18/12/2018

Technical Guideline of the technology contest “Winter city” for the purposes of the National Technology Initiative.

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1. General information

1.1. This Technical Guideline defines requirements for the testing procedure, products and other technical parameters of the contest.

1.2. The Technical Guideline is approved by the Contest Operator.

1.3. The Technical Guideline is published on the official contest website: http://city.upgreat.one/.

1.4. Basic terms and definitions:

1.4.1. **Sensor Database** — the sensor database contains, particular information collected by DC during qualification and final rounds. A complete description of the Sensor Database is given in the Technical Guideline.

1.4.2. **Road-Traffic Accident, RTA, Accident** - an event, arising while a motor vehicle is moving on the road and is involved in said event, where people died or were injured, vehicles, buildings, cargo or other materials were damaged.

1.4.3. **Jury** is a collegial body created in order to ensure scientific, methodological and expert support of the contest, to hold expertise and approve intermediate and final test results of the participants' developments, decide on the Contest winners and awardees. Operating procedure and the Panel of Jury are approved by the Contest Committee.

1.4.4. **Product, Driverless car, DC** is a mechanical vehicle, equipped with an autonomous automated control system, and meets the requirements of the Technical Guideline.

1.4.5. **Team** is a group of developers, specialists and employees headed by a manager. A team acts on behalf of the contest participant at the attendance-based DC test rounds on the testbed and beyond it.

1.4.6. **Contest** is a technology contest "Winter City" which is an open contest to solve scientific and technological problem in the field of driverless cars.

1.4.7. **Contest terms and conditions, Conditions** is the main document which determines the purposes, tasks and procedure of the contest. The document is approved by the Contest Committee for purposes of the National Technology Initiative acting under the Order of the Ministry of Education and Science of the Russian Federation dated May 15, 2018 No. P-429 (hereinafter referred to as "Contest Committee").

1.4.8. **Operator** is the Joint Stock Company “Russian Venture Company,” and under the Decree of the Government of the Russian Federation dated April 3, 2018 No. 403, carries out all the necessary actions for the preparation and holding of technology contests.

1.4.9. **Organising Committee, Committee** is a collective deliberative assembly which carries out coordination activities related to the preparation and holding of the contest. Organising Committee activities and its members are determined by the Operating Procedure of the Organising Committee approved by the operator.

1.4.10. **Partner** is a legal or private entity who, in coordination with the operator, provides financial and/or non-financial support aimed at achieving the goals and objectives of the competition at forming the prize fund of the competition and/or establishing its own nominations within the competition.

1.4.11. **Traffic Rules** - Traffic Regulations of the Russian Federation as amended.

1.4.12. **Testbed** is a venue provided by the operator or partners to conduct participating DC tests, qualification and final contest rounds.

1.4.13. **Prize** is a monetary prize within the conditions and paid to the winner and awardees from the federal budget resources.

1.4.14. **Contest website** is the official contest website and contains complete actual information about the contest: http://city.upgreat.one/.

1.4.15. **Panel of Judges** is a group of individuals controlling attendance-based contest rounds. The operating procedure and the Panel of Judges are approved by the operator.

1.4.16. **Technological problem** is a task to be solved by the Contest Participants.

1.4.17. **Contest Participant** is a Russian or foreign legal entity or a group of such entities whose application for participation in the contest was approved by the organising committee.

1.4.18. **Tests** – a set of events taking place directly on the track which is on the testbed under qualification and final rounds of the contest.

1.4.19. **Traffic Monitoring Center** is a specially equipped place within the testbed for remote monitoring of DC during final round.

1.4.20. **Rides area** is a specially prepared part of the testbed to perform DC rides during qualification and final rounds of the contest.

2. Rounds and terms

2.1. Each stage of attendance-based tests consists of 4 consecutive parts:

2.1.1. First part: arrangement and registration of participants; preparation of DC; systems testing.

2.1.2. Second part: Technical admission – DC check for compliance with the Technical Guideline, test rides.

2.1.3. Third part: qualification/final rides.

2.1.4. Fourth part: packing the equipment and departure from the testbed.

2.2. Qualification and Final Rounds take place within the timelines specified in the Contest Terms and Conditions.

2.3. The exact dates and place of the qualification and final rounds are given to each team no later than 1 month prior to the start of each round.

2.4. Qualification round for each team is conducted in accordance with the following tschedule:

2.4.1. Day 1: registration, arrangement in team areas, preparation, technical admission, test rides.

2.4.2. Day 2: qualification rides, recording the test results, departure.

2.5. Final round is conducted in accordance with the following schedule:

2.5.1. Day 1: registration, arrangement in team areas, preparation, technical admission.

2.5.2. Day 2: training rides and preparation.

2.5.3. Day 3: training rides and preparation.

2.5.4. Day 4: qualification rides, summarization of results, departure.

2.5.5. When necessary, training rides and preparation can be held in fewer days, the teams are notified in advance.

3. Composition and functions of the team members

3.1. All team members must beadults.

3.2. The team must include:

3.2.1. Team leader (manager) is a member of a team who leads the team, represents its interests to the organizer, operator, jury and other organizations involved in the organization, holding and monitoring the Contest, as well as controls and is held responsible for the proper behaviour of all team members. The team manager can carry out his functions only within one team.

