the playing area floor.



3.8. Bowls

Two big bowls are placed on each side of the left entryway of the fixed bridge (see the drawing in the appendix).

The bowls are rhythmic gymnastic balloons, manufactured by « Togu », usually available in common sport stores. The used bowls are black in colour, and 160mm in diameter. Their internal air pressure is set to be balanced with ambient pressure. They shrink in this condition to a 140mm diameter. For the matches, those bowls will be finely covered with talcum powder. Their mass is about 300g.

Those balls may be pushed or thrown to fall down the skittle.





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4. The robots

4.1. Generalities

Each team builds one or two robot(s).

Robots are fully autonomous machines. They shall carry their own power source, actuators and overall command and control system.

The robots are allowed to communicate, only between them and with the possibly used localisation beacons (during the match no remote controlled action is allowed, the robots shall be strictly running on their own).

4.2. Limitations and safety issues

4.2.1. Fair-play...

The aim is to share a friendly time and play as many matches as possible. Then any action not directly related with the match spirit as exposed in this document, and harming for match development will be penalised.

In this spirit, the robots shall not have for a strategy, for example:

- to prevent its opponent to play the skittles.
- to put skittles in the ditch deliberately.
- to jam the opponent robots.
- to use accessories, colours or drawing looking like playing area elements in an attempt to lure the opponent robot.
- to induce vibrations in the table in the aim of laying down skittles or hinder an opponent robot action.
- to cause deliberately degradation at the opponent robot, the paying area, or any of the playing field element.

In addition:

- The robots shall not fix themselves to the playing area (for example suction cup,...). At any time during the match, the force necessary to lift up a robot shall not be more than its weight.
- The robots shall not use a carried skittle to fall down other skittles.

4.2.2. ...and safety

- The robots should not have any protruding or sharp part that may be able to inflict damages or that can be dangerous.
- The use of liquid products, corrosive products, pyrotechnics materials or living beings is forbidden.

All the systems taken aboard the robots, shall respect the law. Specifically, the used systems shall comply to legal safety regulations and must not endanger the participants nor the public both during the matches as in the backstage (see also §8.5).





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As general rule, any device or system considered as potentially dangerous for the contest attendant or the referee will be rejected.

4.3. Balls

The balls can only be used to make the skittles fall over.

The teams are authorised to take up to 8 balls aboard their robot(s). Those balls must remain, within the robot size limits defined in § 4.6 when carried.

These balls shall be mat black balls. They shall be 40mm (+/- 10%) in diameter and have a maximum mass of 100 g (squash balls for example).

Their use is optional. They are not provided by the organisation.

Their use shall neither endanger the surrounding people, nor disturb the development of the game. Their use will be accepted only if those conditions are fulfilled.

A robot can gather balls found on the playing area and use them again.

Teams are recommended to identify their balls with a small distinctive sign. This distinctive sign must not disturb the robot capability to detect these balls (no bright colour markings for example).

4.4. Mandatory equipment

Each robot shall accommodate a starting device. This one shall be easily accessed on the robot. It shall be triggered from pulling on a cord at least 500 mm long. This cord shall not remain attached on the robot after it has been started. Any other systems (remote control, manually activated toggle switch...) will not be approved. If a team runs with two robots, both triggers shall be activated by the same person, and in one single movement.

Each robot shall accommodate an emergency OFF switch. This one shall bear a distinctive sign, at least 20mm diameter (for example a safety switch). This switch shall remain within the dimensions of each robot. It shall be placed in a conspicuous position in a zone that is not dangerous and that is immediately accessible to the referee at any time during the match. This emergency switch shall power off the supply of robot's propulsion and actuators.

Each robot shall accommodate a timer. This one shall stop or shut down the robot automatically at the end of the match.





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Rules... Rules... Rules... Rules... Rules... Rules...

4.5. Recommended equipment

The teams are warmly recommended to encompass their machines with a bumper. The bumper shall be contained within the dimensions of the robot and centred 70mm above the floor. The bumper is intended to prevent always possible damages after unintentional collisions between robots during a match.

