Consistent report of Automotive Innovation Camp (AIC)

18-21 May 2021

CBC 2014-2020
SOUTH-EAST FINLAND - RUSSIA

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Contractor

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Saint-Petersburg, 2021

Contents

1. WP4 objective

WP4 "Automotive Innovation Camp (AIC)" includes the planning and organizing a unique multidisciplinary innovation four-day experience for the student teacher-industry interaction in the cross-border context. Focus is on the weak signals and disruptive technologies in the cross-border automotive and motosport industry. Solving multidisciplinary challenges of the automotive and motorsport industry by the students from the secondary and tertiary partner educational institutions organized in the Finnish-Russian multicultural and multidisciplinary groups. Teachers of the educational partners and members of the Finnish-Russian business community work as coaches and facilitators of the event. Students are expected to generate product/service innovative solutions to respond to the current and future industry needs in the cross-border context.

2. Roadmap of "Automotive Innovation Camp"

The development of the event concept and roadmap was carried out taking into account the following factors:

- directions of the issue;
- age groups of participants;
- participation of industry experts and representatives of the automotive industry;
- dates of the event;
- remote format, taking into account the specifies of holding an event with certain groups of participants in the context of the spread of coronavirus infection COVID-19.

The work on the event was pursued in accordance with the roadmap (table 1).

Table 1. Roadmap of AIC

Task	December	January	February	March	April	May
Planning WP4 in 2021						
Development of the event concept						
Development of nominations						
Search for business case creators						
Business cases development						
Development of advertising and informational materials						
Working with participants						
Development of the event program						
Conducting a four-day event						
Rewarding participants						
Overall results						

3. Development of the event concept

Based on results of the WP1 “Research of the current and development needs in the automotive industry” conducted by Union “Autoprom North-West”, the following necessary competencies in the automotive industry were identified:

- project management;
- communication skills;
- foreign languages;
- creativity and systems thinking;
- intercultural communication;
- use of technologies, programming.

The event of the “Automotive Innovation Camp” promotes the development of all the above skills among the participants.

There is also a growing demand for specialists in the field of digital transformation, intelligent transport systems, unmanned transport, IT, the Internet of Things (IoT), etc. Therefore, these areas were included in the concept of the event.

An indispensable element of modern highways is **Intelligent Highway Control Systems (intelligent transport systems - ITS)**. ITS solve a set of tasks to ensure the comfortable and safe movement of vehicles on the highway, including traffic management issues on the highway itself, the entrance to it, monitoring of weather conditions and management of road maintenance work to ensure safe traffic conditions, traffic management during repair work on the highway and in case of non-standard situations, the most rapid elimination of the consequences of emergency situations, effective interaction with traffic management systems on adjacent highways and city streets. The practice of using ITS on highways shows that their creation increases the capacity of the road by 15-20 %, significantly increases the uniformity of traffic and its safety.

ITS become particularly important when connected cars and highly automated cars appear, which is the main direction in the development of the modern automotive industry. For the effective movement of such cars, a "smart" road is necessary, i.e. a road that is an integral part of a cooperative ITS, when driving along which cars will be able to interact with each other and with the transport infrastructure.

Currently, work is actively underway to create autonomous (unmanned) cars, including testing them when driving on motorways. The “Scandinavia” road, as well as the M-11 “Moscow – St. Petersburg”, were chosen as objects of such testing. That is why Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU) has developed a business case for intelligent transport systems on the “Scandinavia” road section.

As mentioned above, there is currently a trend for **self-driving (unmanned) cars.** The Ministry of Transport of the Russian Federation has created a transport strategy until 2030. The document, among other things, concerns the development of self-driving cars. The Ministry of Economic Development of the Russian Federation is developing a program for launching commercial unmanned taxi services in the country. A driverless taxi will

appear in Moscow, in Innopolis in Tatarstan and on the territory of the "Sirius" educational center in Sochi. Due to the urgency of the issue, the MGBot LLC developed a business case for the assembly of an unmanned vehicle.

At the moment, there is a shortage of specialists in the field of IT. More and more people prefer **mobile applications** than websites, because applications provide high speed, adaptability and convenience. During the event, participants were asked to develop a mobile application that facilitates everyday driving and the use of various services.

The Internet of Things (IoT) is being integrated into the existing IT environment. IoT allows you to manage transport and urban infrastructure more efficiently. There is a wide range of applications of the IoT in automotive industry:

1. connected transport:
   - full transparency of movement;
   - traffic mode control;
   - increasing the utilization of transport;
   - strengthening the discipline of drivers.
2. fleet management:
   - adapting the service to the operating conditions;
   - automatic dispatching;
   - integration with ERP systems.
3. autonomous transport:
   - driver assistance;
   - autopilot of traffic on the highway;
   - promising systems of full autonomy.
4. ensuring security:
   - identification of " friend-foe";
   - prevention of fuel theft and misuse of transport;
   - availability of data for incident investigation.
5. "smart" road:
   - centralized management;
   - monitoring of the load and wear of bridges and tunnels.

The Internet of Things is the technology of the future, so a business case on this topic was also developed for the participants within the framework of the event.

In accordance with the above, the programme architecture was developed, indicated in Table 1.

Table 2. AIC programme architecture

May 18, Tuesday **Automotive innovation camp**
13:30 – 15:30 Business case presentations from representatives of the automotive industry and partners of the industrial cluster "Autoprom North-West"
May 19, Wednesday **Automotive innovation camp**
10:00 – 15:30 Workshops from business-case holders, representatives of the automotive industry and motorsport. Teamwork

May 20, Thursday Automotive innovation camp
10:00 – 13:30 Teamwork, preparation for the defense of projects
May 21, Friday Automotive innovation camp
10:00 – 13:30 Project defense and awarding the winning teams

4. Development of nominations

The following age groups were selected to participate in WP4:

- schoolchildren;
- students of secondary professional education;
- students of universities.

Taking into account the selected directions of the topic, the following nominations were developed for these age groups:

1. Auto and motor sports.
2. Man and car: innovative modes of transport and infrastructure.
3. Road safety.
4. Innovative transport systems.

5. Search for business case creators

Among the participants and partners of the automotive industry cluster "Automotive North-West" in the above nominations, work was carried out to determine the creators of the business cases who has the necessary competencies and is ready to accompany the work with the participants within the framework of the developed business case for the selected nomination.

The tasks of the business case creator included:

- informational and methodological support for a specific business case;
- support and consultation of participants on a specific business case within the framework of WP4;
- identification of experts to participate in the professional evaluation of the participants ' works.

Consultations were held with all partners-creators of business cases in the following areas:

- theme and format of the AIC event;
- case orientation: technical orientation (for example, to come up with a "smart" city system, etc.) or business orientation (for example, how to come up with or bring a new product to the market, etc.);
- form of business cases;
- age categories for which the case is being created;
- workshops conducted by case creators;
- deadline for ready-made cases.

MGbot LLC, as well as the St. Petersburg State University of Architecture and Civil Engineering (SPbGASU), showed their interest in the development of business cases.

5.1. MGBot LLC

Member of the cluster since September 7, 2020. **MGbot LLC** is part of the Macro Group (group of companies). The mission of MGBot is to ensure the activities of educational institutions, electronics specialists and all those who are not indifferent to IoT technologies, robotics and electronics. The components, educational kits and electronic constructors offered by the company can be useful for specialized educational institutions and people interested in electronics, programming, development of electronic devices, designing robots or simply wishing to join the world of electronics and IoT technologies. The company develops new educational kits with the support of the *Fund of assistance to development of small forms of enterprises in scientific-technical sphere* – a state non-profit organization in the form of a federal state budgetary institution, formed in accordance with the decree of the Government of the Russian Federation No. 65 of February 3, 1994. MGbot company website – https://mgbot.ru/about/.

5.2. SPbGASU

Partner of the cluster since September 7, 2020. **St. Petersburg State University of Architecture and Civil Engineering (SPbGASU)** today is a large educational and scientific center, the only university in the North-Western Federal District of the Russian Federation that provides comprehensive training of specialists in the field of construction, architecture, transport and engineering and environmental systems. As a part of SPbGASU there is an automobile and road faculty. The university trains bachelors, masters and specialists in full-time, part-time, correspondence forms of education in accordance with the approved programs of higher professional education. The University has a rich experience in creating business cases. SPbGASU website – https://www.spbgasu.ru/en/.

5.3. Industrial cluster “Autoprom North-West”

The formation of the industrial cluster “Autoprom North-West” began in 2015 at the initiative of the National Association of Automotive Component Manufactures of Russia (NAPAK). The signing of the agreement on the creation of the industrial cluster "Autoprom North-West" between the governors of St. Petersburg and the Leningrad region with the Management Company of the industrial cluster Union "Autoprom North-West" took place on February 15, 2018 within the framework of the Russian Investment Forum in Sochi.

Among the priority projects and activities of the cluster:

1. **Development of suppliers, industrial and technological infrastructure.** Formation of a multi-level automotive ecosystem in the North-West region with integration into global supply chains.
2. **Transport-ecology-innovation.** Sustainable development of the region's transport and logistics system, introduction of innovative modes of transport with the necessary infrastructure.

3. **Sport, science, education.** Development of motorsport, science and children's creativity within the framework of the educational trajectory "School – University (College) – Enterprise" on the basis of Cluster's structural unit – **Children's Engineering Center "Autoprom North-West".**
4. Development of professional qualifications in the automotive industry with integration into the international system of professional standards on the basis of the Cluster's structural unit – **Qualifications Assessment Center "Autoprom North-West".**

5.4. AIC Expert Board

Based on the results of the interaction, the AIC Expert Board was formed in the following composition:

- Sviridova Maya, Director (Union "Autoprom North-West");
- Malyavko Anastasia, Head of Educational Programs Department (Union "Autoprom North-West");
- Podoprigora Nikolay, forensic autotechnical expert, candidate of technical sciences, associate professor of the department of ground transport and technological machines (SPbGASU);
- Brylev Ilya, forensic autotechnical expert, candidate of technical sciences, associate professor of the department of ground transport and technological machines (SPbGASU);
- Solodkiy Alexander, Head of the Department of Transport Systems (SPbGASU);
- Chernykh Natalya, Senior Lecturer, Department of Transport Systems (SPbGASU);
- Chernyaev Igor, Head of the Department of Technical Operation of Vehicles (SPbGASU);
- Torosyan Levan, Associate Professor of the Department of Technical Operation of Vehicles (SPbGASU);
- Graevsky Igor, Assistant of the Department of Technical Operation of Vehicles (SPbGASU);
- Sergeev Pavel, general director (MGBot LLC);
- Kotov Maxim, lead engineer (MGBot LLC);
- Bogolubova Alexandra, project manager (MGBot LLC).