3.2.2. DC Driver - change of DC modes, DC adjustment management in the testing area and the traffic monitoring centre.

3.2.3. DC Driver's Assistant - follows the driver's instructions or substitutes of the driver if necessary.

3.3. The transfer of driving and control rights from driver to driver's assistant and vice versa is carried out under the permission of the chief judge and must be recorded in the ride report at the moment of such transfer.

3.4. The same team member cannot be a part of another team.

3.5. The composition of the team admitted for tests shall not exceed 10 people.

3.6. The team has the right to replace, remove, or add members within the permissible number.

3.7. The team shall include a member with valid driver's license of category B. Only such a member is permitted to drive when the DC is required to move in non-autonomous mode around the range outside the races. Otherwise, the DC can be moved outside the races on a tow truck as well as pulled/pushed off the track.

3.8. All team members shall use visual identifiers provided by the organizing committee (badges, emblems, vests, uniforms, etc.) during attendance-based rounds of the contest.

4. Description of the Testbed

4.1. The Testbed shall include the following areas:

4.1.1. Service area is an place where DC preparations are completed by the teams. The Organizing Committee may change the quantitative and qualitative composition of the service area technical equipment.

4.1.2. Ride area is a specially prepared part of the testbed to perform DC tests during qualification and final rounds of the contest. The ride area is equipped with all the necessary equipment to simulate urban and suburban environments.

4.1.3. Start area is a zone allocated by the panel of judges to each team within the test area for the DC to start during qualification and final rounds of the Contest.

4.1.4. Additional areas are zones for test runs and rides and are arranged upon request. The quantity is not regulated.

4.2. Visibility, wind strength, the level of humidity, and precipitation depends on current meteorological conditions.

4.3. Roadside information and road signs may be partially or completely covered with snow or ice depending on weather conditions or dirt simulation (up to 50%) as determined by the panel of judges.

4.4. The organizing committee, upon agreement with the panel of judges, has the right to change the quantity and quality of snow precipitation in the test area by means of available technology.

5. Requirements for DC

5.1. DC compliant with the requirements specified in Appendix No. 1 of the current Technical Guideline are allowed to participate.

5.2. Any ride in an attendance-based round with points being awarded shall be performed from start to finish completely in autonomous mode, without the driver's intervention. That is, the driver is not involved in the DC control in any way.

6. Technical admission

6.1. Technical admission is carried out before attendance-based tests.

6.2. All DC shall be admitted within this period. DC not approved before the deadline are not admitted to the tests.

6.3. All team members must sign the necessary safety documents before they are permitted to test their DC

6.4. In order to safely test the DC during the technical admission, the DC shall be checked for compliance with the requirements under Appendix No. 1.

6.5. When passing the technical admission procedure, the team shall provide a DC technical description in accordance with Appendix No. 1 of the technical guideline.

6.6. The judge examines a DC and investigates the following:

6.6.1. team's understanding the test rules;

6.6.2. DC compliance with the requirements as stated in appendix No. 1 of the technical guideline);

6.6.3. presence of all mandatory systems and their operation – propulsion (traction) engine start/stop system, remote control with emergency stop buttons (STOP), brakes and other systems;

6.7. According to the results of the inspection, the "Admission to Testing" form is filled in and signed by the judges who conducted the test and the representative (manager) of the team.

7. General Rules for running rides

7.1. When testing, the judges may check the DC compliance with the technical requirements of Appendix No. 1. If the secondary test does not verify the technical admission results, the team is given a chance to right the inconsistency before the next ride. DC with revealed inconsistencies will not be admitted to the next test ride.

7.2. Rides may not be started or may be stopped in case of force majeure or emergency situations with equipment at the testbed.

7.3. Only one DC driver and only one driver's assistant of each team shall stay in the traffic monitoring centre of the testbed during the ride. The driver monitors the road and electrical systems conditions by means of instruments available for monitoring and by using the remote control which sends the commands STOP, PAUSE and DRIVE to his or her team's DC.

7.4. To ensure safety before every start, the team shall demonstrate, at the request of the judge, the operability of the DC emergency stop system by a demonstration of the PAUSE, DRIVE and STOP modes.

7.5. Only judges and team members admitted to conduct DC adjustment works may enter the test area.

7.6. Standing in the test area:

7.6.1. Presence of people in the test area, including inside the DC during the DC autonomous driving is not allowed.

7.6.2. Violators shall be immediately removed from the test area and given a warning. In case of a multiple violations the team is disqualified.

7.7. The DC driver can quit the ride at any time. Such an action shall be performed without interfering with the other DC.

7.8. When a violation of the test rules or a dangerous situation during the ride is noticed by the judge, he or she has the right to stop the DC. Such order instruction is compulsory.