The use of electromagnets by many teams may be expected. It is recommended to all teams to take this into account in their design and include possible protection in their electronics.

4.6. Robot spatio-temporal limitations

The teams are allowed to set their robot(s) with deployable mechanisms. If such mechanisms are used, the robot(s) shall typically unfold them after the match start signal.

The perimeter of the robots is defined as the convex envelope which fits the vertical projection of the robot on the ground (see following figures).

The perimeter of the robot or pair of robots, in the starting position, shall not exceed 130 cm.

The perimeter of the robot or the sum of the perimeters of the two robots in fully deployed configuration shall not exceed 2m at any time during the match.

The height of the robots shall not exceed 400mm, not considering beacon supporting mast. This limits apply even during deployment movement.

Each robot may carry up to 2 skittles at a time.

The skittles possibly carried by a robot during the match are not part of its dimensions, but those skittles shall not enter the beacons field of view. This one is defined as starting above a 400mm height from the playing area floor.

A robot shall be understood as a set of objects mechanically linked together (then a robot cannot disperse parts or elements on the playing area).

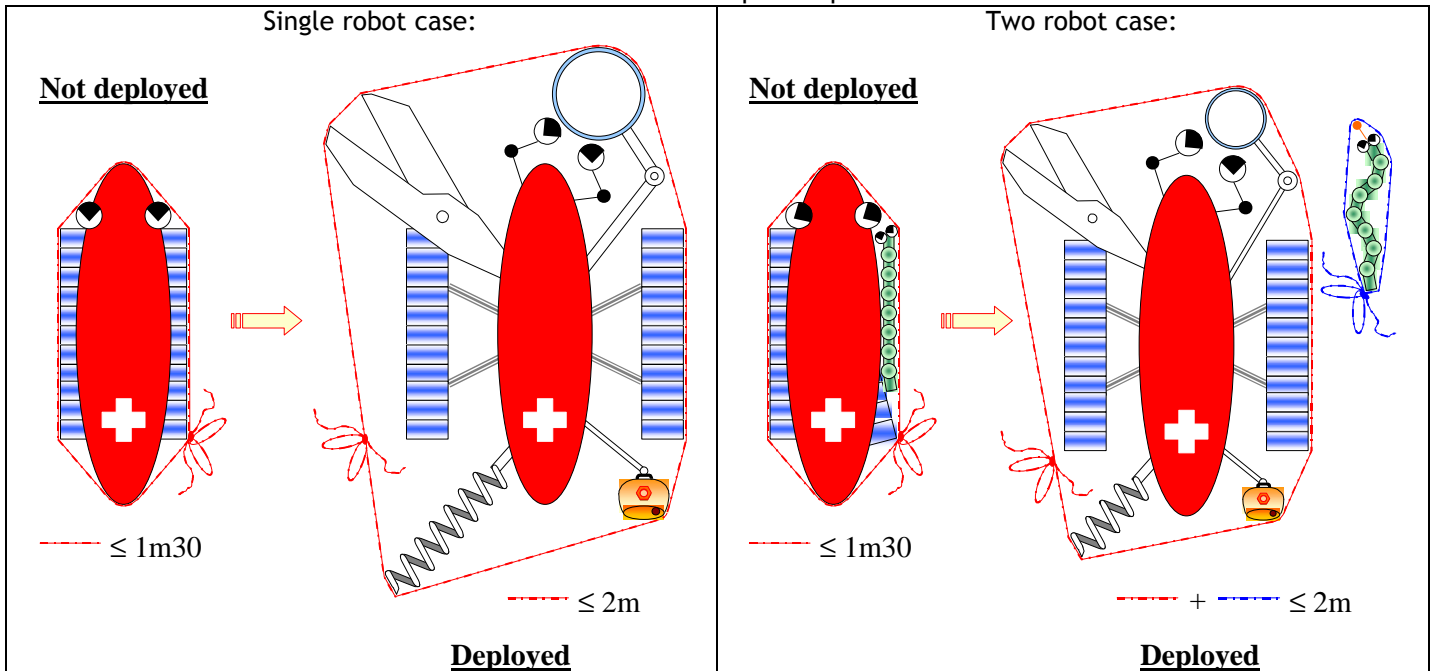


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Here follow several examples of perimeter cases



4.7. Energy sources

All energy sources are allowed (springs, pressurised gas, cell, batteries,...) except for those using corrosive products, pyrotechnics products, or living beings.