6. Business cases development

6.1. Development of a business case plan

The developed business cases should be relevant and in demand, and the solutions should be of an applied nature. Participants are tested for their knowledge, skills to analyze situations and offer solutions. In this regard, the main sections/plan of the business case were identified:

1. **general information about the business case** – the background of the business case. The current state of affairs, input data, a description of the situation;
2. **application in other countries –** existing examples of the use of the product/service in other countries;

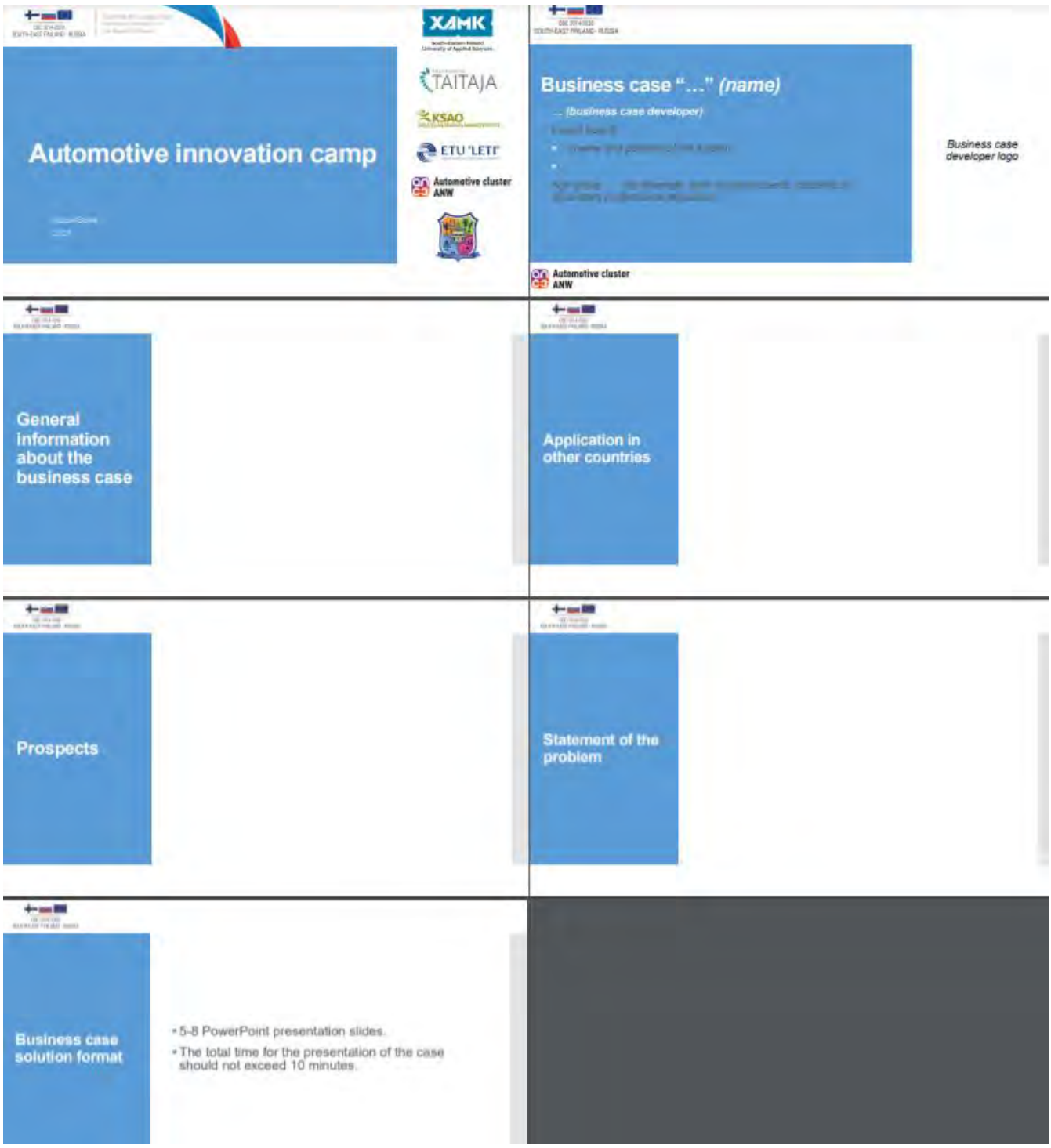
3. **prospects** for the development of the direction;
4. **the formulation of the problem**;
5. **the format of the business case solution** is a specific type of solution that students should present.

This plan is indicative and can be changed at the discretion of the creator of the business case. For example, technical details, possible scenarios, recommendations for a solution, and so on can be added.

6.2. Development of a business case template

As an auxiliary tool for developers of business cases, creating a single format, systematization, requirements of the Cross-Border Cooperation Program "Russia-South – Eastern Finland 2014-2020" on the use of logos and banners, a business case presentation template was created, shown in Picture 1.

It should be noted that this template was sent to all the creators of business cases in Russian. The business cases received in Russian were translated into English for the English-speaking participants of the event.



Picture 1. Business case presentation template

6.3. Development of business cases

In total, 6 business cases were prepared, including:

- 3 business cases from SPbGASU;
- 2 business cases from MGBot LLC;
- 1 business case from Union "Autoprom North-West".

6.3.1. Business case "Automotive expertise of road accidents"

Business case developer - Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU).

Expert board:

- **Podoprigora Nikolay** – forensic autotechnical expert, candidate of technical sciences, associate professor of the department of ground transport and technological machines;
- **Brylev Ilya** – forensic autotechnical expert, candidate of technical sciences, associate professor of the department of ground transport and technological machines.

Age group: students of secondary professional education.

General information about the business case:

- On the territory of the Russian Federation, road transport is the most potentially dangerous means of transportation, which accounts for most of all traffic accidents - about 95-98%.
- Due to the severity of the consequences, road traffic accidents (RTA) remain a serious social, economic, moral, psychological, and medical problem. Therefore, establishing the true causes of accidents and ensuring a high level of objectivity in the conclusions of forensic auto-technical experts is a priority goal of every investigation.

Circumstances and primary data:

- April 01, 2020, at about 12:30 a.m. on Zeleny Prospekt, there has been a road accident involving: a Nissan vehicle, license plate XXXXX, driven by a driver GG and a vehicle brand A, license plate XXXXX, driven by a BB driver.
- Road conditions: daylight road illumination, unlimited visibility, asphalt dry, clear.

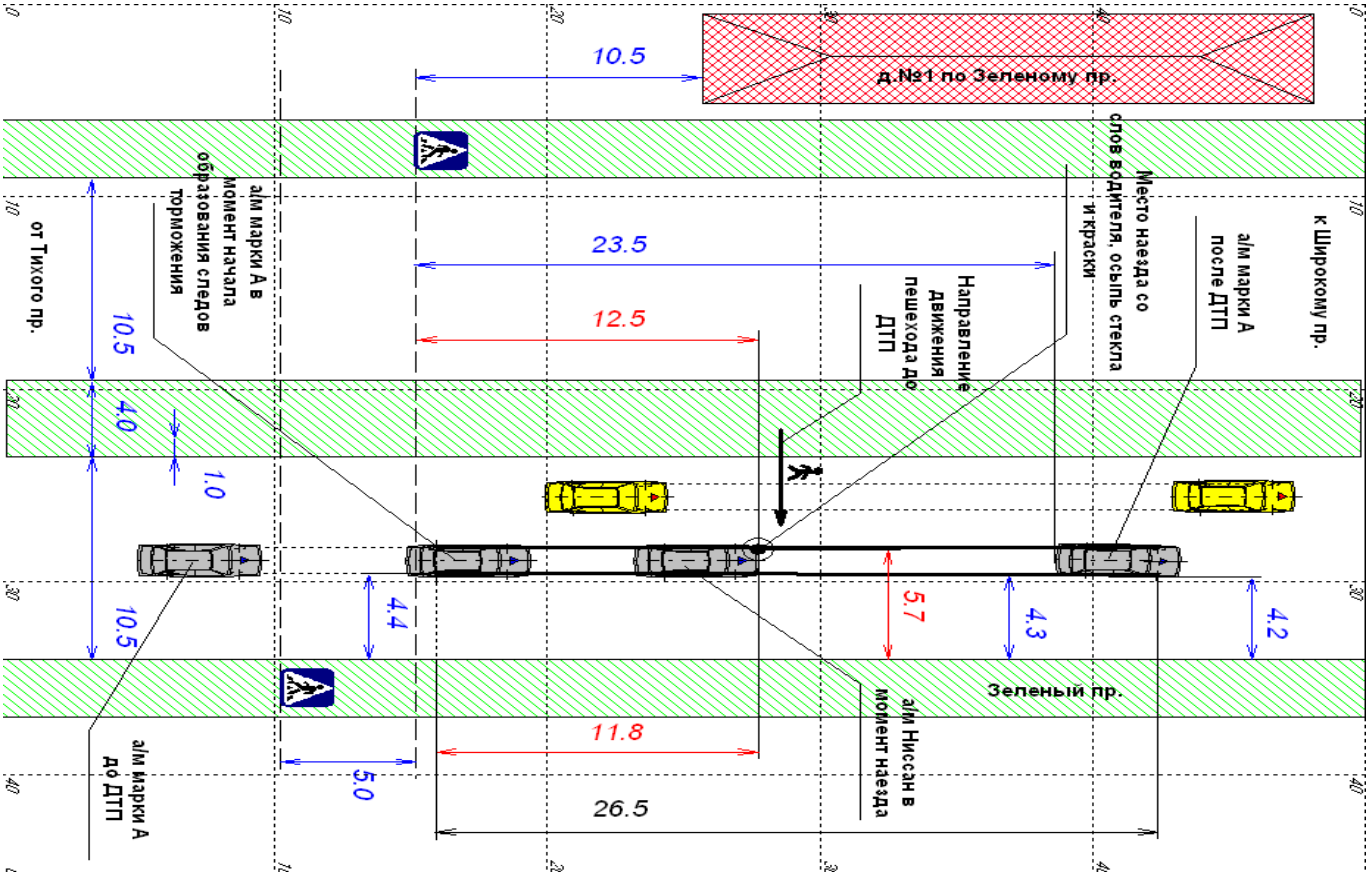
Diagram of the accident is shown in Picture 2.

Research Questions:

- What was the speed of the car of brand B in this traffic situation before the start of braking?
- How should the drivers have acted in this traffic situation, according to the requirements of the traffic rules?
- Did they have the technical ability to prevent accidents?
- Did their actions comply with the requirements of the traffic rules?

Problem-solving recommendations:

1. Determine the speed of the vehicle in the considered road transport situation using the calculated dependencies.
2. Evaluate the correctness of the actions of the drivers of the vehicle in this TTP, guided by the requirements of traffic rules.
3. Assess the technical ability to prevent road accidents, guided by the requirements of traffic rules.



Picture 2. Diagram of the accident

Materials for solving the problem (given to all teams at the first meeting):

1. Evtyukov S.A., Vasiliev Ya.V., Forensic auto-technical expertise. Theory and practice. Tom 1 – SPb.: Publishing house Petropolis, 2018.
2. Evtyukov S.A., Vasiliev Ya.V., Forensic auto-technical expertise. Theory and practice. Tom 1 – SPb.: Publishing house Petropolis, 2018.
3. Puchkin V.A. Basics of expert analysis of road accidents: Data base. Expert technique. Solution methods – Rostov-on-Don: 2010. – 400 p.

Business case solution format:

- 3 - 4 PowerPoint presentation slides.
- The total time for the presentation of the case should not exceed 10 minutes.

6.3.2. Business case "Intelligent transport systems"

Business case developer - Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU).

Expert board:

- Solodkiy Alexander Ivanovich, Head of the Department of Transport Systems
- Chernykh Natalya Vladimirovna, Senior Lecturer, Department of Transport Systems

Age group: students of secondary professional education.

Creation of an intelligent transport system on the "Scandinavia" road section:

- Highway A-181 (E-18) "Scandinavia" is a section of the road connecting Russia with Finland. The road passes through St. Petersburg, Vyborg, and ends at the Torfyanovka checkpoint. Refers to state highways of federal importance. A-181 is part of one of the main routes of the international Asian network - AH8 - from the border of Finland to Iran; and the European route E18, which combines motorways with sea traffic from Northern Ireland to St. Petersburg.
- The road was built according to the standards of the II category and had only 2 traffic lanes with a width of 3.75 m each, many intersections at one level. Since the beginning of the 2000s, the traffic intensity on the A-181 "Scandinavia" highway has increased 3 times. The road has ceased to cope with the flow of vehicles and there is a need for its reconstruction. Due to a large number of trucks, the lack of dividers, low light on the road, tragic accidents regularly occur. Residents called the route "the road of death".
- The reconstruction of the road began at the beginning of 2015 on the section from 44 to 65 km. It was planned to fully complete the work carried out in two stages by the fall of 2019. However, the contractor completed them 10 months ahead of schedule. The federal road using crushed stone-mastic asphalt concrete was expanded to six lanes of 3.75 m each. Transport interchanges, two overpasses, about 40 culverts, an elevated pedestrian crossing were built, a bridge over the Sestra River was reconstructed, barrier fences were installed, and noise protection screens were installed in the residential area; the track was also equipped with an outdoor lighting system.
- Currently, reconstruction is underway on the section from 65 to 100 km. After the reconstruction of the road, the number of lanes will increase from two to six, the roadbed will be expanded from 15 to 35 m. In addition, it is planned to reconstruct four interchanges in two levels, build three overhead pedestrian crossings, and install lighting and automated traffic control systems throughout the section.

