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Locehilios LEGO League

Construction/Conduct Rules

Draft 0.8

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1 Robots

1.1 Robot Definition

A robot is single entity capable of performing tasks and combating other robots. Each competition will have its own requirements for how a robot must act. For example, a combat competition will often require that a robot move, and a robot that remains stationary for a given amount of time would be considered defeated.

1.2 Naming

All robots must be given a clever and threatening name used to instill fear in other opponents. The terms “clever and threatening” are open to each teams interpretation and the names shall not effect the competition judging.

1.3 Human Interaction

Robots must **do no harm** to humans.

1.4 Materials

1.4.1 Permitted Materials

Materials are limited to LEGO pieces, rubber bands, and batteries.

1.4.2 Not-Quite-LEGO Pieces

The balls and pucks from the RoboSports set, the Throbots Frisbee discs, and any other “Not-Quite-LEGO” pieces may be used without restriction.

1.4.3 Contraband

Any materials not specified in the permitted materials list (see 1.4.1) are considered contraband. This includes, but is not limited to: wire, tape, paper, stickers, motorized tools, fluids, dust, or sand, etc. Old bricks which had stickers applied to them in the past must have them removed to be used in competition.

1.4.4 Banned LEGO Pieces

There are currently no banned LEGO pieces.

1.5 Construction

1.5.1 Interlocking Pieces

LEGO pieces are designed to snap together. This is how robots must be constructed. No string, wire, tubing, or rubber bands may be used hold pieces together.

1.5.2 Adhesives

Using glue or any adhesive is absolutely not allowed.

1.5.3 Piece Modification

LEGO pieces may not be modified in any way. This includes but is not limited to: melting or heat-welding pieces together, cutting or scoring pieces to change their adhesiveness. No modification of motors. LEGO pieces must be used as a complete piece without the removal of any material.

1.5.3.1 Exceptions

The following are exceptions to the piece modification rule:

1.5.3.1.1 LEGO Flex Tubes and Flex Axles

LEGO flex tubes and axles are designed to be bent into any desired shape. However, they may not be cut or broken.

1.5.3.1.2 LEGO Axels

LEGO axels may be cut to be shortened to any standard LEGO axel size. For example a six stud axel may be cut into two three stud axels. However, axels cannot be cut to any non-standard length or modified in any other way.

1.5.3.1.3 LEGO Pneumatic Tubing

Tubing may be cut to any length, but may be used for pneumatic routing only. Tubing may not be used for tying pieces together, tethering weights or weapons, etc.

1.5.3.1.4 Homemade Sensors

Homemade sensors may be used as long as they are enclosed within standard LEGO pieces, and are connected to the robot in the usual fashion (snapped together as interlocking pieces). Homemade sensors must be declared before each tournament and inspected to ensure no structural advantage is gained by using it.

1.5.4 Rubber Bands

1.5.4.1 Permitted Rubber Bands

Any LEGO rubber band is permitted. Non-LEGO rubber bands are permitted as long as their width is no larger than standard LEGO rubber bands.

1.5.4.2 Acceptable Use

Rubber bands may only be used for power or as projectile ammunition. Rubber bands may not be used for holding pieces together, or as rubber “armor”.

1.5.4.3 Modification

Rubber bands cannot be altered in any way. This includes cutting them.

1.5.5 Batteries

In general, batteries must supply electrical power. By default, plug-in adaptors may not be used.

1.5.5.1 Acceptable Use

Batteries may only be used for power. They may not be used as weapons, weights, ballast, etc.

1.5.6 Projectiles

In combat competitions, projectile weapons are by default, permitted as long as they are constructed using the permitted materials list (see 1.4.1) and acceptable use rules (see 1.5.4.2 and 1.5.5.1). This also applies to ammunition for such weapons.

1.5.7 Modular Systems

Modular systems are a subset of a robot that can be exchanged between events within a competition. Modular system may not be more than 50% of the robot (by weight). Modular systems are by default not allowed.

1.5.8 Drones

A robot that divides into multiple robots is said to have spawned drones. Drones are, by default, not allowed.

1.6 Programming

1.6.1 Programming

Robots may be controlled by LEGO intelligent programmable bricks.

1.6.1.1 Alternate Programming

It is permitted to use alternate programming instead of RCXCode or RoboLab programs. NQC, Spirit programming, or alternate firmware such as pbForth and BrickOS is acceptable.

1.6.2 Infrared Communication

Use of the RCX's IR port is subject to the rules and restrictions of the competition. At no time is it acceptable to intentionally use the IR port to shut down or alter the programming of or alter the operation of another robot.

1.6.2.1 Acceptable Use

In some competitions use of the IR port may be acceptable. IR can be used for proximity detection, wireless remote control, or light based camouflage. If IR usage is acceptable during a competition, a robot will be assigned a range of IR port commands with which it may operate. Use of any command outside the assigned range is strictly prohibited.

Only signals may be sent with the IR port. No low level commands, program transfers, etc. (such as codes to turn off other RCXs)

2 Competition Format

Each competition will have a defined format. This can change with every competition and is meant to be flexible. All formats cannot be outlined here. Instead this document will describe the types of information that is defined in the competition format.

2.1 Type

Each competition format will be one of the following types.