With respect to batteries, it is requested to use only models with solid electrolyte in order to prevent any problem after an acid leakage.

It is strongly recommended for teams, to possess several battery sets and care for an easy access in the robot for their replacement. This shall allow to have a set fully charge at hand in any circumstances for a quick robot reconfiguration. The teams shall be able to play two matches successively.

4.8. Control systems

The teams may use any kind of robot control system (analog, microprocessors, microcontrollers, computers, programmable logic ...).

Those systems must be fully integrated in the robot(s).



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4.9. Robot localisation beacon support

It is strongly recommended to the teams to set their robot with a support to accommodate a localisation beacon prepared by opposing teams.

A team may choose not to set its robot(s) with a beacon support. But in that case, if the opponent requires such device, and needs it, the team will be scratched for the current match.

The beacon support shall at anytime comply with the following constraints :

- It shall be carried by the robot as a 80x80mm square surface, located 480mm above the floor level. The structure supporting this platform must stay within the vertical projection of this platform. This mast cannot host any part of the robot other than sensors. The mast shall be robust and rigid enough for supporting the opponent's beacon in a stable configuration proper to its operation. The team is responsible for the robustness of its mast.
- The platform surface of the support shall be fully covered with Velcro (soft "snaggable" face) on a 80x80mm square surface.
- The support shall be located at the centre of the robot as much as possible. In robot non deployed configuration, the distance between the support and the maximum robot extension on one side, shall be not less than 50% of the equivalent distance on the opposed side.

The support shall be able to support also a flag module identifying the robot allocated colour (see §6.1 for details).



