

Practical Olympiad Problems

1. General rules

Participants of the Olympiad get the construction kits Lego Mindstorms NXT 9797 of equivalent complete equipment. One team gets one kit. Each team may use their laptops with their software. All the robots must be fully autonomous. Any kind of touch to robots during executing the tasks is prohibited. Participants may execute tasks in order they prefer. When team solved the problem it should submit solution to the referee. Referee reserves the right to score additional points to solution if they deem this solution valuable and original. At the end of the Olympiad teams hand construction kit over in its original complete equipment.

2. Problems

Problem 1. Stepping robot on the line

Construct and program a robot which will walk along the curve line from start to finish at the minimal possible time. Only stepping robots are allowed to participate. Robot is deemed to be stepping if the following criteria are met: robot should move leaning only to natural-like limbs (legs); each leg fulcrum should perform a translatory motion and must not rotate round some center; using of wheels touching the floor is prohibited.

Maximal time for execute the task is 120 seconds. If vertical projection of the robot fully leaves the line, penalty points are scored. If the robot moves away from the line further than three lengths of its corpus or for a time longer than 20 seconds, the attempt is not scored.

Line curvature is no less than 300 millimeters. Using of two motors and any kind of sensors in robot's construction is allowed. Maximal size of the robot is 250x250x250 millimeters.

Problem 2. Backwards

Construct and program a robot, which will ride along the curve line from start to finish at the minimal possible time. The robot has a light sensor placed on the behind of its corpus.

Construction of the robot is a twine-engine bogie with bearing wheel. The light sensor is directed downwards. The sensor is placed in the vertex of the equilateral triangle with robot's wheels on base. Distance between wheels is between 15 and 20 centimeters. Placement of wheels and sensor is determined with the special template.

Maximal time for execute the task is 120 seconds. If vertical projection of the robot fully leaves the line, penalty points are scored. If the robot moves away from the line further than three lengths of its corpus or for a time longer than 20 seconds, the attempt is not scored.

Line curvature is no less than 300 millimeters. Using of two motors and any kind of sensors in robot's construction is allowed. Maximal size of the robot is 250x250x250 millimeters.

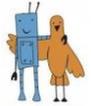
It's purporting that robot is orienting on the line which is not known beforehand, using only the light sensor. Other kind of solutions is not allowed.

Problem 3. Cheery sorter

Create a program for the robot at the figure below, executing which robot will sort ten Lego balls of red and blue colors. Balls are selected randomly. For the each wrong sorted ball penalty points are scored.

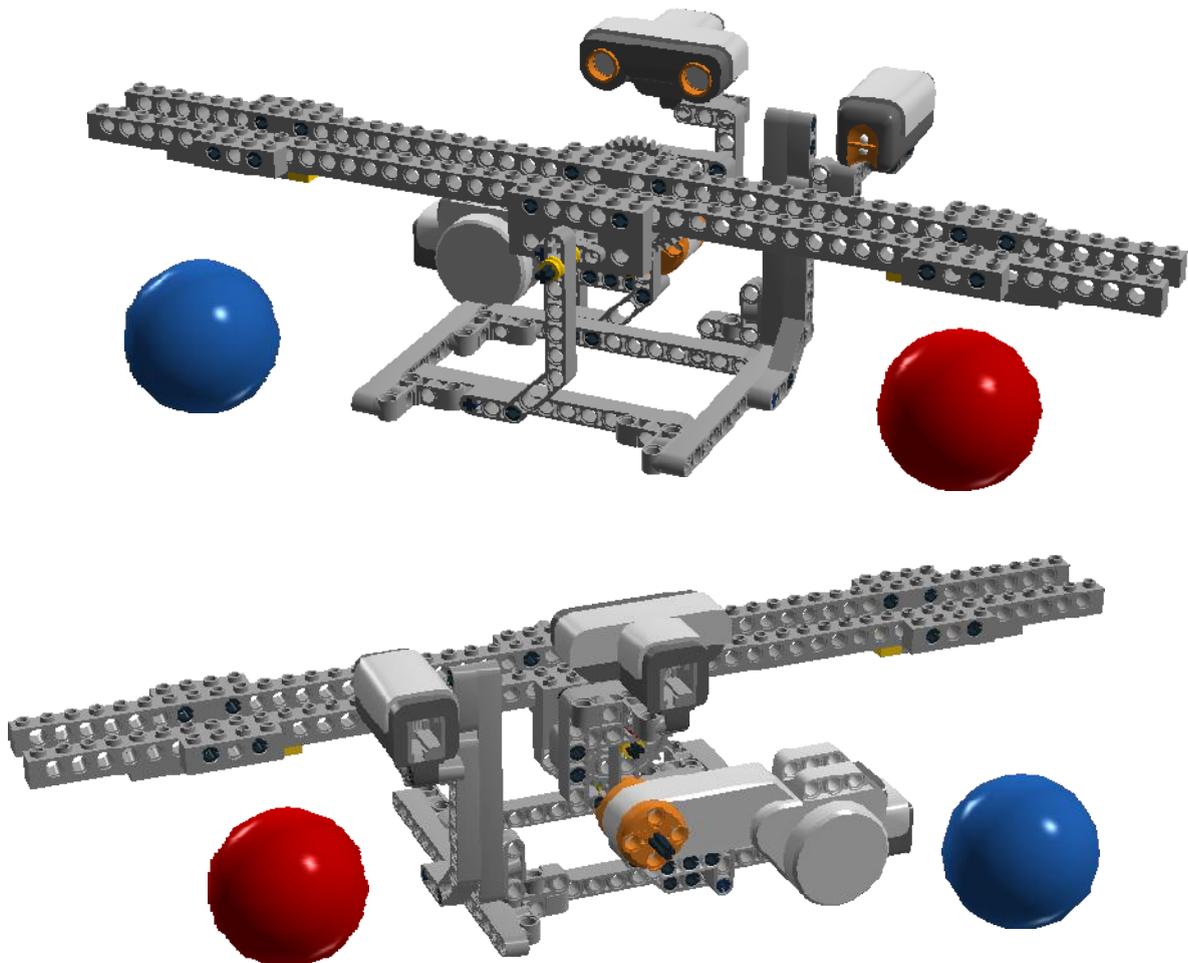
Sorter robot is controlled by one motor. Robot's construction is suggested by the organizer. It is a swing with a gutter where ball is placed to. The controlling motor is placed on the rotation axis. Opposite to it distance sensor is placed, near the axis light sensor is placed. There are two colored bars under the gutter. There are also two baskets at the both sides of the gutter at the distance of three centimeters of it.

For placing a ball to the right basket 5 points are scored. For placing a ball to the wrong basket 5 points are lost. If ball miss both the baskets no points are scored. If the ball rolls out the colored



bar and then roll back to the center, 1 point is scored. No more than 10 points may be scored in this way. A team objective is to score maximal count of points. If two teams have the same count of points, best time is had regard to.

During the task execution participant is placing balls one by one to the center of swing opposite to distance sensor. Robot must be in standby mode placing swing horizontally. It should react to the ball at less after two seconds after hand was put away. If ball is rolling down straight away, no points are scored. Operator must not participate in robot's working process.



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September 27, 2014

International robotics festival

ROBOFINIST

September 27-28, 2014