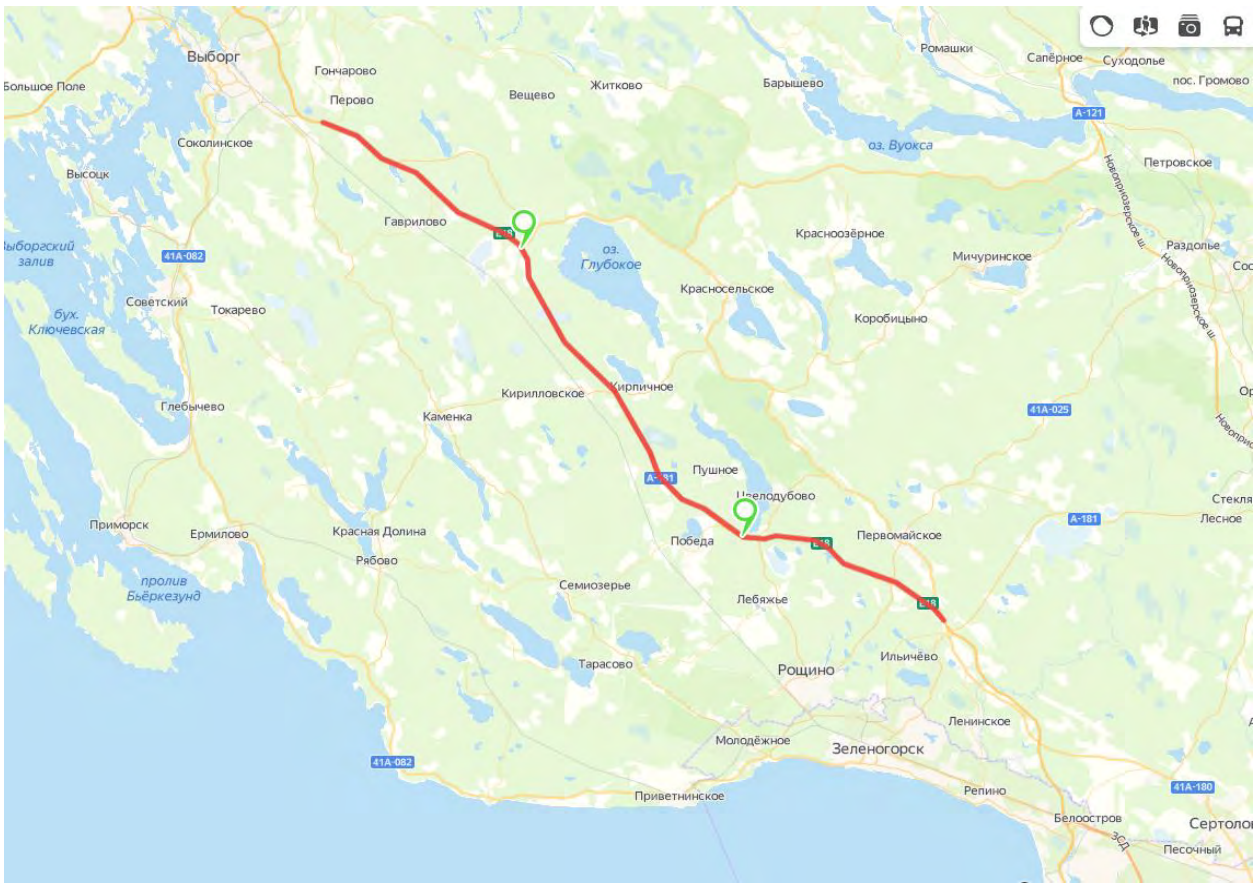
In the future, the A-181 will be equipped with a modern intelligent transport system (ITS) and rightfully called a “smart road”. Thanks to the information partnership between Russia and Finland, using mobile services and applications, drivers will be able to cross the border with detailed information about the traffic situation, weather conditions, traffic jams, and transfer hubs. Also, a part of cash payments for tourists and transport companies will be transferred online to a non-cash basis.

For more information, please follow the links:

- http://nwroads.ru/rekonstrukciya-skandinavii/
- https://avtorosdor.ru/trassa-a181-skandinaviya/

as well as on the Internet at the request of “Scandinavia Highway”, “Reconstruction of the “Scandinavia” Highway.

Reconstructed section of the "Scandinavia" highway are shown in Pictures 3-6.



Picture 3. Reconstructed section of the "Scandinavia" highway (part 1)

Picture 4. Reconstructed section of the "Scandinavia" highway (part 2)

Picture 5. Reconstructed section of the "Scandinavia" highway (part 3)

Picture 6. Reconstructed section of the "Scandinavia" highway (part 4)

Intelligent transport systems (ITS):

- An intelligent transport system is a control system that integrates modern information and telematic technologies and is designed for automated search and acceptance for implementation of the most effective scenarios for managing the transport and road complex of a region, a specific vehicle, or a group of vehicles to ensure given mobility of the population, to maximize indicators of road use. network, increasing the safety and efficiency of the transport process, comfort for drivers and users of transport (Intelligent Transport System, ITS). (GOST R 56829-2015 Intelligent transport systems. Terms and definitions).
- An intelligent transport system (ITS) provides for the integration into a single hardware and software complex of existing and future information and control systems in transport, automation, and centralization of the collection, transmission, and processing of information about the functioning and current state of all components of transport systems, the exchange of this information, its delivery, both to the participants in the transport process, and to the management structures, and use in the automatic and automated mode when optimizing all transport processes.

Due to its complexity, coverage of many areas of transport activities, the development of ITS contributes to the solution of a variety of problems characteristic of transport systems in modern conditions.

Innovate experience:

Currently, ITS is beginning to be actively implemented in the construction and reconstruction of highways and high-speed roads in Russia and abroad.

Examples of such highways are:

- road M-11 Moscow - St. Petersburg,
- "Western High-Speed Diameter" in St. Petersburg,
- sections of the E-18 highway, which were reconstructed in Finland.

Tasks for the development of ITS on the high-speed road A-181 (E-18) "Scandinavia":

To create a modern ITS that provides a solution to the entire range of traffic control tasks on a high-speed road with a high level of comfort and traffic safety, full information support for traffic participants. When creating an ITS, provide for the possibility of using separate sections of the road for testing autonomous ("unmanned") connected vehicles, and in the future, the movement of autonomous connected vehicles along with it.

In particular, the solution of the following main tasks must be ensured:

- traffic flow control while driving;
- highway entrance control;
- management of the transport and operational state of the highway;
- control and management of the transportation of special cargo.

Requirements for traffic management on highways:

- the need to maintain the continuity of movement;
- maintaining a speed limit corresponding to the status of the road;
- accounting for meteorological conditions;

- automated detection of congestion, road accidents, queues;
- automated control of entrances;
- allocation of lanes for the movement of special vehicles, convoys, etc .;
- control and management of the transportation of special cargo.

Preparation of proposals for the development of ITS on the reconstructed section of the A-181 (E-18) "Scandinavia":

1. Determine the set of functions performed by the ITS.
2. Determine the composition of ITS peripheral equipment.
3. Arrange ITS peripheral equipment.
4. Give proposals for the introduction of innovative technologies.
5. Conduct an expert assessment of the expected functional effects from the implementation of LITS.

Materials for solving the problem (given to all teams at the first meeting):

1. Presentation of a lecture on the ITS course "ITS on highways"
2. GOST R ISO 14813-1-2011. Intelligent Transport Systems. Scheme of building the architecture of intelligent transport systems. Part 1. Service domains in the field of intelligent transport systems, service groups and services.
3. Evstigneev I.A. Fundamentals of the creation of intelligent transport systems on the federal highways of Russia. M. 2016.
4. Drawings of tender documentation for the reconstruction of the road section, km 65 - 100.
5. *At the request of the participants, other GOSTs on ITS can be provided.*

Business case solution format:

- 6-8 PowerPoint presentation slides.
- The total time for the presentation of the case should not exceed 10 minutes.

6.3.3. Business case "Mobile application "Driver's assistant"

Business case developer - Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU).

Expert board:

- Chernyaev Igor, Head of the Department of Technical Operation of Vehicles
- Torosyan Levan, Associate Professor of the Department of Technical Operation of Vehicles
- Graevsky Igor, Assistant of the Department of Technical Operation of Vehicles

Age group: high school students; students of secondary professional education.

Development of the functionality of the "Driver's Assistant" mobile application:

The current trend in the field of road transport is the development of operational monitoring systems. (This is a consequence of the increased availability of digital technologies and transport telematics.).

Examples: fuel consumption monitoring systems, route, and traffic monitoring systems, driving style monitoring systems, etc.

Drivers need an online assessment of the technical condition of the car, economy, and driving safety using standard available "gadgets“.

Existing solutions in the field of vehicle monitoring are mainly aimed at the business segment. Mobile "driver assistants" are mainly for reference legal purposes.

There is also a need to improve methods for solving the problem of ensuring road safety.

The task of developing a mobile application for individual car owners, informing them about the economy, safety (style) of driving, and the technical condition of the car can be considered relevant.

Partially similar functionality has:

- Commercial vehicle operation monitoring systems;
- Driving rating systems used by insurance companies, car sharing;
- On-board diagnostic (OBD) systems;
- Mobile diagnostic applications using ELM327 adapters;
- Mobile apps trackers.

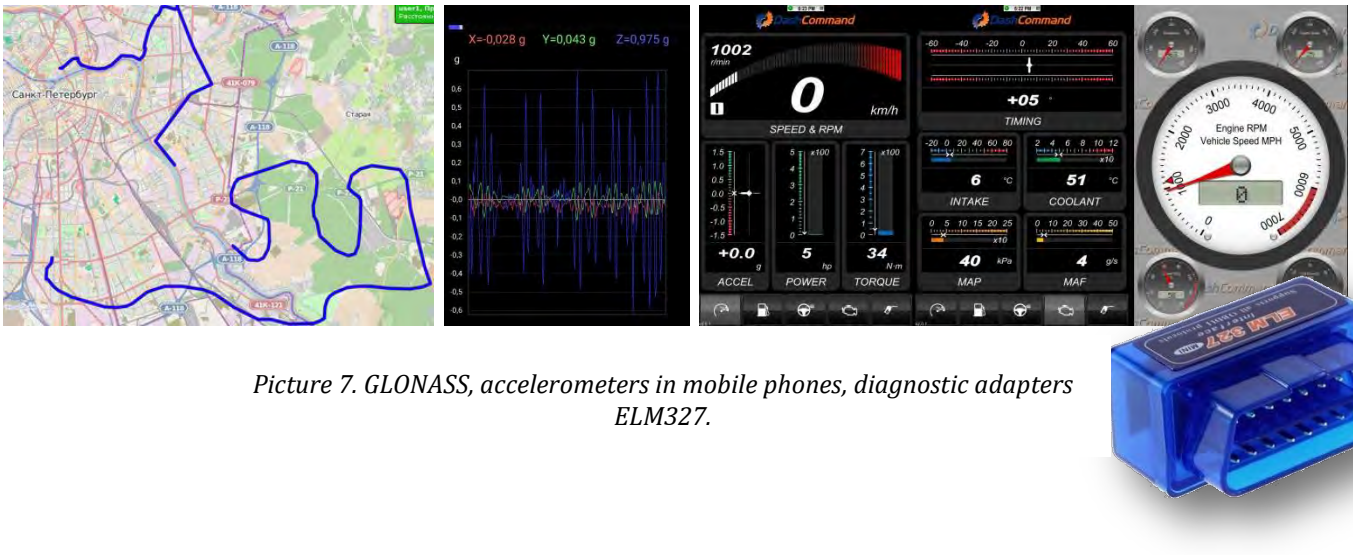
Not targeted at individual car owners.