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5. Beacon

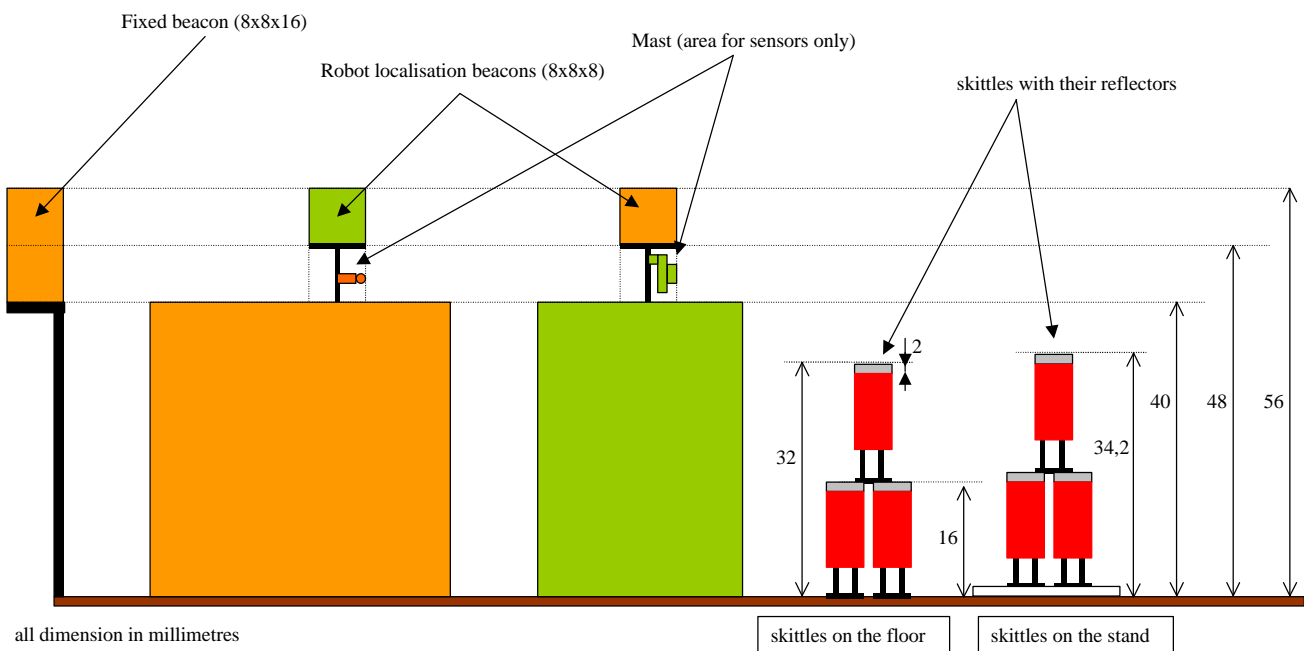
5.1. Generality

The beacons are meant to help the robots to locate themselves, the opposing robot location on the playing area, and possibly the stacked skittles.

The goal of the beacons is not allowed to jam the opposing robot(s). If there is any risk that they may deliberately disturb the development of the match, they will not be possibly used.

Three fixed beacon supports are placed each end side of the playing area: one at the centre, the two others on each corner (see the drawing in the appendix). Their platform is placed 400mm above the playing area floors. The supports are painted black.

The use of beacons is optional and they shall be design and built by the teams.





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5.2. Robot localisation beacons

One localisation beacon can be fitted onto the beacon support mast of each opponent robot.
Two beacons are allowed per team (one per opponent robot).
The robot localisation beacons shall be fully autonomous and independent.
The maximum size for a robot localisation beacon is a 80mm edge cube.
The beacons will be fitted on the beacons support provided for this purpose by the opponent robot(s).
The elements used for the beacon manufacturing shall be useful (no load or similar dummy). The referee may request if necessary that the team opens its beacon box for inspection and verification.
The robot localisation beacon top shall be able to support the flag module identifying the robot allocated colour (see §6.1).

5.3. Fixed beacons

Each team can use a maximum of three beacons, to be placed on the provided supports around the playing area. Their making and their use is optional. The supports allocated to the team are the ones on the opposite side of the robot starting area.

Those beacons must remain within a square base of 80x80mm and can be 160mm high.
They must be globally autonomous, but can be linked together by a wire. The optional wire shall not be able to disturb the development of the match.

5.4. Design requirements

The beacon underneath surfaces shall be covered with Velcro (soft "snaggable" face) as a way to fasten them on their assigned support.
The beacons (robot localisation or fixed ones) shall remain on their support all along the matches.

5.5. Communication signals

In order to avoid interference between the teams, it is recommended to encode the communication signals.

We strongly recommend the teams using infrared devices, to take in account the strong ambient light used during the competition. Moreover, this illumination may vary during the competition depending on the time and on the area.

We also mention that the contest staff uses H.F. devices during the contest.

No protest will be taken in account regarding interference problems. The machines must be able to adapt to the conditions that may change depending on the moment and their location during the contest.





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6. Match timeline

6.1. Playing area and robot identification

For each match, the playing area and the robots are allocated with a colour marking built as a small flag module: red or green.

The use of this marking is to help the public to associate at any instant a robot with its team.

The flag module mass is negligible. It is placed directly on the robot beacon support, or directly on the robot (see §5.2 with respect to the possibility of no beacon support being present on the robot) and on the fixed beacons.

It is requested from the team to provide a flat surface, set with Velcro (catch side) to support this on its robot(s) (typically the beacon support) and the beacons (either fixed or mobile).

6.2. Start procedure

A side of the playing area is allocated to the team before each match.