7.9. Examples of the main dangerous situations for a judge to give the order to stop are as follows:

7.9.1. DC constitutes a potential hazard to people;

7.9.2. DC continues driving outside the roadway;

7.9.3. DC loses parts of its structure on the testbed (if not caused by any collision).

7.10. Based on the results of the accident evaluation, a DC may be withdrawn from the ride by the jury's decision.

7.11. During the test rides, the following is not allowed:

7.11.1. to remotely intervene in the DC operation, except for the cases described previously. Violation of this clause entails the immediate disqualification of the team and the annulment of their results.

7.11.2. to fill up the DC with fluids and gases,

7.11.3. to charge the DC from external sources

7.11.4. to replace or repair components and parts.

7.12. High beam lights are allowed only to attract attention and may only be used for a maximum of 1 second at a time.

7.13. Participants are not allowed to install any equipment on dynamic and static obstacles provided during the round.

7.14. Other rules of the rides: training – section 8; qualification – section 9; final – section 10.

8. Training (test) rides.

8.1. Training rides are carried out on designated days.

8.2. DC is admitted to the training rides at the testbed road by passing through technical admission procedure.

8.3. To provide all teams with equal access to the roads, each team shall agree on the time of their training rides with the judges.

8.4. The duration of the training ride is regulated by a previously established schedule. Upon expiration of the allotted time, the ride is forcibly stopped to allow another DC enter the road.

8.5. Unscheduled training rides are not allowed.

9. Qualification round

9.1. DC is admitted to the qualification rides at the testbed road by passing through the technical admission procedure.

9.2. Qualification round includes the following contest tasks:

9.2.1. avoidance of static obstacles, simulating: a parked vehicle, snowdrifts, road work, etc.;

9.2.2. driving through a controlled intersection with possible pedestrians and traffic;

9.2.3. safely following a vehicle, simulating acceleration and complete stops (road traffic mode);

9.2.4. driving through uncontrolled intersections equipped with a system of pedestrian circulation in different directions;

9.2.5. parking a vehicle in a specified territory, without violating any traffic rules;

9.2.6. driving through a controlled intersection with traffic signal recognition and an adequate response to a vehicle which suddenly passes through a red light at an intersection.

9.2.7. turning left from a street onto a main road in the presence of other vehicles;

9.2.8. driving through control points of the testbed section with urban and suburban infrastructure, independently plotting a route (considering the sequence of control points).

9.3. Each team has 3 attempts of 10 minutes to pass the qualification round.

9.4. Each attempt is allowed to demonstrate the ability to solve one or more contest assignments.

9.5. Each team passes qualification attempts separately.

9.6. Each team is free to overcome tasks in any order and any number of times within each attempt.

9.7. The order of the teams is determined by a drawing procedure at least 8 hours prior the start of the test rides.

9.8. Unscheduled qualification rides are not allowed.

9.9. Before each attempt a DC is manually driven to the start area in any driving direction in accordance with the traffic rules and switched over into PAUSE mode.

9.10. Qualification task areas and paths are located on the territory of the qualification testbed according to the Qualification Tasks Map (hereinafter referred to as the Task Map). The Task Map is communicated to the teams in advance.

9.11. Upon the Judge's command "Marsch!", the team remotely switches the DC from the PAUSE to DRIVE mode.

9.12. Teams independently choose the route and the sequence of qualification tasks in advance in accordance with the testbed conditions and the Traffic Rules.

9.13. The judge stops the attempt and records the points scored at the stopping time in the event of:

9.13.1. DC driving on the wrong side;

9.13.2. DC blocking the movement of other vehicles participating in the ride at the testbed or creating an emergency situation.

9.14. The task is considered completed and is counted subject to DC overcoming the task area on one of the possible paths in accordance with the criteria specified in Table No. 1.

9.15. Upon successful task completion, DC has the right to continue driving. On the judge's command, the completed task is considered

fulfilled. Points are not added for a repeat execution of a task.

9.16. In case of unsuccessful task completion, DC has the right to continue driving. The task remains activated and the DC may attempt it again.

9.17. To successfully complete task 9.2.8. the team manager must indicate the sequence of any three DC team tasks prior to the attempt. In case of the completion of the ordered tasks(regardless of the result obtained), the task is considered completed. Passing of other tasks without violating the originally specified sequence is allowed.

9.18. The attempt is considered completed in case of:

- passing all tasks;
- end of the allotted time (10 minutes);
- the team manager's decision to stop the ride;
- the judge's decision to stop the ride.

9.19. During subsequent attempts the only tasks that remain activated are the ones which were unfulfilled in previous attempts.

9.20. The final evaluation of the qualification round is the sum of points obtained from the qualification tasks fulfilment for all three attempts (1 point per task). Maximum number of points for qualification is 8 (eight).