The required functionality is "scattered" in different applications.

Technical details:

There are available sources of information about the parameters characterizing the operation of the car, which do not require additional equipment (or minimal additional equipment):

- GLONASS / GPS coordinates - information about the trajectory of movement, speed, and acceleration;
- built-in accelerometers in many mobile phones - information on acceleration and deceleration intensities;
- diagnostic adapters ELM327 - information on technical parameters (including fuel consumption, detected errors in the operation of vehicle systems).



Picture 7. GLONASS, accelerometers in mobile phones, diagnostic adapters ELM327.

Existing "car" applications do not track changes in indicators over time, which may be important for individual car owners. Such functionality is available in mobile applications of the fitness trackers and pedometers format.

Picture 8. Existing "car" applications.

The analysis of driving styles is carried out mainly based on the analysis of the intensities of acceleration and deceleration.

A task: to develop proposals for the functionality of a mobile application for individual owners with the working title "Driver's Assistant".

The application must:

- provide information to the driver in a convenient and accessible form:
- do not require additional equipment of the vehicle for their work (except for diagnostic adapters);
- provide information on efficiency, the safety of driving (style), and technical condition;
- provide an analysis of the dynamics of indicators;
- encourage drivers to ensure road safety.
- these requirements can be reasonably adjusted.

Problem-solving recommendations:

- To substantiate information about the operation of the car, which is needed by individual car owners.
- Analyze existing mobile applications and their functionality, perhaps choose a prototype.
- Justify the indicators by which the information will be presented to the car owner.
- Justify the parameters that must be "monitored" to determine these indicators.
- Propose technical means for monitoring these parameters.
- Suggest a mobile app menu structure.

- Suggest a name for the application that would be associated with economy and/or safety.

Business case solution format:

- 5-8 PowerPoint presentation slides.
- The total time for the presentation of the case should not exceed 10 minutes.

6.3.4. Business case «Maintenance optimization and vehicle fleet management platform using IoT»

Business case developer - MGbot LLC.

Expert board:

- Sergeev Pavel, general director
- Kotov Maxim, lead engineer
- Bogolubova Alexandra, project manager

Age group: students of students of secondary professional education.

Maintenance optimization and vehicle fleet management platform using IoT:

The current trend in the field of road transport for companies that own or operate a fleet of vehicles is the need to remotely track the location and operation of vehicles, as well as their technical condition.

- Manufacturers and car owners need to identify malfunctions and promptly report them on the phone screen. In-car sensors measure the performance of every part and then tell the owner when to repair using the Internet of Things.

- Fleet managers use special applications that not only monitor the vehicle in real time, but also monitor the weather conditions, which is important for drivers. Fuel consumption and part wear data allows managers to control costs and cut costs. All this leads to the fact that the business works more efficiently, and consumers receive a better service.

There are sensors and tags in the design of the car that help to read important information: fuel level, oil level, engine condition, etc.

Some manufacturers have gone a little further:

- Lexus additionally marks a number of car parts and elements with VIN numbers to check their originality and enhance identification capabilities
- Also, all Lexus models sold in the Russian market have the L-Mark identifier. The tags are unique to each vehicle and are designed to protect against theft.

Tags are read and thus you can identify the brand of the car and its owner.

Picture 9. Lexus (VIN number, L-Mark identifier)

Task:

for the platform to optimize maintenance and fleet management is to develop:

1. Platform interface (how it will look to the user);
2. Specification of sensors from which it is necessary to collect information about the car;
3. Algorithm for transmitting and outputting data using the Internet of Things.

The platform should:

- Provide information to the driver, vehicle fleet owner and car manufacturer information on the technical condition of each vehicle in the fleet in a convenient and accessible form;
- Issue recommendations for planned repairs;
- If possible, recommend new parts or repair services from contractors.

Business case solution format:

- Up to 10 PowerPoint presentation slides with info graphics;
- The total time for the presentation of the case should not exceed 10 minutes;
- Optionally - demonstration of the transmitted data from the car in the Blynk application.

6.3.5. Business case “Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)

Business case developer - MGbot LLC.

Expert board:

- Sergeev Pavel, general director;
- Kotov Maxim, lead engineer;
- Bogolubova Alexandra, project manager.

Age group: high school students; students of students of secondary professional education.

What is a self-driving car?

- This is a car equipped with an automatic control system, capable of moving from point A to point B without human intervention.

How self-driving cars work?

- To arrive at a destination, an autonomous vehicle must know the route, understand the environment, follow traffic rules, and properly interact with pedestrians and

other road users. To meet these requirements, the drone uses the following technologies:

1. Cameras: visually detect objects such as road markings and signs;
2. Radar: detects obstacles and objects in front and behind and determines the distance to them;
3. Lidar: similar to radar, but much sharper and detects objects around the vehicle (full 360 degree view);
4. AI: the brain of the car. Processes data from cameras and sensors, drives a car and makes decisions.

An organization called SAE International has done a good deed and has standardized 5 levels of autonomy that all market participants adhere to:

- Level 0—No Automation: The driver has to control everything - steering wheel, brake and gas. An ordinary car.
- Level 1—Driver Assistance: The car helps to brake or accelerate. Cruise control cars are about Level 1.
- Level 2—Partial Automation: A car can control acceleration and deceleration at the same time, but the person must be aware of the situation and be ready to take control. The most striking example of Level 2 is Tesla.
- Level 3—Conditional Automation: The car can completely control the movement, but at some point it may ask to take control. Rumor has it that the Audi A8 (2018) can do all of this, but there are no reviews yet.
- Level 4—High Automation: Can do everything at Level 3, but can handle more difficult driving situations. In general, you can let go of the steering wheel and do nothing, but if the car cannot make a decision, it will notify you and smoothly park on the side of the road. Companies like Waymo or Aptiv are claiming the 4th Level.
- Level 5—Full Automation: Full autonomy, no human involvement required. The car itself makes a decision in any situation, the steering wheel may be missing.

General Motors

As one of the leading automakers, GM has spent a ton of money to remain the leader in self-driving cars. In 2016, he acquired the UAV startup Cruise Automation for over $ 1 billion. Cruise received a total of $ 2.25 billion from SoftBank and $ 1.1 billion from GM in 2018. To further dominate the autonomy market, GM also acquired a lidar maker. GM is testing its drones in San Francisco with plans to expand to New York.

Picture 10. General Motors

Waymo (leader in manufacturability)

The oldest startup, founded back in 2009. At the moment, it is considered the most advanced self-driving car. Priced at $ 175 billion (!), Waymo has driven a total of 10 million miles in Chrysler, Honda and Jaguar vehicles. Waymo recently announced plans to buy another 62,000 Fiat Chrysler for a future self-driving paid taxi.

Picture 11. Waymo

Tesla

Tesla has a very different perspective on the unmanned future. Elon Musk believes that the drone can only work on certain cameras (after all, a person drives a car with just a pair of eyes), without lidars. Despite the fact that Tesla cars have autopilot functions, they still trample the 3rd level of autonomy, and accidents due to autopilot are also enough.

Picture 12. Tesla

Why has it taken so long to develop self-driving cars?

Waymo was founded in 2009 and only now they are more or less ready for commercial travel (and then in sunny California). That is, almost 10 years later. Why so long? While the race for unmanned technology has accelerated over the past 5 years, all companies face common challenges:

Lidar

Lidar is essentially a laser device that constantly turns and “shoots” a laser 360 degrees, determining the distance to every point that can be measured.

Unfortunately, lidars are expensive (from 500,000 rubles per 1 piece), and in an unmanned vehicle you need a lot of them (2–5 pieces).

There is still no way to get rid of it, because only the radar and the camera are not enough for clear navigation in the terrain. Various companies are working to reduce the cost of the lidar and release a new low-cost solid-state lidar (no rotating elements), but such products are still in development.

AI (artificial Intelligence)

AI is the heart of the car. AI detects objects from cameras, tries to recognize an object (for example, a dog, person, car, road sign, etc.), determine how pedestrians and other cars will behave. In order for such artificial intelligence to work, engineers “feed” it huge amounts of data so that special algorithms can learn from this data. The more quality input data, the better the algorithms will perform.

Even though algorithms have come a long way, they are still “stupid” for a two year old. A striking example is the incident with the Uber drone (due to which a person died), the algorithm could not recognize the person on the road (in other words, since the driver did not have time to notice him). But besides a person, you also need to "see" a large number of other objects - every car, road sign, traffic light, be able to determine traffic lanes and much more.

Weather

Let's be honest, almost no self-driving car can drive normally in snow or heavy rain. The exception is MIT University. They learned to navigate by the casts of the roadway under the car.

Cartography

Simple maps and simple GPS accuracy (3-10 meters error) are not suitable for unmanned vehicles; the car needs to understand where it is located with centimeter accuracy. Although the car has many sensors, it is necessary to have accurate information about the surrounding area (geometry of road markings, road boundaries, nearest road signs, etc.). All this information is in the so-called HD-maps - a digital model of the road.

For cartography to remain relevant, special cartographic machines (a special car with cameras and lidars) must drive through the streets and “digitize” them. So with the advent of self-driving car racing, a cartography race has begun among companies like Here, TomTom, DeepMap, lvl5, Carmera, Google and others. In the 21st century, data is the new gold.

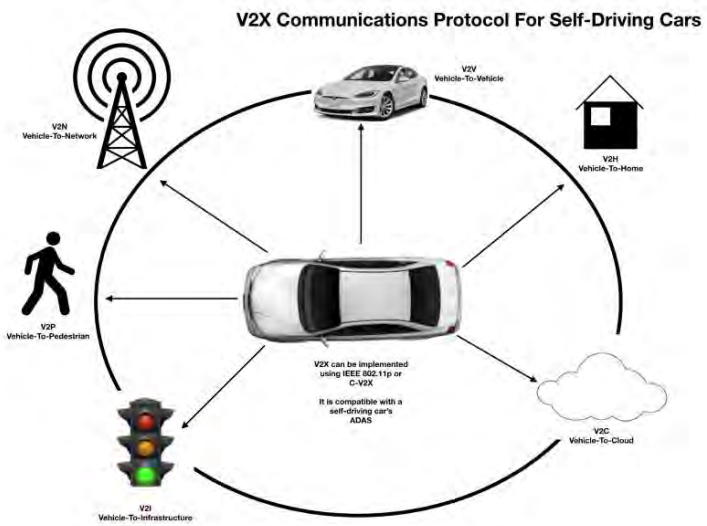
Picture 13. One of the Google Street View cars

Infrastructure

Self-driving cars require new road infrastructure. And not just infrastructure, but smart infrastructure in which cars could communicate not only with the infrastructure itself (signs, traffic lights, etc.), but also with other cars. Here are some basic terms:

- V2V (vehicle-to-vehicle) — cars exchange information directly with each other;
- V2I (vehicle-to-infrastructure) — cars exchange information with road infrastructure;
- V2P (vehicle-to-pedestrian) — cars exchange information with pedestrians (for example, the car sees the pedestrian's smartphone and understands that there is a person here).

For example, a car is driving on a highway, and a road sign 300 m ahead says: "I am such and such a sign, I am there." An unmanned vehicle will be able to understand in advance what lies ahead and plan its actions in accordance with this information.



Picture 14. Scheme of data exchange through the Internet of Things between objects on the road for an unmanned vehicle

Task

to create educational materials for schoolchildren and students on the study and development of the work of an unmanned vehicle based on the set of mobile robotics "Dynamics":

1. **Assemble and program 2 sets according to the instructions in the available design;**
2. **Create a scheme for supplementing the "Dynamics" structure with sensors that will bring it as close as possible to the driving conditions of an unmanned vehicle (according to the diagram on slide 8);**
3. **Algorithm for data transfer and data output using the Internet of Things between two sets of "Dynamics";**
4. **Visualization of the interface of the output data in an application for the Internet of Things (for example, Blynk).**

Performed using 1 or 2 sets of "Dynamics" produced by MGBot.