Each team shall position its robot(s) not deployed the following way:

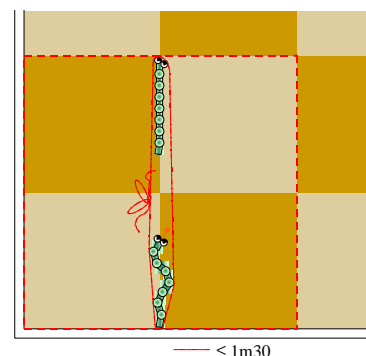
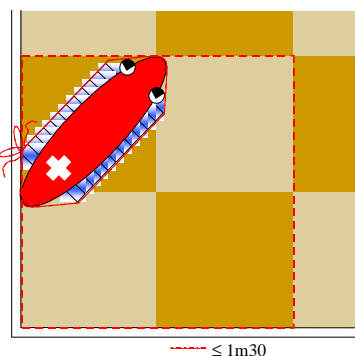
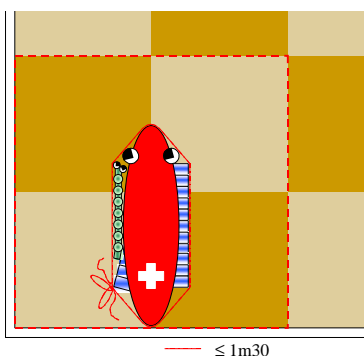
Case 1 -One robot:

- The robot must be within the starting area.
- It must be in contact with one of the playground's borders.

Case 2 -Two robots:

- The two robots must be within the starting area.
- One of the two robots must be in contact with one of the playground's borders.

Teams shall install their robot(s) on their starting location within 3 minutes.



Only two people are allowed access to the playing area for the robot preparation.



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Rules... Rules... Rules... Rules... Rules... Rules...

Once both robots are in place, no intervention or transmission of external information is allowed. The referee toss the position for the bridges, the stands and the skittles groups, and install them. The referee asks the participant whether they are ready and if they have any remarks about the placement of all the game elements. No objection regarding the placement will be accepted beyond this last moment.

At the start signal given by the referee, the robots are activated by one of the team member. The robot shall then run on their own in a fully autonomous way.

Any team, which does not scrupulously follow this starting procedure (anticipated or delayed start), is charged with a false start. A new start shall be given with a new random layout for skittles and bridges. The referees keep the right to start the robots themselves.

6.3. Match sequence

Robots have 1 minute and 30 seconds to get as many points as possible. This must be accomplished in complete autonomy.

The teams staff in not allowed, in any way, to touch the robots, the playing area or any of the game elements during a match. Any action made without the referee consent will lead to the team elimination for the current match. The team will then loose all the points possibly get during the match.

If the robot leaves the playing area, it cannot be put back into it. The match continues without being played again. However, a robot cannot deliberately push an opposing robot out of the playground.

At the end of the match, the robots will stop using their timers. If the timer does not work properly, the emergency stop button will be used by the referee to stop them.

The referees will count the point without touching the robots. Then they will announce the scores.

The team staff is allowed to touch the robots and leave the scene only with the explicit referee consent after a common agreement on the announced score.

6.4. Score calculation

6.4.1. Points

The points count is made when the match is over.

Each skittle of the team colour laying down on the playing area gives one point to the team.

Skittles carried by the robot(s) do not enter in the count.





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6.4.2. Penalties

A penalty is associated with the gift of one point to the team opponent score at the end of the match. Any robot whose action is not compatible with the rule spirit, may be allocated penalties by the referees.

The referee will assign a penalty for example in the following cases:

- a robot violently running into the opponent robot;
- a robot considered dangerous with respect to the table and / or the opponent robot(s);
- a robot which strategy is to prevent the other team to access the skittles.

Warning: this list is not exhaustive. Other penalties can be allocated when the referee consider this justified.

6.4.3. Scratching

The referees will scratch a team:

- that has not come on time at the backstage waiting room for matches;
- that took more than 3 minutes to get ready on the playing area;
- whose not even one robot did completely leave the 4 squares of the starting area for the whole match;
- whose robot(s) do not have a mobile beacon support when its opponent requests and requires one.

In addition, the referees may scratch a team:

- Whose robot shows a deployment or an action that has not been previously approved by the referees, or any deliberate action not in line with the rules.

A team being scratched during a match loses all the points gathered during this match.