9.21. Points are awarded to teams for successful demonstration of the solution according to the table:

Table 1 "Criteria for teams scoring for performing tasks at the Qualification round"

No.	Task	Criterion of scoring	Number of points
1	Avoidance of static obstacles, simulating: a static vehicle, snowdrifts, road work, etc.	DC avoids an obstacle the left or right (depending on the hindrance location or road marking) without touching it or violating the traffic rules.	1
2	Driving through a controlled intersection with possible pedestrians and traffic	DC stops at the stop line (sign 6.16), waits for the green traffic light and continues driving according to the route, not violating the traffic rules until completely passing the intersection.	1

3	Safely following a vehicle, accelerating and coming to a complete stop (road traffic mode)	DC passed a given route following the preceding vehicle at a distance of no more than 10 and no less than 2 meters and turned off the route with no traffic violations.	1
4	Driving through an uncontrolled intersection equipped with a system of pedestrian circulation simulation in different directions	DC completely passed the intersection without disturbing the mannequin pedestrians and did not touch them with any part of the vehicle (including wheels)	1
5	Parking a vehicle in a parking spot in a specified territory without any traffic violations	DC, completed the planned route in the specified area, determined a vacant parking space corresponding to its size, and parked in the selected space without crossing into an adjacent parking space.	1
6	Driving through a controlled intersection with traffic signal recognition and an adequate response to a vehicle running through a red light in the intersection.	Whist driving through the green traffic light, the DC must timely determine a vehicle moving through the intersection perpendicular to itself, and timely stop, accelerate, or manoeuvre around it without traffic violations to avoid an accident	1
7	Turning left from a street onto a main road in the presence of other vehicles	When driving on a given route DC did not touch any other vehicles, turned left from from a street onto the main two-way road whilst maintaining a safe distance from other moving vehicles. not creating an emergency, without traffic violations, and continued on the specified route.	1

8	Driving through control points on the testbed section with urban and suburban infrastructure, independently plotting a route (taking into account the sequence of control points) without traffic violations	DC independently plots the shortest route and drives according to the new route, without crossing the road markings or breaking any of the traffic rules.	1

9.22. During the ride attempt, the team is not allowed to access the DC.

9.23. Teams can provide a sensor data record collected during qualification round as a Sensor Database Sample (see Appendix No. 2).

10. Final round

10.1. Admission to the Final round.

10.1.1. Admission to the final round is granted to a maximum of 10 teams that successfully passed through qualification round, scored at least 4 (four) points, as well as provided the sensor database description and sample agreed with the organizer in accordance with Appendix No. 2.

10.1.2. In case the number of teams that successfully passed through qualification round exceeds 10 (maximum allowed number of teams), the teams which scored the highest points are granted the admission to the final round due to clause 10.1.1.

10.1.3. If the number of points scored in the qualification round is equal, the teams are selected as follows:

- the largest number of tasks completed in one attempt (hereinafter - the best attempt);
- the lowest continuing number of the best attempt;
- time of the best attempt completion.

10.2. Ride procedure.

10.2.1. The contest assignment within the rounds consist of a single ride over the testbed control points, independently plotting a route, taking into consideration that other DC may have their own route, without violating traffic rules or provoking other participants to such violations.

10.2.2. The date of the final round can be changed in case of:

10.2.2.1. non-compliance of weather conditions with the conditions specified in the technological barrier;

10.2.2.2. technical failures of the testbed infrastructure;

10.2.2.3. damage to the testbed not allowing to ensure equal participation conditions to all teams.

10.2.3. When preparing the DC, it should be noted that for various reasons it may take more than 3 hours from the beginning to the end of the whole ride.

10.2.4. DC drivers, DC driver's assistants and the judges assigned to them are located at the testbed traffic monitoring centre during the ride.

10.2.5. Each team has its own DC remote control, which switch between the modes: STOP; PAUSE; DRIVE.

10.2.6. Upon the chief judge's command "Marsch!", the DC team managers remotely switch the DC from the PAUSE to DRIVE mode.

10.2.7. The start is the same for all DC, which are located at their individual starting positions.

10.2.8. Each DC drives along its own route, plotted based on control points provided by the judges, their own route, and traffic rules.

10.2.9. During the ride, dynamic and static obstacles are located on the testbed.

10.2.10. If a DC stops (DRIVE mode) and impedes other DC traffic for more than 3 minutes on a given section of the road, the judges will act in accordance with clause 10.2.11. Access to the DC or the possibility to evacuate the DC from the testbed is provided during the nearest technical pause.

10.2.11. In case of an accident involving DC at the testbed, the chief judge will stop the ride and announce a technical pause. All DC drivers will switch their DC to STOP mode on the judge's mark. The team whose DC driver has ignored the judge's command is disqualified. The countdown is suspended.

10.2.12. The judge and representatives of the team(s) involved in the accident are sent to the accident site. They define: the culprit(s) of the accident; the possibility to continue the ride for an innocent team. The culprit's DC is eliminated from the ride and its current score is recorded.

10.2.13. By the end of the technical pause the DC of the team:

10.2.13.1. unable (not willing) to continue the participation, is evacuated from the testbed site and suspended from the ride;

10.2.13.2. DC able to continue is moved (arranged) to their new starting position which is no more than 10 meters from the accident point and switched to the PAUSE mode.

10.2.13.3. DC not involved in the accident are switched to the PAUSE mode.

10.2.14. The team at fault for the technical pause is disqualified and its DC is suspended from the ride.

10.2.15. After the accident or jam is cleared off the testbed, the chief judge commands “Drive!” and the DC team managers remotely switch the DC from the PAUSE to DRIVE mode. Simultaneously, the countdown starts again.