Business case solution format:

- Up to 10 PowerPoint presentation slides with infographics;
- The total time for the presentation of the case should not exceed 10 minutes;
- Demonstration of the assembled "Dynamics" and the interface of the transmitted data from the car in the application for the Internet of Things on a phone or PC.

6.3.6. Business case "From the first Russian cars and motor vehicles to the present day (to the 125th anniversary of the first Russian production car)"

Business case developer - Union "Autoprom North-West".

Expert board:

- Sviridova Maya, Director of Union "Autoprom North-West"
- Komarova Ekaterina, Executive Director of Union "Autoprom North-West"
- Malyavko Anastasia, Head of Educational Programs Department

Age group: schoolchildren, students of secondary professional education, universities.

Exactly 125 years ago, 14 July 1896, the first serial Russian car was presented at the All-Russian Industrial Art Exhibition in Nizhny Novgorod.

The first car of domestic production with an internal combustion engine was ready and passed a series of tests in May 1896. In July, at an exhibition in Nizhny Novgorod, he made a demonstration trip. It was a car of Frese and Yakovlev.

On the wave of the rapid industrial lift, which was observed in the Russian Empire from the second half of the XIX century, the appearance of the domestic automotive industry looks quite organic. Pioneers of this industry in our country were the retired lieutenant of the Imperial Fleet Evgeny Yakovlev and Mountain Engineer Peter Frez, which constructed the car represented in July 1896 to the general public. They gave the start of the serial production of cars in Russia.

Picture 15. first serial Russian car (Frese-Yakovlev)

The St. Petersburg Freset Factory has become a pioneer in the mass production of passenger and trucks. Only from 1901 to 1904 more than 100 cars were collected here, including equipped with electric drive. There were also tests of trolley buses and trains with electrical station.

Task:

- to prepare scientific and technical materials, archival references, abstracts for placement in the virtual museum of auto- and mototechnics “Auto-Evolution”, formed by the Children's Engineering Center "Autoprom North-West";
- structuring the goals and results of the business case presentation with the preparation of a short presentation and project defense in Russian or English.

Recommendations for solving the problem:

1. Acquaintance with the history of the creation of equipment in the chosen direction (cars, trucks, motor vehicles, special equipment, passenger transport);
2. Collection and processing of information from open sources and interviews with market experts;
3. Development of a presentation report for project defense in Russian or English;
4. Preparing to defend a project.

Materials for solving the problem:

- will be sent to teams through the business case holder.

Business case solution format:

- 4-5 PowerPoint presentation slides.

– The total time for the presentation of the case should not exceed 10 minutes.

7. Development of advertising and informational materials

7.1. Creating a flyer for the event

In order to increase interest in the WP4 Automotive Innovation Camp event, an attention-grabbing flyer design was developed, shown in Picture 16.

Picture 16. Flyer for the "Automotive Innovation Camp"

7.2. Placement of information in the partner network

To attract participants, announcements of the event were published on the website of the industrial cluster "Autoprom North-West":

- for the Russian-speaking audience - https://nwasz.ru/deyatelnost/novosti/192-industry-day-1-in-russia-17-18-maya-2021-g.html
- for the English-speaking audience - https://nwasz.ru/race4scale/193-industry-day-in-russia-automotive-innovation-camp-innovative-business-may-17-21-2021.html

In order to increase the coverage of participants, announcements of the event were also published on the websites of the cluster partners:

- St. Petersburg Cluster Development Centre - https://spbcluster.ru/2021/04/26/industry-day-v-rossii-automotive-innovation-camp-innovative-business-17-21-maya-2021-g/
- Industry Development Center of the Leningrad Region - https://crplo.ru/page19523969.html.

8. Working with participants

8.1. Mailing to educational institutions in Russia

For the purpose of direct communication with educational organizations and attracting students, an information distribution was made to partners and participants of the automotive industry cluster “Autoprom Noerth-West”.

Table 3. List of educational organizations

Higher educational institutions in the field of automotive and related industries	
1.	Moscow Automobile and Road Construction State Technical University
2.	Bauman Moscow State Technical University
3.	Moscow Polytechnic University
4.	Saint Petersburg State University of Architecture and Civil Engineering
5.	Saint-Petersburg Electrotechnical University ETU “LETI”
6.	Peter the Great St. Petersburg Polytechnic University
7.	Nizhny Novgorod State Technical University n.a. R.E. Alekseev
8.	Ural Federal University named after the first President of Russia B. N. Yeltsin
9.	Novosibirsk State Technical University
10.	Kazan National Research Technical University named after A.N.Tupolev
11.	Industrial University of Tyumen
12.	Tula State University
13.	Volgograd State Technical University
14.	Irkutsk National Research Technical University
15.	Samara State Technical University
16.	Vladimir State University named after Alexander Grigorievich and Nikolai Grigorievich Stoletov
17.	Pacific National University
18.	Yaroslav-the-Wise Novgorod State University
19.	Yuri Gagarin State Technical University of Saratov
20.	Tambov State Technical University
21.	Izhevsk State Technical University named after M.T. Kalashnikov
22.	Altai State Technical University named after I.I. Polzunov
23.	Togliatti State University
24.	Kaliningrad State Technical University
25.	Bratsk State University
26.	Tuvan State University
27.	T.F. Gorbachev Kuzbass State Technical University
28.	Murmansk State Technical University
29.	Kazan (Volga region) Federal University
30.	North Caucasian State Academy
31.	Pskov State University
Secondary educational institutions in the field of automotive and related industries	
32.	Togliatti Engineering College
33.	Naberezhnochelninsky Polytechnic College
34.	V.D. Potashov Technical College
35.	St. Petersburg Automobile Road College
36.	Cluster of Automotive Industry (Samara) – Training Center
37.	Saint Petersburg Engineering and Manufacturing College
38.	St. Petersburg state budgetary professional educational institution "lyceum of service and industrial technologies"
39.	Shchelkovsky College (St. Petersburg)

8.2. Forming an application for participation in the AIC

An application was formed for the AIC participants with the choice of a nomination and a description of the students (Picture 17).

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	2.			
	3.			
	4.			
	5.			
Телефон ответственного лица / сотрудника				
e-mail				
Информация о команде / резюме	Приложением: второй лист к данному документу.			

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Picture 17. Application for participation in AIC from teams

8.3. Forming teams

The applications received from schools, colleges, and universities are shown in Pictures 18-25.

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Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Бельский Георгий Андреевич	01.12.1997	1-ЭТМКм-1
	2.	Разумов Павел Александрович	11.06.1998	1-ЭТМКм-1
	3.	Гончаров Владислав Андреевич	02.12.1995	1-ЭТМКм-1
	4.	Майоров Максим Эдуардович	10.03.1987	1-ЭТМКм-1
	5.	Шевелёв Андрей Евгеньевич	12.04.1968	1-ЭТМКм-1
Телефон ответственного лица / сотрудника	+7-921-3864309, Черняев Игорь Олегович (преподаватель)			
e-mail	chernyaev@rambler.ru			
Информация о команде / резюме	Приложением: второй лист к данному документу.			

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Picture 18. Application 1 from SPbGASU

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Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Степанов Михаил Дмитриевич	29.07.2001	2-ТТП-2
	2.	Тамбулатова Екатерина Ивановна	25.04.2001	2-ТТП-2
	3.	Грук Николай Алексеевич	19.12.1998	2-ТТП-2
	4.	Пашилов Сергей Александрович	03.03.2001	2-ТТП-2
	5.	Ермилов Валерий Андреевич	15.08.1997	2-ТТП-2
Телефон ответственного лица / сотрудника	+7-921-3864309, Черняев Игорь Олегович (преподаватель)			
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Picture 19. Application 2 from SPbGASU

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Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Афанасьев Константин Владимирович	18.04.2004	300
	2.	Кузьмаков Дмитрий Алексеевич	12.12.2003	300
	3.	Тюрин Владимир Алексеевич	15.01.2004	300
	4.	Фарафонов Иван Александрович	12.07.2004	300
	5.	Юшков Никита Александрович	02.08.2003	300
Телефон ответственного лица / сотрудника	+7(905) 22-111-79			
e-mail	dmitriy_maslov@mail.ru			
Информация о команде / резюме	Приложением второй лист к данному документу			

*Резюме должно строго соответствовать реальной деятельности конкурсанта, содержать информацию об образовании, навыках, месте работы и функционале конкурсанта.

С условиями Конкурса ознакомлен(а) и согласен(на). Как автор не возражаю против размещения конкурсной работы на безвозмездной основе в сети Интернет, использования её в теле- и радиопередачах и на наружных рекламных носителях на территории Российской Федерации, а также публикации в печатных средствах массовой информации, в том числе посвященных Конкурсу в некоммерческих целях.

В соответствии с Федеральным законом Российской Федерации от 27 июля 2006 г. N 152-ФЗ «О персональных данных» даю согласие Союз «Автопром Северо-Запад» в течение 5 лет использовать мои вышеперечисленные персональные данные для составления списков участников Конкурса, опубликования списков на сайте, создания и отправки наградных документов Конкурса, рассылки конкурсных материалов, использования в печатных презентационных/методических материалах Конкурса, предоставления в государственные органы власти, для расчета статистики участия в Конкурсе, организации участия в выставках и социальных рекламных кампаниях.

Подпись _____	Дата подачи заявки «12» 05 2021 г.

Picture 20. Application 3 from Fire and Rescue College

АВТОПРОМ СЕВЕРО-ЗАПАД
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Полное юридическое название образовательного учреждения (школа, СПО, ВУЗ) / компании	Санкт-Петербургское государственное бюджетное профессиональное образовательное учреждение "Пожарно-спасательный колледж "Санкт-Петербургский центр подготовки спасателей"			
Вид номинации / бизнес-кейса (нужное подчеркнуть):	Человек и автомобиль: инновационные виды транспорта и инфраструктура; Безопасность на дорогах			
Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Мачехина Дарья Олеговна	01.10.2004	300
	2.	Парамонов Александр Сергеевич	22.09.2004	300
	3.	Киринчук Евгений Александрович	30.11.2004	300
	4.	Тропин Владислав Анатольевич	27.05.2004	300
	5.	Клецко Евгений Вечяславович	27.02.2004	300
Телефон ответственного лица / сотрудника	+7(905) 22-111-79			
e-mail	dmitriy_maslov@mail.ru			
Информация о команде / резюме	Приложением: второй лист к данному документу.			

*Резюме должно строго соответствовать реальной деятельности конкурсанта, содержать информацию об образовании, навыках, месте работы и функционале конкурсанта.

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Подпись _____	Дата подачи заявки «12» 05 2021 г.

Picture 21. Application 4 from St. Petersburg Fire and Rescue College

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Полное юридическое название образовательного учреждения (школа, СПО, ВУЗ) / компании	Муниципальное общеобразовательное бюджетное учреждение "Средняя общеобразовательная школа "Центр образования "Кудрово"			
Вид номинации / бизнес-кейса (нужное подчеркнуть):	1. Авто- и мотоспорт; 2. Человек и автомобиль: инновационные виды транспорта и инфраструктура; 3. Безопасность на дорогах; 4. Инновационные транспортные системы.			
Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Шмаров Владислав	12.04.2004	10 класс
	2.	Детковский Даниил	24.01.2004	10 класс
	3.			
	4.			
	5.			
Телефон ответственного лица / сотрудника	Кадиев Сергей Магомедович, тел. 8-981-963-50-49			
e-mail	s.kadiev@mail.ru			
Информация о команде / резюме	Приложением: второй лист к данному документу			

*Резюме должно строго соответствовать реальной деятельности конкурсанта, содержать информацию об образовании, навыках, месте работы и функционале конкурсанта.