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7. Contest master timeline

7.1. Approval

To participate to the qualification rounds, a robot shall be controlled by a referee who checks :

- That the robot(s) complies(y) with the rules : for this purpose, the robot shall be capable to easily show all of its possible actions and deployments.
- That under match conditions, free of an opponent :
 - The robot or the pair of robot(s) are able to win a match (this means that it shall have laid down more of its own colour skittles than of the opponent in one minute and half).
 - The robot(s) is(are) equipped with a automatic stop timer that works properly.
- That the team provides a technical file (see appendix).

A robot or pair of robot which satisfies these criteria will be approved.

N.B. :

It is mandatory to keep referees informed of any major modifications (functionality, size...) made after approval and between matches. The referees will check that the modifications do not the robot compliance to the rule. If the control is successful, the referee will revalidate the approval.

A deployment or an action, which has not been approved and is used during a match, will lead to a scratch of the robot for current match.

At any time during the competitions, and in the event of doubt over a robot, the referees have the right to proceed with a new approval.

For example, any robot which reproduces a forbidden action for several matches will be ask for correction and a new approval.

7.2. Qualification rounds

If the team number allow for it, the qualification rounds are made of 5 matches at least. The qualification rounds result decides which teams are qualified for the final round.

The qualification score is determined by adding the points cumulated during each match with bonus points:

- 4 points for a victory,
- 2 points for a draw,
- 1 for a defeat,
- 0 for a scratched match.

A 0 to 0 score is considered to be a double defeat. Hence, each team gets 1 bonus point.

When the qualification rounds are over, the teams are sorted using their qualification points count.

The teams that have the same points count are sorted by comparing the points cumulated during each match without adding the bonus points. The organisers may, if necessary, request extra matches.





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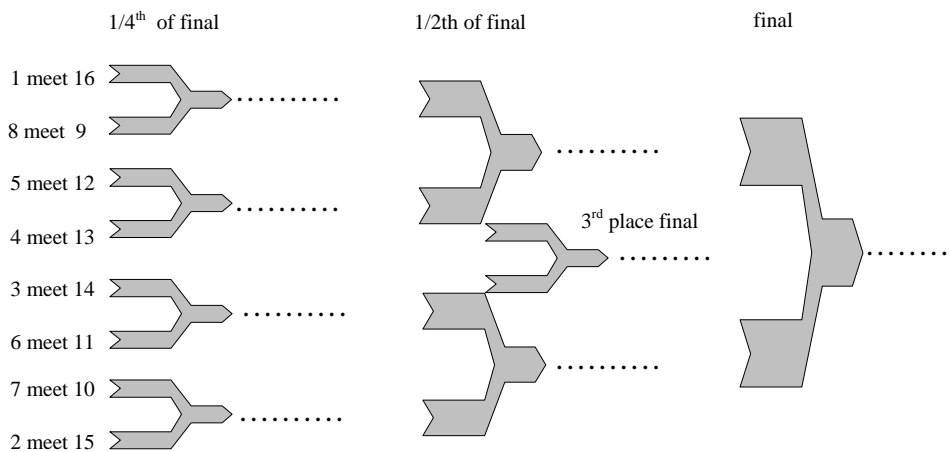


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7.3. Final round

The first 8 or 16 teams from the qualifying phase (depending on the number registered teams) are selected for the final round.

The matches for the final round are organised according the principle shown below:



During final phase matches are knockout matches.

In the event of a draw or double withdraw, the match is replayed immediately. If this second match is a double withdraw or a tied, the winner will be determined from points gained at the end of qualification rounds.