10.2.16. Team members cannot change the DC position (rearrange or turn) on the road after the ride start, or provide any assistance to the DC (remove objects from the path, provoke a stop, etc.) while driving during the ride.

10.2.17. In the process of the final round the “Judge's List” for a tested DC is filled out.

10.2.18. The organizers have the right to make changes to this section no later than 2 months prior to the final round.

10.3. The drawing procedure and ride routes.

10.3.1. DC teams start areas and routes are determined by drawing for zones at least 8 hours prior to the start of the final round.

10.3.2. The final round is conducted in such a way that part of the distance can be overcome at night time.

10.3.3. A route is a randomly generated set of sequential control points on the testbed schematic.

10.3.4. The ride routes are formed in a random way considering the total length of the route of 50 km, while the estimated time of a ride does not exceed 180 minutes.

10.3.5. DC shall pass control points sequentially, according to the received task.

10.3.6. The route length is determined by the sum of the minimum distances along the testbed roadway between the route control points. The actual distance the DC travels within the route is not considered.

10.3.7. The total distance of the DC team ride is 50 km ± 50 m.

10.4. Preparing for the ride and the start procedure.

10.4.1. DC shall take its starting position 30 minutes before the ride start, unless otherwise specified by terms and conditions of the task.

10.4.2. DC shall be ready for the ride 5 minutes before the start. By this time DC is switched from STOP to PAUSE mode, and shall be in this mode before the ride start.

10.5. Rules for running rides.

10.5.1. During the Final round, no people shall stay in DRIVE mode inside the DC.

10.5.2. After the chief judge's command “Marsch”, the DC are permitted to start driving, the countdown begins, the DC driver switches the DC to DRIVE mode.

10.5.3. The countdown ends:

10.5.3.1. upon reaching the control run of 50 km;
10.5.3.2. at the expiration of the allotted time for the ride;
10.5.3.3. upon the team manager's decision to stop the ride;
10.5.3.4. upon the judge's decision to stop the ride.

10.5.4. The final DC stop in the ride can be performed automatically or from the emergency stop button (STOP).

10.5.5. When leaving the obstacle or the roadside, as well other manoeuvres not prohibited by the traffic rules, reversing is allowed.

10.6. Barriers to the DC movement.

10.6.1. The DC route can contain obstacles for it to pass over (drive around it without contact). The DC is allowed to bypass the obstacle from either direction in accordance with the traffic rules.

10.6.2. A barrier is an object simulating a pedestrian or a vehicle, as well as objects simulating roadwork and other hindrances.

10.6.3. Barriers are arranged prior to the final round start. Rearrangement of the roadway barriers is possible, if no DC is at a distance of less than 30 m from the barrier.

10.6.4. After a collision with a barrier (contact with a barrier) or a road fence, DC is allowed to continue driving along the route, if after a collision the DC is able to continue driving.

10.6.5. A pedestrian circulation simulation is achieved by moving a dummy along the roadway. The dummy crosses the roadway at a speed of 2 km/h to 7 km/h and at an angle of at least 60 degrees to the axis of the road, or through a pedestrian crossing. The dummy starting point is not on the roadway, it can be hidden.

10.6.6. Static obstacles are objects located on the roadway, constituting a traffic hindrance, but allowing the DC passage without violating traffic rules.

10.6.7. All teams are aware of road restrictions in all parts of the testbed in advance.

10.6.8. Vehicles driven by drivers can be used to simulate a traffic flow as part of the ride.

10.7. The amount of penalty minutes charged for violation of traffic rules:

No.	Article of the AOC RF	Violation	Charged minutes

1	-	Exceeding the designated speed by more than 5, but less than 10 kilometres per hour	1
2	-	Exceeding the designated speed by more than 10, but less than 15 kilometres per hour	4
3	-	Exceeding the designated speed by more than 15, but less than 20 kilometres per hour	8
4	-	Exceeding the designated speed by more than 20 kilometres per hour	16
5	12.10 part 1	Crossing railroad tracks beyond the railway crossing, entering the railway crossing with a closed or closing railroad crossing gate or whilst the traffic light is red, or a crossing guard prohibits movement, as well as stopping or parking on railway crossing	15
6	12.12 part 1	Driving through a red traffic light or a restrictive sign of the police officer, except for the cases provided by part 1 and 2 of article 12.10 of the AOC RF	10
7	12.12 part 2	Failure to comply with the traffic rules on stopping at a stop line marked with road signs or road markings, at a red traffic light, or a restrictive sign of a police officer	3
8	12.14 part 1	Failure to comply with the traffic rules about giving a warning before starting, changing lanes, steering, turning or stopping	1
9	12.14 part 1.1	Failure to comply with the traffic rules (with the exception of certain cases) regarding vehicle placement on the road during either a left, right, or U turn.	1
10	12.14 part 2	Swerving or reversing in places where such manoeuvres are prohibited, except	10