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Подпись _____	Дата подачи заявки «12» мая 2021 г.

Picture 22. Application 5 from Kudrovo Techopark School

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Полное юридическое название образовательного учреждения (школа, СПО, ВУЗ) / компании	МБОУ «Псковская инженерно-лингвистическая гимназия» и МБОУ «Палкинская средняя школа» Совместная команда			
Вид номинации / бизнес-кейса (нужное подчеркнуть):	1. Авто- и мотоспорт; 2. Человек и автомобиль: инновационные виды транспорта и инфраструктура; 3. Безопасность на дорогах; 4. Инновационные транспортные системы.			
Состав команды*	№ п/п	ФИО	Дата рождени	Класс / группа
	1.	Носов Роман Антонович	05.09.2005	9 «Б» ПИЛГ
	2.	Ившин Ярослав Станиславович	01.12.2005	9 «Г» ПИЛГ
	3.	Царо Даниил Сергеевич	14.12.2004	9 "Б" ПИЛГ
	4.	Орлов Егор Вячеславович	29.03.2004	10 «а» Палкино
	5.	Васильев Сергей Алексеевич	16.09.2005	9 «а» Палкино
Телефон ответственного лица / сотрудника	+79118971191 Плявинский Теодор Андреевич			
e-mail	teodorspb@mail.ru			
Информация о команде / резюме	Приложением: второй лист к данному документу.			

*Резюме должно строго соответствовать реальной деятельности конкурсанта, содержать информацию об образовании, навыках, месте работы и функционале конкурсанта.

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Подпись	Дата подачи заявки «13» мая 2021 г.

Picture 23. Application 6 from Pskov engineering and linguistic gymnasium and Palkinskaya secondary school (Joint team)

АВТОПРОМ СЕВЕРО-ЗАПАД
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не позднее 30 апреля 2021 года

Полное юридическое название образовательного учреждения (школа, СПО, ВУЗ) / компании	Академия транспортных технологий			
Вид номинации / бизнес-кейса (нужное подчеркнуть):	1. Авто- и мотоспорт; 2. Человек и автомобиль: инновационные виды транспорта и инфраструктура; 3. Безопасность на дорогах; 4. **Инновационные транспортные системы**.			
Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Сума Григорий Олегович	04.07.2002	ДР-82
	2.	Ивановский Максим Алексеевич	19.08.2001	ДР-82
	3.	Ялышев Айрат Ильдарович	01.15.2002	ДР-82
	4.	Артёменко Артем Александрович	02.04.2002	ДР-82
	5.	Вырлан Антон Анатольевич	23.05.2002	ДР-82
Телефон ответственного лица / сотрудника	Рассказов С.Д. +79112249133			
e-mail	rsd-84@mail.ru			
Информация о команде / резюме	Приложением: второй лист к данному документу.			

*Резюме должно строго соответствовать реальной деятельности конкурсанта, содержать информацию об образовании, навыках, месте работы и функционале конкурсанта.

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В соответствии с Федеральным законом Российской Федерации от 27 июля 2006 г. N 152-ФЗ «О персональных данных» даю согласие Союз «Автопром Северо-Запад» в течение 5 лет использовать мои вышеперечисленные персональные данные для составления списков участников Конкурса, опубликования списков на сайте, создания и отправки наградных документов Конкурса, рассылки конкурсных материалов, использования в печатных презентационных/методических материалах Конкурса, предоставления в государственные органы власти, для расчета статистики участия в Конкурсе, организации участия в выставках и социальных рекламных кампаниях.

Подпись	Дата подачи заявки «29» апреля 2021 г.

Picture 24. Application 7 from Academy of Transport Technologies

АВТОПРОМ СЕВЕРО-ЗАПАД
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не позднее 30 апреля 2021 года

Полное юридическое название образовательного учреждения (школа, СПО, ВУЗ) / компании	Рязанский институт (филиал) федерального государственного автономного образовательного учреждения высшего образования «Московский политехнический университет»			
Вид номинации / бизнес-кейса (нужное подчеркнуть):	1. Авто- и мотоспорт; 2. Человек и автомобиль: инновационные виды транспорта и инфраструктура; 3. Безопасность на дорогах; 4. Инновационные транспортные системы.			
Состав команды*	№ п/п	ФИО	Дата рождения	Класс / группа
	1.	Кашин Дмитрий Сергеевич	20.12.1999	181Р51
	2.	Комаров Сергей Дмитриевич	27.09.2000	181Р51
	3.	Булычев Дмитрий Игоревич	22.07.2001	191Р51
	4.	Моторин Михаил Юрьевич	17.09.1998	191Р51
	5.	Тимаков Алексей Николаевич	21.04.1999	201Р61
Телефон ответственного лица / сотрудника	8-920-637-69-08			
e-mail	aitts@rimsou.ru			
Информация о команде / резюме	Приложением: второй лист к данному документу.			

*Резюме должно строго соответствовать реальной деятельности конкурсанта, содержать информацию об образовании, навыках, месте работы и функционале конкурсанта.

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Подпись _____ | Дата подачи заявки «14» 05 2021 г.

Picture 25. Application 8 from Ryazan Institute (branch) of the Moscow Polytechnic University

8.4. Distribution of business cases by teams

The registered teams were distributed by the AIC Expert Board according to business cases, taking into account the wishes of the participants and the categories of age groups.

All the presented cases belong to the "Executive-cases" format, which implies getting acquainted with the case directly on the day of the event.

Table 4. Distribution of teams by business cases

Teams	Business-case
Kudrovo Techopark School: 1. Barsukova Olga 2. Bolotin Daniel 3. Garayev Danila 4. Zhukov Artyom 5. Shmarov Vladislav	Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)
Academy of Transport Technologies: 1. Suma Grigory 2. Ivanovsky Maxim 3. Yalyshev Airat 4. Artyomenko Artem 5. Vyrlan Anton	Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)
St. Petersburg Fire and Rescue College: 1. Machekhina Daria 2. Paramonov Alexander 3. Kirinchuk Evgeny 4. Tropin Vladislav 5. Kletsko Evgeny	Automotive expertise of road traffic accident
Pskov engineering and linguistic gymnasium and Palkinskaya secondary school (Joint team): 1. Roman Nosov 2. Ivshin Yaroslav 3. Tsaro Daniel 4. Orlov Egor 5. Vasiliev Sergey	Automotive expertise of road traffic accident
St. Petersburg Fire and Rescue College: 1. Afanasyev Konstantin 2. Kuzmakov Dmitry 3. Tyurin Vladimir 4. Farafonov Ivan 5. Yushkov Nikita	Mobile App “Driver’s Assistant”
SPbGASU: 1. Belsky Georgy 2. Razumov Pavel 3. Goncharov Vladislav 4. Maiorov Maxim 5. Shevelev Andrey	Maintenance optimization and vehicle fleet management platform using IoT
Ryazan Institute (branch) of the Moscow Polytechnic University: 1. Kashin Dmitry 2. Komarov Sergey 3. Bulychev Dmitry 4. Motorin Mikhail 5. Timakov Alexey	Maintenance optimization and vehicle fleet management platform using IoT
SPbGASU: 1. Stepanov Mikhail 2. Tambulatova Ekaterina	Intelligent transport systems on the "Scandinavia" road section

3. Gruk Nikolay 4. Pashilov Sergey 5. Ermilov Valery	

9. Development of the event program

As a result, the final program of the event for May 18-21, 2021 was formed, presented in Pictures 26-27.

Automotive cluster ANW

CBC 2014-2020 SOUTH EAST FINLAND - RUSSIA

Actual Project

Business Programme

Automotive innovation camp

May 18-21, 2021 **Online format: Zoom platform**

May 18, Tuesday **Zoom link:** https://zoom.us/j/95011227740?pwd=YkFkWjFyMHR1UlFRTGFYUHlJYndJQT09 ID: 950 1122 7740 Password: 135950
11:00 – 12:00 Round-table: "Science, education, sport: new opportunities for career guidance and development of children's technical creativity" – *Greetings and appeals from the participants and partners of the industrial cluster "Autoprom North-West"* – *Children's Engineering Center "Autoprom North-West". Start of the International Competition for Young Specialists of the Automotive Industry "AutoEvolution-2021" (for schoolchildren, students and young professionals).*
12:00 – 13:00 Business case presentations from representatives of the automotive industry and partners of the industrial cluster "Autoprom North-West" by directions: – *Auto and motor sports* – *Man and car: innovative modes of transport and infrastructure* – *Road safety* – *Innovative transport systems* **Business-cases:** – *Automotive expertise of road traffic accident* – *Mobile App "Driver's Assistant"* – *Intelligent transport systems on the "Scandinavia" road section* – *Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)* – *Maintenance optimization and vehicle fleet management platform using IoT* – *From the first Russian cars and motor vehicles to the present day (to the 125th anniversary of the first Russian production car)*

May 19, Wednesday

Zoom link: https://zoom.us/j/96274062056?pwd=bVVIS0RVbVgwT2JzQmdNYm9nSmNKdz09
ID: 962 7406 2056
Password: 298377

11:00 – 13:00 Workshops from business-case holders, teamwork, preparation for the defense of projects

Timing – 20 minutes on each business-case

Time	Business-case	School, college, university
11:00 – 11:20	Maintenance optimization and vehicle fleet management platform using IoT	SPbGASU
11:20 – 11:40	Intelligent transport systems on the "Scandinavia" road section	SPbGASU
11:40 – 12:00	Automotive expertise of road traffic accident	St. Petersburg Fire and Rescue College
12:00 – 12:20	Mobile App "Driver's Assistant"	St. Petersburg Fire and Rescue College
		St. Petersburg Marine technical College named after Admiral D. N. Senyavin
12:20 – 12:40	Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)	Kudrovo Techopark School
		Academy of Transport Technologies
12:40 – 13:00	From the first Russian cars and motor vehicles to the present day (to the 125th anniversary of the first Russian production car)	Ryazan Institute (branch) of the Moscow Polytechnic University

May 20, Thursday

Zoom link: https://zoom.us/j/94955431947?pwd=VlBWS0hFenBVaGVNSVlnYmZDL0NPZz09
ID: 949 5543 1947
Password: 191211

11:00 – 12:30 Teamwork, preparation for the defense of projects *(according to the schedule of meetings)*

May 21, Friday

Zoom link: https://zoom.us/j/97446700842?pwd=dlZjcW5aVnB6Z3R2aHZwTy9uSjRVZz09
ID: 974 4670 0842
Password: 965115

11:00 – 12:40 Project defense
12:40 – 13:00 Awarding the winning teams

Pictures 26-27. Final program of Automotive Innovation Camp

10. Implementation of AIC activities

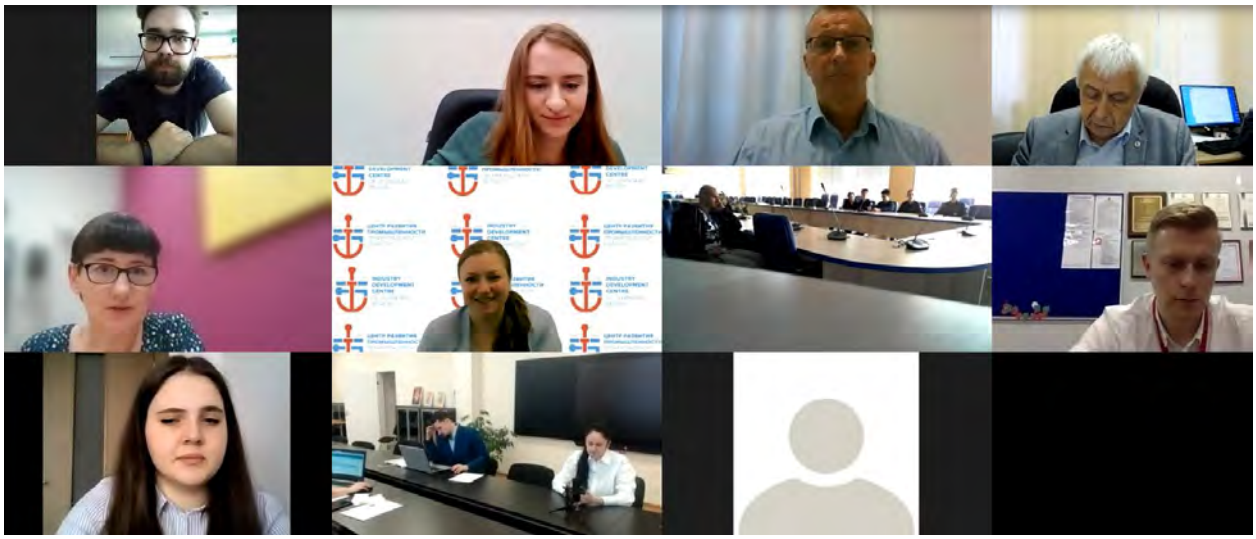
10.1. First day (May 18, 2021)

The event was opened with welcoming words from the partners of the industrial cluster "Autoprom North-West".