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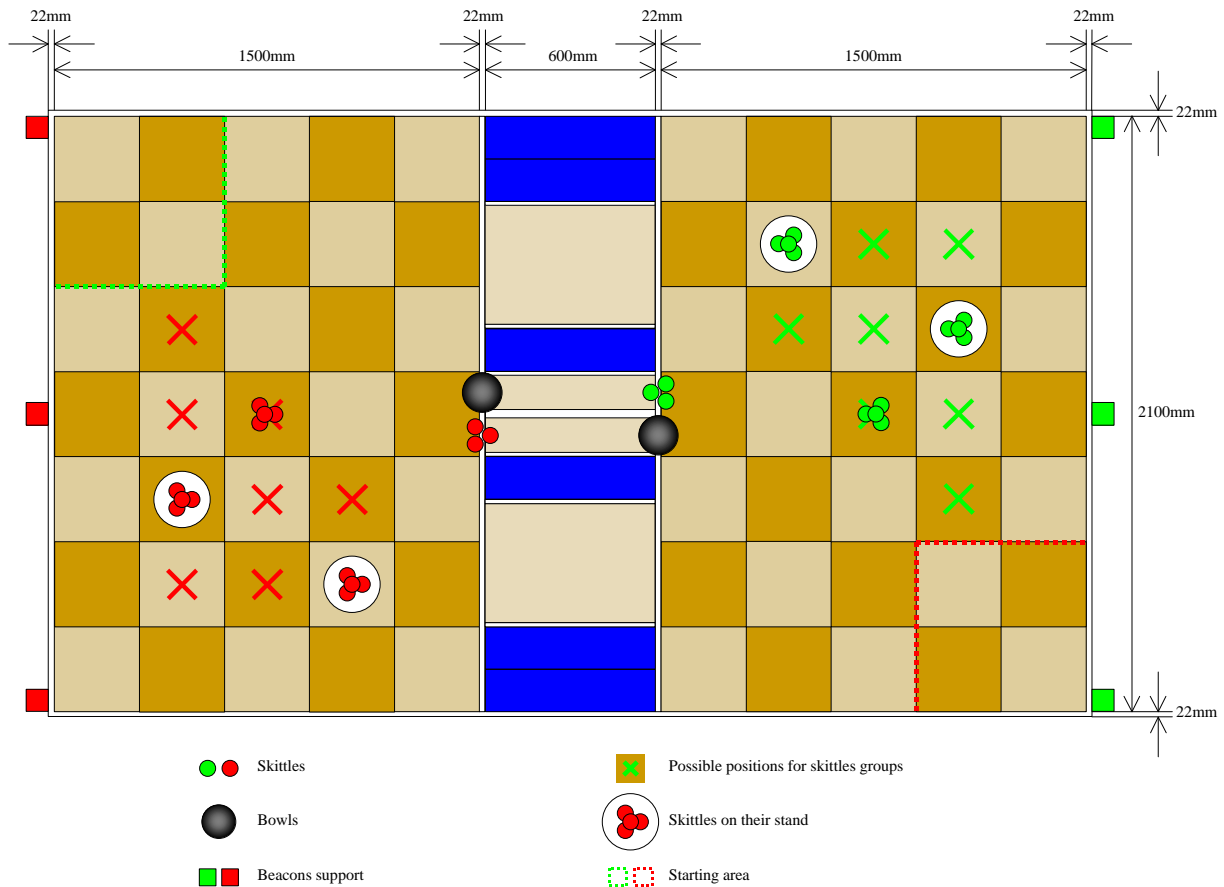


Rules... Rules... Rules... Rules... Rules... Rules...

8. Appendixes

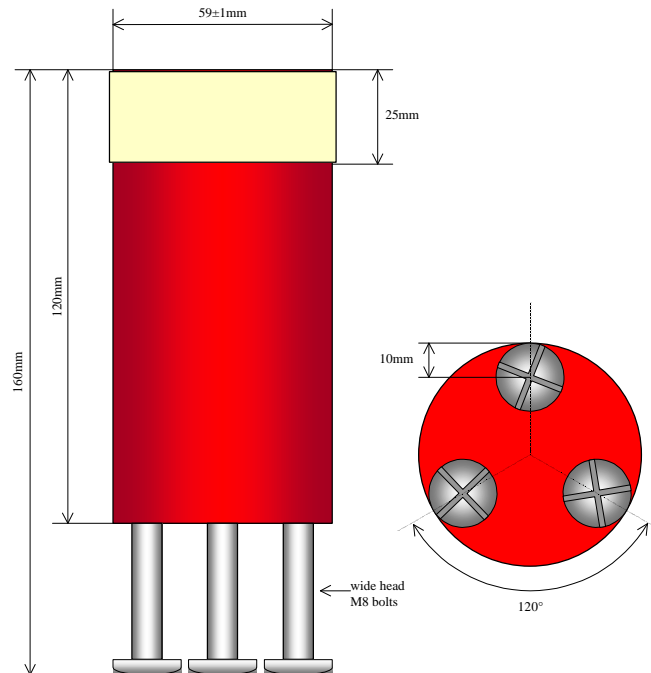
8.1. Playing area drawing

Dimensions are given in mm and are subject to the general tolerances defined in §3.1.2.