		as provided by part 3 of article 12.11 and part 2 of article 12.16 of the AOC RF	
11	12.15 part 1	Violation of rules for the positioning a vehicle on the roadway, passing of oncoming traffic, driving on a hard shoulder, crossing a public transport line, or driving/standing in a pedestrian crosswalk.	1
12	12.15 part 2	Driving on bicycle, foot paths, or sidewalks in violation of the traffic rules	5
13	12.15 part 3	Driving in the oncoming lane when avoiding a hindrance or in the oncoming tramroad when avoiding a hindrance in violation of the traffic rules	5
14	12.15 part 4	Driving in the oncoming lane or on a tramroad is a violation of the traffic rules, except as provided by part 3 of article 12.15 of AOC RF	15
15	12.16 part 1	Failure to comply with the requirements described by road signs or road markings, except for cases provided by parts 2-7 of article 12.16 and other articles of the AOC RF	1
16	12.16 part 2	Turning left or swerving in violation of the requirements described by road signs or road markings	10
17	12.16 part 3	Driving in the opposite direction on a one-way road	20
18	12.17 part 1.1	Driving or stopping in a designated lane for public transport vehicles in violation of traffic rules, with the exception of cases provided by parts 3-5 of article 12.15 of the AOC RF, and the case provided for by part 1.2 of article 12.17 of the AOC RF	3
19	12.18	Failure to comply with the requirements of the traffic rules to give way to pedestrians, cyclists or other road users (except for vehicles drivers), who have the advantage in motion	10

20	12.24	Violation of the traffic rules or the rules of vehicle operation, resulting in personal injury (mannequin)	30
21	12.33	Driving in a temporary restricted area (road work)	10
22	12.33	Bumping into a temporary enclosure (road work fence)	1
23	12.27	Failure to comply/yield in the event of a vehicle collision.	10

10.8. Determination of the final time based on the test results.

10.8.1. The final time based on the test results (I) is equal to the sum of the time of ride (B) and the sum of the received penalty minutes (M), thus I = B + M.

10.8.2. Penalty minutes are charged for violations during the test execution in accordance with article 10.7.

10.8.3. Time tracking is carried out with pinpoint accuracy and is recorded by the judges using special technical means.

10.9. Determination of winners.

10.9.1. The winner is the team whose DC completed the contest assignment (to overcome the established technological barrier during the tests - to drive 50 km in the fastest total time, but not exceeding 180 minutes), and provided the organizers with the sensory database, obtained during the final round, according to Appendix No. 2.

10.9.2. Final standings are determined by the total time value: the better the total time, the higher the ranking.

10.9.3. The prize between the winners is divided according to the contest terms and conditions (section 7 of the contest terms and conditions).

Appendix No. 1 “Requirements for DC”

to the Technical Guideline of
the Contest
National Technology Initiative
“Winter city”

Requirements for DC

1. The following DC are admitted for participation (for other restrictions, see below):
   1.1. on the basis of motorized vehicles (vehicle) of categories N1, M1, M2 in accordance with the technical regulations of the Customs Union TR CU 018/2011 “On the safety of wheeled vehicles” (TR CU SWV);
   1.2. on the basis of wheeled vehicles, issued by an industrial enterprise until 1991, which, according to their characteristics, correspond to Appendix No. 1 and No. 4 of the TR CU SWV in categories N1, M1, M2;
   1.3. on the basis of self-made vehicles, which, according to their characteristics, correspond to Appendix No. 1 and No. 4 of the TR CU SWV in categories N1, M1, M2. A self-made vehicle is a vehicle made (assembled) by an individual or a legal entity that does not have permits to issue (manufacture) mechanical vehicles designed for use on public roads.
2. The actual DC unladen weight during the tests shall not be less than 700 kilograms and no more than 3500 kilograms.
3. External DC dimensions are limited to the following sizes:
   3.1. width from 1.2 m to 3 m;
   3.2. height from 1.2 m to 3.6 m;
   3.3. length from 2 m to 7 m.
4. The protrusion of any DC equipment and antennas over the dimensions of the original vehicle:
   4.1. in length - no more than 0.4 m per side;
   4.2. in width - no more than 0.2 m per side;
   4.3. in height - no higher than 1 m.
5. The team shall have a DC remote control with only the buttons STOP, PAUSE and DRIVE. It is necessary that the DC have a remote-control emergency stop system that is equipped with a feature which ensures that the loss of communication with DC for more than 1 minute is equivalent to pressing the STOP button.
   Emergency stop means a full stop is achieved in the minimum amount of time as well as in the minimum amount of distance.
   5.1. DRIVE - DC performs manoeuvres using manoeuvring (steering) systems and systems providing the DC movement and breaking power (engine, transmission, braking system).

5.2. STOP - running (propulsion) engine does not work, the braking system keeps the DC in place or slows the DC quickly until it stops, the operation of other systems is allowed;

5.3. PAUSE - DC is ready to start driving (actions for the movement preparation have been carried out) and is motionless, the propulsion engine can be running.

5.4. The DRIVE, STOP and PAUSE buttons located on the remote control shall be visually noticeable, convenient for pressing with one hand and their values shall be labeled. For the remote-control mode buttons, the following colours are used: STOP - red, PAUSE - yellow or orange, DRIVE - green or blue.