Maria Kurtysheva, the Leading Cluster Manager of the St. Petersburg Cluster Development Center (JSC "Technopark of St. Petersburg"), emphasized:

"The St. Petersburg Cluster Development Center is engaged in the development of innovations and startups, support for technological enterprises. We express our support for all

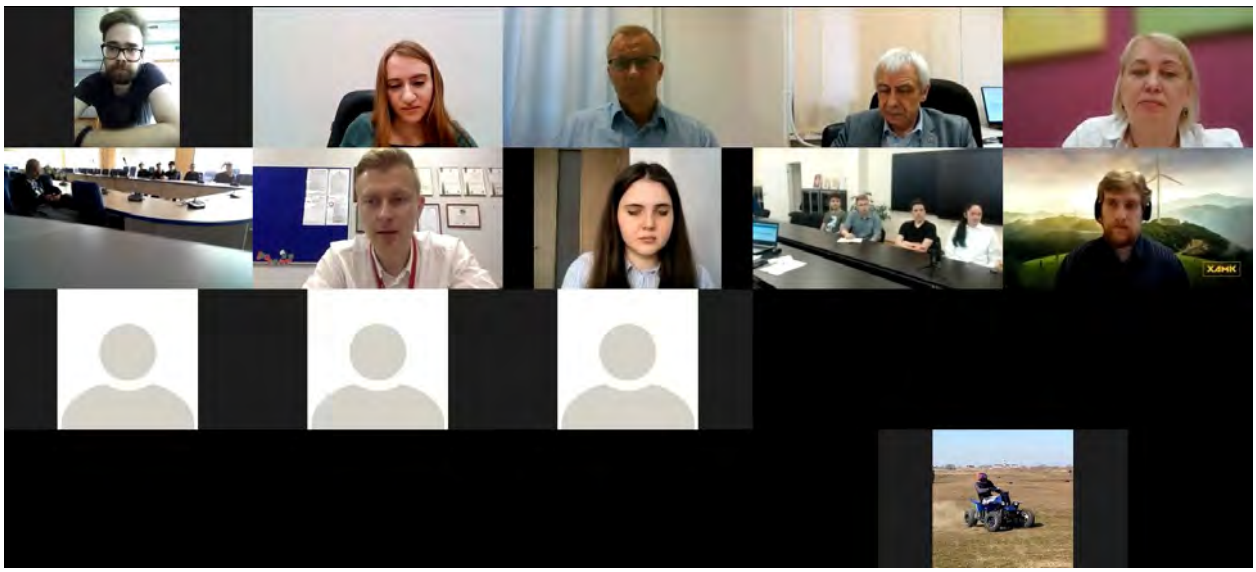
initiatives, especially in the field of personnel competence development, since the training of highly qualified specialists begins from the school bench. The symbiosis between industry and education is very important. We are glad to see that it is developing in an international way. We wish all participants good, interesting tasks, fruitful work. You can prove yourself and get acquainted with the existing problems in the market. Perhaps in the future you will be able to find yourself in these organizations".



Picture 28. Greetings from the St. Petersburg Cluster Development Centre and Industry Development Center of the Leningrad Region (ZOOM screenshot)

Vera Shtokaylo, General Director of the autonomous non-commercial organization "Industry Development Centre of Leningrad Region" said:

«There are <u>three directions</u> in the structure of the "Industry Development Centre of Leningrad Region". <u>One of them</u> is the Cluster Development Center of Leningrad region, which helps the development of cluster initiatives and cooperation. <u>The second direction</u> is to help Russian companies in bringing their products to foreign markets, <u>the third</u> is to increase labor productivity at enterprises of the Leningrad region. As part of the third direction, we have created a "Process Factory", where we train college students and enterprise specialists. This project makes a great contribution to the development of the two regions and the Russian Federation as a whole. Participation in such competitions as the Automotive Innovation Camp gives an opportunity for further development. The needs of organizations become clear. We are glad to welcome the participants. I also invite you to take an excursion to our Center, to trainings and to the "Process Factory". There are opportunities for internships and further employment. We wish you good luck!».



Picture 29. Greetings from "Metalloproduktsia" LLC (ZOOM screenshot)

Evgeny Dorofeev, Operations Director at Metalloproduktsia LLC, addressed the participants:

«At the moment, there is such a trend in the development of the automotive industry as the deepening of localization. Our country has been moving along this path for a long time. This path is rather connected not so much with the improvement of some technologies, but rather with ensuring the industrial safety of the country so that we can produce basic products. It is important to note that effective production requires volumes that are not yet available in Russia. However, we have the potential to develop R & D, engineering and services, which is connected both with the development of the automotive industry itself and with the future of car users. Our company was one of the first to supply goods to the factories of Ford, Subaru, Mitsubishi. We are the first supplier from which these companies order research and development, and for the markets of Europe, the USA and East Asia. There is potential in this, this event is relevant and timely, we are always looking for talents. Those of you who want to become an engineer can apply to the cluster "Autoprom North-West».

Then a round table was held with representatives of business and educational organizations "Science, education, sports: new opportunities for career guidance and development of children's technical creativity". Director of the Union "Autoprom North-West" **Maya Sviridova** told about the activities and main subprograms of the structural unit of the industrial cluster of the Children's Engineering Center (CEC) "Autoprom North-West".

Download the presentation of the CEC "Automotive Industry North-West" - https://disk.yandex.ru/i/wihf0CaoVP0CRg

Children's Engineering Center "Autoprom North-West"

The Children's Engineering Center "Autoprom North-West" is a structural unit of the managing company of the industrial cluster Union "Autoprom North-West".

The goal is to achieve a new quality of practice-oriented school education in accordance with the state policy for the preparation of a nationally-oriented personnel reserve for technological development and leadership of Russia in the format *"School – Higher education (Vocational education and training) – Enterprise"*.

Project objectives:

1. Creation of conditions for the disclosure and intensive development of the talents of schoolchildren in the environment of scientific and technical creativity, stimulating their interest in the field of innovations and high technologies and in obtaining the professions of specialist engineers in the automotive industry and in other areas of engineering and technical orientation.
2. Increasing the competitiveness of students through participation in project and research activities with the support of the scientific community and business in the context of network interaction of educational organizations in the region with the "Kudrovo" Education Center, which acts as the Regional Network Resource Center for the Development of Education in the Leningrad region.
3. Assistance in the formation of competencies among young people that contribute to increasing motivation for conscious professional self-determination when choosing a future profession of an engineering and technical orientation and successful self-realization in it.

Automotive cluster ANW

Automotive cluster "Autoprom North-West"

Picture 30. Children's Engineering Center "Autoprom North-West" presentation (first day of AIC, May 18, ZOOM screenshot)

At the round table, it was announced the start of the International Competition of young specialists in the automotive industry "AutoEvolution-2021", which will be held in a hybrid format in St. Petersburg. Schoolchildren, students of secondary specialized educational institutions, higher educational institutions, undergraduates and postgraduates, young specialists working in the automotive industry can take part.

Anastasia Malyavko, Project Manager at the Race4Scale project, told the order of the 4-day event Automotive Innovation Camp and clarified the main organizational points.

Representatives of the automotive industry and partners of the industrial cluster presented their business cases in the automotive industry:

1. Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set);
2. Automotive expertise of road traffic accident;
3. Mobile App "Driver's Assistant";
4. Maintenance optimization and vehicle fleet management platform using IoT;
5. Intelligent transport systems on the "Scandinavia" road section;
6. From the first Russian cars and motor vehicles to the present day (to the 125th anniversary of the first Russian production car).

The participants were given 3 days to solve these business cases. On the 4th day, the defense was held.

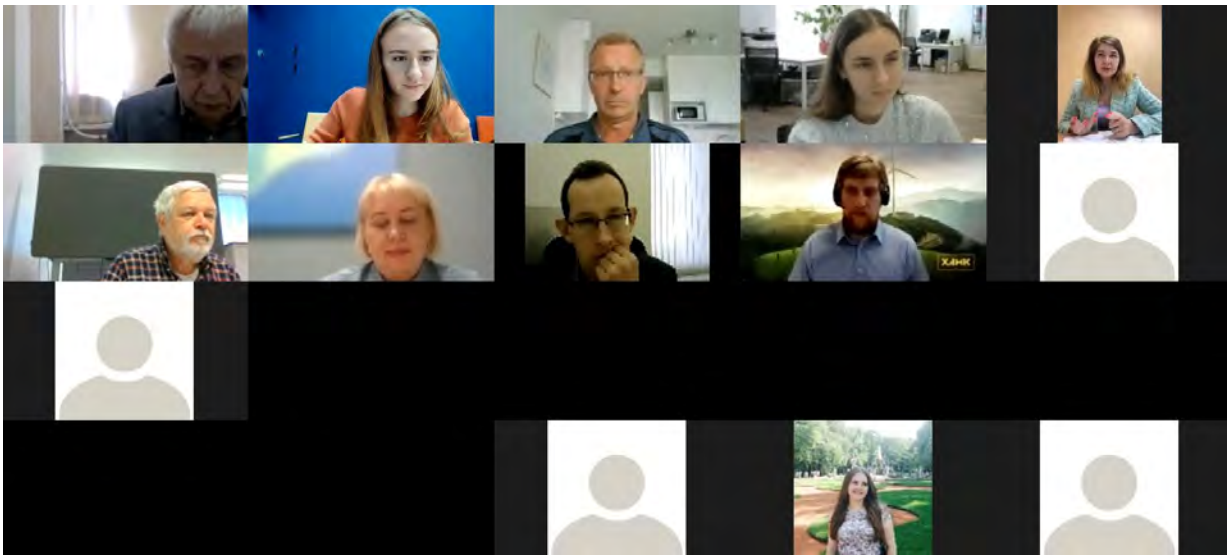
10.2. Second day (May 19, 2021)

On May 19, 2021, seminars were held from the owners of business cases, at which the participants were explained the tasks set, additional information and recommendations for solving business cases were given.

The project manager of MGBot LLC, Alexandra Bogolyubova, explained that in the business case "Maintenance optimization and vehicle fleet management platform using Internet of Things", the participants face 3 tasks:

1. the platform interface (how it will look for users);
2. specification of sensors in which it is necessary to collect information about the car;
3. the data transmission algorithm.