Rules... Rules... Rules... Rules... Rules... Rules...

8.2. Skittle drawings



- Reflector:

It is made of an adhesive retro reflector tape, 0.2mm thick, 25mm wide, silver colour. Its reference is XUZB05 from "Telemecanique". The tape is distributed on line by the RADIOSPARES company under reference 324-1591 (1m).

- Bolts:

Large low profile bulged head bold, with crossed slots.
Length: 80mm, Diameter: 8mm (M8), Head diameter: 19mm.



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8.3. Painting references

Element	Colour	Paint type	Reference
Playing field, chessboard	Beige (glossy finish)	Acrylic	RAL 1001
Playing field, chessboard	Brown (mat finish)	Acrylic	RAL 8024
Playing field, borders, skittle stands, and handrails.	Traffic white (mat finish)	Acrylic	RAL 9016
Playing field, ditch edge line	Traffic white (glossy finish)	Acrylic	RAL 9016
Playing field, ditch	Sky blue (mat finish)	Acrylic	RAL 5015
Beacons support	Traffic Black (mat finish)	Acrylic	RAL 9017
Skittles	Green (mat finish)	Acrylic	RAL 6002
Skittles	Fire red (mat finish)	Acrylic	RAL3000

8.4. Technical file

In order to get approval, each team is required to provide a technical file during the approval.

This file shall presents the major information related to the design of the robot (drawings, technical references, specificity...) on a A1 format poster. This file intends to favour exchanges and communication between teams.

This technical file must be easy to understand for the most people (several drawings, simple explanations....). The file shall not forget to provide:

- the name of the team;
- the number of team members;
- the presentation of a design, innovation, new strategy developed by the team for robot, or any detailed design that the team is specifically proud of.

This poster will be displayed in the pit of the team, in the backstage. The poster will be written in the team mother language and, as far as possible, in English.

A similar document will be provided as a « ppt » (Microsoft PowerPoint), « pdf » (Adobe Acrobat) or «jpg» or «png» (image) format files. In any case, the chosen resolution should guarantee texts to be read. The file maximum size shall remain below 10Mo.





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The electronics version is intended for presentation on the EUROBOT web site, and archive in the EUROBOT project data base.

This document may be sent beforehand to the National Organisation Committee or provided at your arrival at the competition.

8.5. Safety instructions

Below you will find a list of safety instructions to be compliant with. This list is not exhaustive, and it may be subject to legislation modification or national variation.

As a general rule, the teams develop systems that satisfy design and manufacturing criteria that do not endanger the team or the audience both in the pits and during the matches.

That is why you shall ensure that your systems comply with the applicable legislation.

8.5.1. On-board voltage

All robots must comply with the legal standards concerning "low voltage". Therefore, the internal voltage of the robots shall not exceed 48 V.

8.5.2. Compressed-air systems

All pressure systems must comply with the applicable law. In France, this shall be in accordance with the "Conseil Général des Mines" (French safety and approval board).

Reminder of Decree 63 of January 18, 1943 and Ministerial Order of July 25, 1943 (French legislation):

- Maximum pressure: 4 Bars
- Maximum Pressure x Tank Volume product: 80 bars x litre.

Further information may be found on:

<http://www.industrie.gouv.fr/sdsi/> (for France)

8.5.3. Lasers

Max optical output power for lasers shall be lower than 1mW (0dBm).

8.5.4. Powerful light

In case a high intensity power source is used (by beacons for example), the light intensity shall not be given as dangerous for the human eye in case of direct illumination. Note: this may be the case with some powerful light emission diode.