6. On one DC external lateral surface it is necessary to have flashing warning lights, installed: STOP - red, PAUSE - yellow or orange, DRIVE - green or blue. The visibility of the signalling lights shall be about 2 m.

7. DC outer surface must have an emergency stop button and the requirements for the emergency stop button are as follows:

7.1. the button is located on a surface accessible for pressing and holding the button with a finger or palm of the hand;

7.2. the button can be located only on the DC left and right sides;

7.3. the braking system engages after pressing the emergency stop button. The DC braking system then performs an emergency stop.

8. DC shall have additional warning systems (preferably not homemade):

8.1. Signalling horn - siren or sound signal (60-70 dB). The main direction of the alert is in front of the DC;

8.2. Signalling light - one or several flashing orange, green, or blue lights (one of these colours) with a 360 degree view around the DC. The frequency of flashes shall be within (40 ± 20) flashes per minute. The signalling horn shall work separately from the indicator lights;

8.3. while the DC is driving, both systems (lights and sound) must be turned on and shall remain on until the DC is turned off.

9. Requirements for lighting equipment.

9.1. The DC shall be equipped with serviceable light devices and use them during test rides according to the traffic rules of the Russian Federation: marker lights, directional indicators, brake lights, low beams, reversing and fog lights. It is also allowed to install and operate other lighting devices in accordance with the TR CU SWV of Appendix No. 3 Section 1.

9.2. The quantity, type, location, mode of operation, and the colour of the DC external lighting devices shall comply with the requirements of

all vehicle designs. See Table 6a GOST R 51709-2001 or TR CU SWV Appendix No. 3 Section 1.

9.3. Low beam, side, and outline marker lights shall operate constantly.

9.4. Brake lights(primary and secondary) shall be activated when the brake system controls are engaged and shall operate every time the system is engaged.

9.5. The reverse lights shall turn on when the reverse gear is engaged and shall operate every time the system is engaged.

9.6. The DC front part must have no red light elements (both active and reflecting).

9.7. The DC rear part shall have no white light elements (both active and reflecting) with the exception of the reverse lights operating.

9.8. The absence of front diffusers is not allowed.

9.9. Directional indicators shall be serviceable. The frequency of flashes shall be within (90 ± 30) flashes per minute or (1.5 ± 0.5) Hz.

9.10. The hazard lights shall ensure the simultaneous activation of all directional indicators in flashing mode with a frequency of (90 ± 30) flashes per minute or (1.5 ± 0.5) Hz.

9.11. Reflective marking materials used for DC reflective markings shall be marked in accordance with GOST R
41.104. Damaged and delaminated reflective markings are not allowed.

10. Requirements for the engine and its systems.

10.1. The leaking of fuel from the gas tank of gasoline and diesel engines are not allowed. Shut-off devices for fuel tanks must be in working condition. Fuel tank caps shall be locked in the closed position and damaged caps are not allowed.

10.2. The gas fuel lines in a petrol operated DC must be leakproof. The use of fuel lines or other necessary devices for the movement of fuel that are expired or have not been recently serviced are not allowed.

10.3. The connections and exhaust system elements shall not have leaks. Visible damage, short circuits and traces of electrical components insulation wear are not allowed.

11. Requirements for brake control do not allow:

11.1. leakage of brake fluid, leakage of brake lines or connections in the hydraulic brake actuator;

11.2. bends, visible wear spots;

11.3. corrosion, threatening the loss of operation of functionality;

11.4. mechanical damage to brake lines;

11.5. parts with cracks or residual deformation in the brake actuator.

12. Requirements for steering: damage to or lack of steering column and steering case mounting parts, as well as increasing the mobility of the steering gear parts relative to each other or the body (frame), not provided by the DC manufacturer (in the operating documentation), are not allowed. Threaded connections shall be tightened and secured in the manner provided by the DC manufacturer. Play in the steering arm joints and steering connections is not allowed. Steering column positioning device with an adjustable position of the steering wheel (if any) shall be in working order.
13. Requirements for tires and wheels.
    13.1. General requirements shall be in accordance with clause 4.5 of GOST R 51709-2001.
    13.2. DC is equipped with tires of the same type (all-season, winter) and with an all-wheel tread pattern of the team's choice prior to the ride start. Studded snow tires are allowed to have anti-skid studs with dimensions of 1.2 mm ± 0.3 mm in size, installed only at the places specified by the tire manufacturer. Tires of non-rubber composition, the installation of special equipment (chains, rings, dovetails, etc.) on the wheels, or the application of any substances on the road and/or wheels is prohibited.
14. DC can use sensors with any (safe) operating principle to determine the environment: inertial, sound, ultrasonic, radio-locating, optical, laser, as well as visual perception systems with the use of cameras (visible range, thermal, etc.).
15. DC can receive signals from satellite navigation systems available for common use - GPS, GLONASS, RTK. Organizers do not guarantee stable communication. The blocking of global positioning systems may be possible during some tests.
16. DC can be equipped with regular operating anti-lock braking system (ABS) and an electronic stability program (ESP).
17. Other requirements:
    17.1. Visible loose bolts, the failure of suspension components, and drive line failure of the DC are not allowed.
    17.2. Visible failure, short circuits, and traces of electrical component insulation breakdown are not allowed.
    17.3. DC shall be equipped with a wheel-mounted mudgaurds required by design. The width of these devices shall be not less than the tire width.
    17.4. The leakage of oils and pressure fluids from the engine, gearbox, on-board gear-box, rear axle, clutch, battery pack, cooling and air conditioning systems, or additional hydraulic devices installed on the vehicle is not allowed.
    17.5. Excessive corrosion of the vehicle frame and its associated fasteners or chassis straighteners, leading to the entire structure failure, are not allowed.

