Robotour - robotika.cz outdoor delivery challenge

version 2 (2012-11-07)

The Goal of the contest

The objective of the Robotour contest is to encourage development of robots capable of transporting you to work in the morning or to deliver the building material you have just purchased in an online shop. The path to this goal is neither easy nor short, but we believe that the outcome is worth it 🙂.

Rules

Task The task for the robots is to deliver payload in given 1 hour time limit to destination as far as 1km. Robots must be fully autonomous, not leave the road and choose correct path on junctions. The place of start and destination will be the same for all robots.

Map The robots can only use Open Street Map. The key concept of this map is its verifiability. Anything that is verifiable and is described in map features can be used by the teams to update the map of the contest area. Note, that Open Street Map is primarily used for people, and certain rules have to be respected.

Robots Team can deploy only one robot. Every robot must have EMERGENCY STOP button, which stops its motion. The button must be easily accessible, red and must be fixed part of the robot (Big Red Switch), so it could be used in case of danger. The minimum size of the switch is defined by an inscribed circle with diameter of 2cm. The team must show that it is easy to manipulate with the robot — two people must be able to carry it several tens of meters. There is also minimal size — robot has to carry full 5l beer barrel.

Leaving the road The robots are expected to stay "on the road" which means to stay on the paved passage ways. If any robot leaves the road, the trial ends. The team has to take care of their robot and remove it immediately.

Obstacles There could be obstacles on the road. Besides natural obstacles like benches there could be also artificial obstacles. A typical (artificial) obstacle is for example a figurant, a banana paper box or other robot. Robots may not touch an obstacle. Contact with an obstacle means end of the trial. The robot may stop in front of the obstacle and visually or acoustically give notice. Note, that the robot has to detect, that the obstacle is no longer present.

Robots Interaction The cases where a faster robot catches up a slower one won't be explicitly handled. The faster robot can handle the slower robot as an obstacle, i.e. avoid it or wait until the „obstacle" disappears. In general the road rules will be respected: right of way, avoidance to the right, passing on the left.

Start All robots will start simultaneously from the same park road. Start area for each team will have approx. 1.5x1.5 meters. Start areas will follow one after another on one side of the road. In the start area each team can place its robot as they see fit. The order of robots on start is given by the results the in previous round(s) (a better robot will be closer to the destination). The order in

the first round will be given by the order of successful homologation. Robots start automatically via their internal timers. One minute before the start, no interaction with the robot is allowed. Robot, which starts before official start time, will be disqualified for given round and will get zero points.

Blocking traffic Due to the crowds of robots in potential narrow roads it is necessary to deal with traffic blockage. Every team can in any time sue a robot of another team that is blocking road. From that moment sued robot has one minute to leave an area defined by +/- one meter from its current position. If the robot fails to leave this area it will be stopped and removed from the road. Otherwise the contest continues and suing team gets warning for false judge. If this is for the 3rd time the robot of suing team is stopped and removed from the road.

Reaching goal The robot has to indicate when the goal is reached, for example via sound signal. The judge marks that position and robot autonomously navigate back to the start without operator interaction.

Score The team whose robot manage best to proceed along the route wins. The aerial distance of the last robot position (leaving the road, a collision or a timeout) to destination (or start if destination was reached) is critical. For every meter towards the destination team gets one point = distance(start,goal)-distance(final position,goal). If the robot reached the goal the measured distance is calculated as 2*distance (start,goal) - distance(marked position,goal) - distance(final position,start). In every round a robot can get at most twice the aerial distance of the start and the destination.

Organization The contest will consist of 4+1 trials for each team. The start and destination will be different for every trial. The selected destination will be announced to all teams 10 minutes before the start. The speed of the robots is not important (actually the speed limit is 2.5m/s). All points gained during all trials will be summed together. The trial starts at a specified time and ends after 1 hour. The robot must leave the start area within 10 minutes of the start. Each team has to arrange for one person familiar with the rules that will be part of the referee team during the competition.

Homologation A team can participate in the contest if it is able to score at least one point. Necessary condition is the ability to travel 10 meters long route fragment without collision with an obstacle. The start procedure will be tested (automatic start) as well as the functionality of the EMERGENCY STOP. Usage of liquids, corrosive, pyrotechnic material and live beings is strictly prohibited. Every robot has to be accompanied by a team member, older 18 years, who is fully responsible for the robot behavior.

Technical documentation Every team has to provide basic technical documentation about their robot (for presentations, general public and journalists). Three winning teams will be asked for more detail description for website presentation and easier entry of novices in the next year.