2.1.1 Task

In this type of competition, each robot must complete a task or set of goals. The judging is tailored to each competition, but it might consist of awarding points for certain goals, speed, accuracy, or some other quantifiable achievement.

2.1.2 Game

In this type of competition, each robot goes head to head with one or more robots in a set of matches. During these matches the robots compete to complete a task or set of goals. The major difference between Task and Game type competitions is that in the game

competitions a robot has the opportunity to affect its opponent's performance.

2.1.3 Combat

In this type of competition, each robot goes head to head with one or more robots in a set of bouts. During these bouts the robots spar and score points for landing blows or incapacitating opponents.

2.2 Autonomy

Each competition will define the level of autonomy required of robots

2.2.1 Manual

Manually controlled robots are completely controlled by their owner.

2.2.1.1 Hands-on

The robot is fully operated by their owner by integrated buttons, triggering sensors, polarity switches, pneumatic switches, etc.

2.2.1.2 Remote

The robot is fully operated by their owner using a remote control.

2.2.1.2.1 Wired

The remote control is connected to the robot via a wire.

2.2.1.2.2 Wireless

The remote control is not connected to the robot but communicates with the robot via light, sound, IR, Bluetooth, or any other wireless protocol.

2.2.2 Guidance

This level of autonomy means the robot mostly controls itself. However, a robot's owner is allowed to signal the robot for a particular reason. An example of this would be a combat robot which navigates on its own, but receives a signal from its owner to know when to attack. A competition with this level of autonomy will specify what types of signals are allowed and for what purpose. By default only wireless communication is allowed for these signals (see 2.2.1.2.2)

2.2.3 Autonomous

Autonomous means *completely* autonomous. Once a robot has been started, its owner may not touch it or signal it in any way.

2.3 Restrictions

Competitions may further restrict robot construction and conduct beyond rules mentioned above. Robots can be restricted using the following categories as well as other specific competition restrictions.

2.3.1 Size

A size restriction can be imposed. The size will be specified as a maximum height, width, and length measured in inches. If a competition imposes a size restriction, any participating robot may be no larger than that size. This applies to initial size. By default, is acceptable for a robot to expand or grow to a larger size once the competition has begun.

2.3.2 Weight

A weight restriction can be imposed. The weight will be specified in ounces. If a competition imposes a weight restriction, any participating robot may be no heavier than that weight. This weight includes batteries and any ammunition.

2.3.2.1 Weight Classes

A competition can define multiple weight classes. If it does then robots will compete against other robots in its weight class.

2.3.3 Motor Count

A motor count restriction can be imposed. The motor count will be specified as a number. The motor count of a robot can be calculated as follows. One point for each 9V or 4.5V train motor. One-half point for each micro-motor. The sum of these points is a robot's motor count. If a competition imposes a motor count restriction, any participating robot may have a motor count no larger than that motor count.

2.3.4 IR Usage

A IR usage restriction can be imposed. A competition will explicitly allow or disallow IR usage. If IR usage is allowed, it must be in accordance with the acceptable use rules pertaining to infrared communication. (see 1.6.2.1)

2.3.5 Processing Power

A processing power restriction can be imposed. If a competition imposes a processing power restriction, the number and types of intelligent bricks used in the construction of any participating robot may not exceed processing power amount. This applies only to

intelligent bricks used in the robot itself. This does not apply to the construction of a remote control (if allowed).

2.3.6 Power Source

A limit on power sources can be imposed. This limit will determine if internal batteries, AC adaptors, or external battery boxes can be used.

3 Competition Procedures

3.1 Inspection

All robots are subject to inspection prior to every competition to ensure all rules and restrictions are followed. Robots failing an inspection will be NOT allowed to participate.

3.2 Judging

The purpose of judging is to determine a winner of the competition. The method of judging will be defined differently for each competition. In general, the judging will involve awarding points to robots for completing tasks, winning matches, etc. Often participants will need to do the judging (due to a lack of non-partial judges). If any participant is allowed to judge, all participants must judge as well (to be fair).

3.3 Tournaments

If a competition involves a tournament, the following tournament formats will be used by default.

3.3.1 Only Two Robots

Two robots will participate in a “best of five” tournament. The robots will compete in 5 rounds. The first robot to win three rounds shall win the tournament.

3.3.2 Three to Eight Robots

Three to eight robots will participate in a “round robin” tournament. Each robot will compete against another robot in a “round robin” fashion. The robot with the most overall victories shall win the tournament. If robots end with equal numbers of wins, a second “round robin” tournament, or a “best of five” tournament will begin (depending on the number of tying robots).

3.3.3 More than Eight Robots

More than eight robots will participate in a double elimination tree tournament.

3.4 Maintenance

In general, robot maintenance is allowed when a robot is not competing as long as the competition schedule is not delayed. If a robot is not ready to participate at its scheduled time, it shall forfeit.

3.4.1 Repairs

Repairing robots includes fixing combat damage, adjusting settings and calibrations, swapping modular systems, loading ammunition, replacing broken rubber bands or string, filling pneumatic tanks, replacing batteries, etc.

Repairs do not include reconstructing a different robot.

3.4.2 Downloading

Any downloading of programs (or other IR transfers) must be done away from other robots, and you must alert other participants of your activity.