17.6. DC shall be equipped with an audible warning device (used according to the traffic rules). Devices described in article 8 shall not be used.

17.7. DC must have a place to install the organizers' dash cameras which will be pointing forward, backward sideways. The judges have the right to mount cameras on each side of DC. Mounting points are coordinated with the team.

17.8. The organizer has the right to place 4 (four) labels no larger than A4 paper size on the DC of each team. The label indicates the team number, as well as logos of the contest organizers and partners.

17.9. DC shall be equipped with trailer coupling in front and behind.

17.10. DC shall not cause irreparable harm to the testbed environment or infrastructure at any point during the contest.

17.11. DC shall not have any dangerous sharp edges or parts causing injury to people or damage to the testbed infrastructure.

18. Other requirements for DC are based on guidelines and methods of GOST R 51709-2001 "MOTOR VEHICLE. SAFETY REQUIREMENTS FOR TECHNICAL CONDITION AND EXAMINATION PROCEDURE". At that, a full examination under the specified GOST is not performed - see previous paragraphs.

19. While there are no explicit requirements for DC, team members shall be guided by safety principles.

Appendix No. 2 “Sensor Database”

to the Technical Guideline of
the Contest
National Technology Initiative
“Winter city”

1. The Sensor Database (hereinafter referred to as SDB), when using the appropriate sensor, shall contain sensor data records collected during the product testing in attendance-based rounds, as per the following minimum requirements:

Item No.	Sensor type	Minimum requirements
1	Video camera	Untouched (unedited) video, with a resolution of at least 640x480 and a frequency of at least 10 frames per second. In the case of video corruption, the bitrate must be at least 3 bits per pixel per second for colour video (for example, for video with a resolution of 1280x720, the minimum bitrate must be ~ 2.8 Mbps) and at least 2 bits per pixel per second for monochrome video.
2	Inertial measurement unit	Indicates accelerometer, g sensor and MAD device with a frequency of at least 10 Hz.
3	Lidar, radar	The raw input thread returned by the sensor, or processed data with minimal losses. (for example, unfiltered point clouds)
4	Odometry	With a frequency of at least 10 Hz.
5	Global Navigation Satellite System	Absolute coordinates with a permissible estimate and a frequency of at least 1 Hz.

2. If the Product uses several sensors of the same type, the data shall be recorded for each sensor.

3. The recording of each sensor data shall contain time tags with synchronization accuracy not worse than 0.1 second as relating to the product clock.

4. The aggregate records duration for the final round shall be at least 30 minutes. If any part of the record does not meet the requirements of the current Appendix, this part is not considered when calculating the duration.

5. Participants have the right to add the BSD if there are readings of sensors that are not included in Table 1 - control signals and the results of sensor data processing; data collected beyond the qualification and final rounds (for example, calibration data, data collected during test rides outside the testbed).

6. The list of data contained in the SDB and the description of their format (hereinafter - the SDB Description) is sent to the organizers in advance (no less than 2 months) prior to the final round start and are an integral part of the SDB. The data format shall not prevent third parties from using the SDB, for example, by encrypting the data, using proprietary formats requiring software purchases, etc.

7. The SDB Description shall contain the following information:

- a list of sensors, a description of the format and parameters (resolution, frequency, bitrate, etc.) of the sensor data record;
- the product schematic with marked relative arrangement of the sensors with an accuracy of no worse than 10 cm in the coordinate and 5 degrees in the angle;
- sensor calibration parameters.

8. For the purposes of early resolution of disputable issues regarding the SDB parameters, in addition to the SDB Description, prior to the final round start, the participants will provide the organizers with the SDB sample, which is a test record of sensor data collected while the DC was driving in autonomous mode at a speed of at least 20 km/h, lasting at least 1 minute. An SDB Sample can be collected both at the participant’s site and during the qualification tests.

9. If the organizer has questions about the SDB Description or Sample, the participants are obliged to answer or correct these questions. Until all remarks are eliminated, the SDB Description and Sample are considered not to have passed the approval process.

Approval of the SDB Description and Sample is an integral part of the technical admission procedure for the final round.

10. In case of technical difficulties which make it impossible to perform SDB recording in accordance with the minimum requirements, the judge, in consultation with experts, shall have the right to reduce the requirements for the participant's SDB in the approval process.

11. SDB (including Description and Sample) is transferred to the organizers under the open license (see Art. 1286.1 of the Civil Code of the Russian Federation) similar to Creative Commons Attribution 4.0 International.

12. The organizers undertake to provide free access to the SDB and the SDB Description to all interested parties through publication on the internet under the open license specified in clause