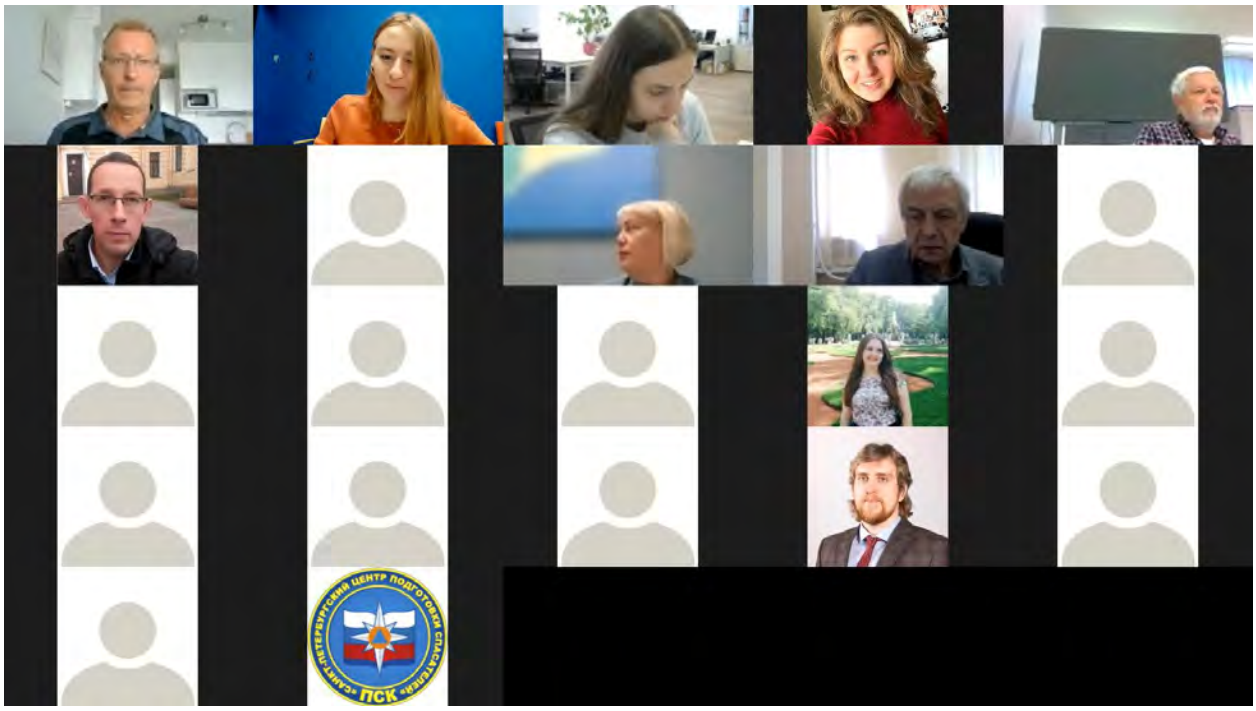
The task is to create a system with the help of which the owners of the fleet will be able to effectively manage it (car breakdowns and repairs, parking data, etc.). Participants need to start with a specific car model, they can consider the case on the example of the KAMAZ fleet. Teams need to understand what sensors are already available on KAMAZ (oil level, pads, engine, etc.). Next, it is necessary to analyze sensors and information collection systems in the domestic and foreign automotive industry. Make a list of new sensors (for example, vibration sensors of individual parts). Thus, a list of new sensors is formed, information about cars is collected and transmitted to the platform using Internet of Things. Important information about the technical condition of cars appears on the platform. For example, the inscription "it is necessary to order oil" and a list of contractors pops up.



Picture 31. Workshop from MGbot on the Platform operating via the IoT (ZOOM screenshot)

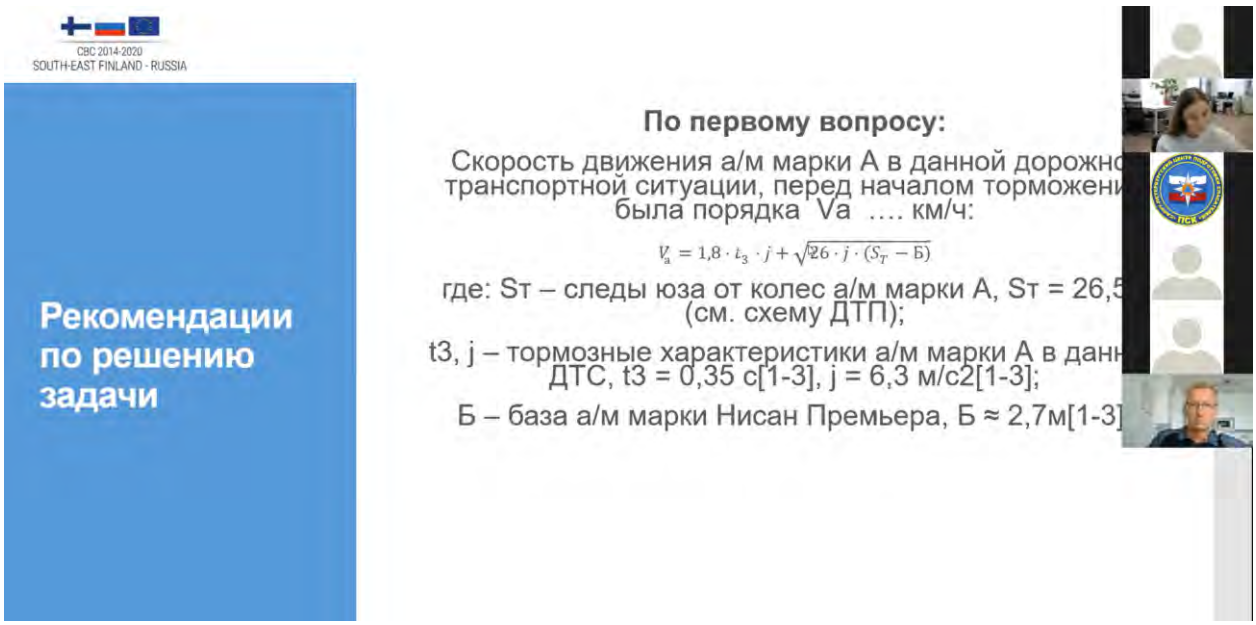
Natalia Chernykh, senior lecturer of the Department of Transport Systems at SPbGASU, noted in the business case "Intelligent Transport Systems on the Scandinavia highway section" that the participants have a main object – a reconstructed section of the "Scandinavia" highway. The participants were advised to determine the set of functions that the electric car will perform. Based on these functions, it is necessary to determine the composition of peripheral equipment (sensors, detectors, stations for determining the state

of meteorological conditions, displays for drivers, etc.). A set of literature and lectures specified in the case can help participants in this issue. Next, it is necessary to arrange the peripheral equipment on the route section. As a conclusion, it is necessary to evaluate the effectiveness: safety, environmental friendliness, comfort of movement, etc. An important point is the proposal for the introduction of innovative technologies: to ensure the movement of unmanned vehicles on the highway, the development of a user product that works through a smartphone or an on-board computer with the integration of peripheral equipment.



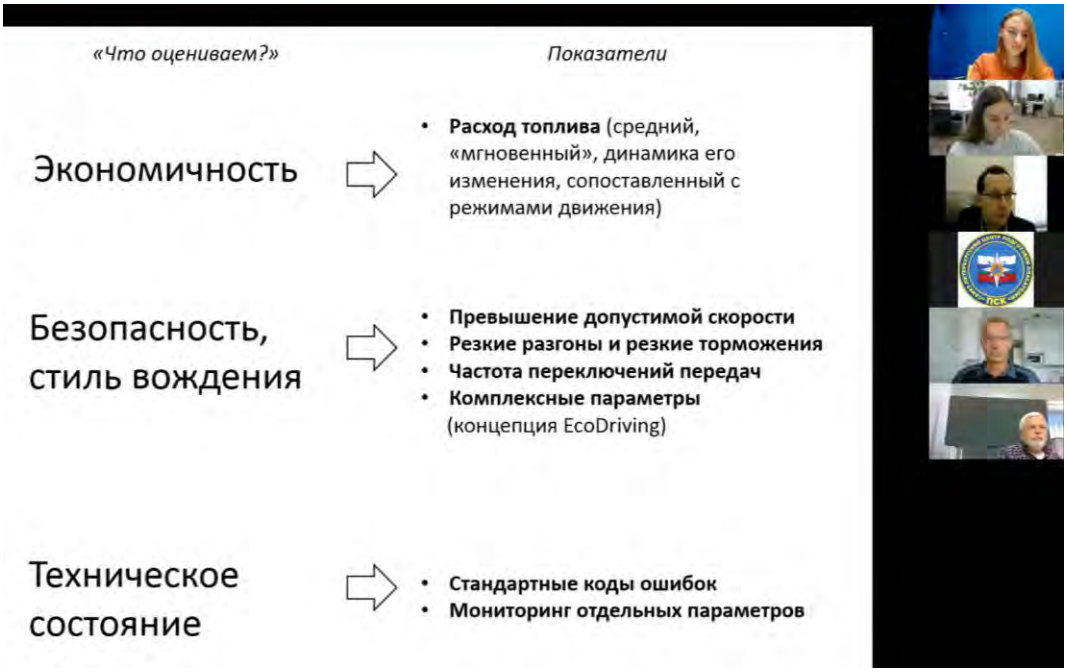
Picture 32. Workshop from SPbGASU on the intelligent transport systems (ZOOM screenshot)

Ilya Brylev, Associate Professor of the Department of Ground Transport and Technological Machines of SPbGASU, began with answers to the participants' questions on the business case “Automotive expertise of road accidents”. After that, he recommended checking the correctness of the initial data for calculating the speed of the car in this traffic situation. Based on the scheme of the accident, participants need to check whether the length of the car's tracks is indicated correctly. He suggested how to make measurements correctly (whether it is necessary to subtract the wheelbase from the measurement). The actions of drivers should be classified in terms of the Traffic Rules of the Russian Federation. Also, the participants must determine the technical possibility of preventing an accident. To do this, it is necessary to calculate the stopping distance of the car at the permissible speed of movement.



Picture 33. Workshop from SPbGASU on the automotive expertise of road accidents (ZOOM screenshot)

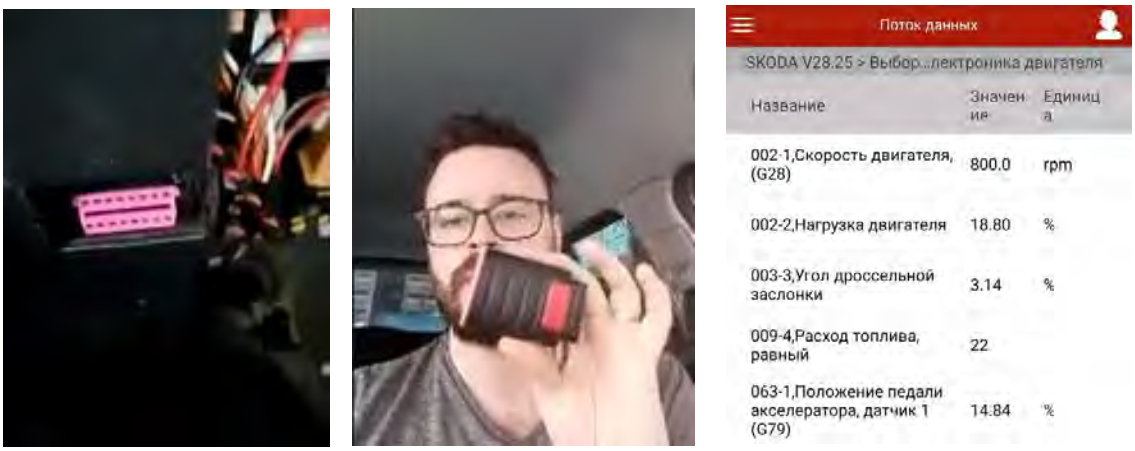
Igor Chernyaev, Head of the Department of Technical Operation of Vehicles at SPbGASU, noted that the business case "Mobile application "Driver's assistant" is aimed at individual car users. To justify the indicators for which information will be transmitted to the driver in the application, it is necessary to monitor the movement and operation of the car. Teams should offer technical means for monitoring (sensors, diagnostic adapters, GLONASS/GPS). As a result, it is necessary to propose the structure of the menu of the mobile application (it is allowed without drawing the interface).



Picture 34. Workshop from SPbGASU on the Mobile App (ZOOM screenshot)

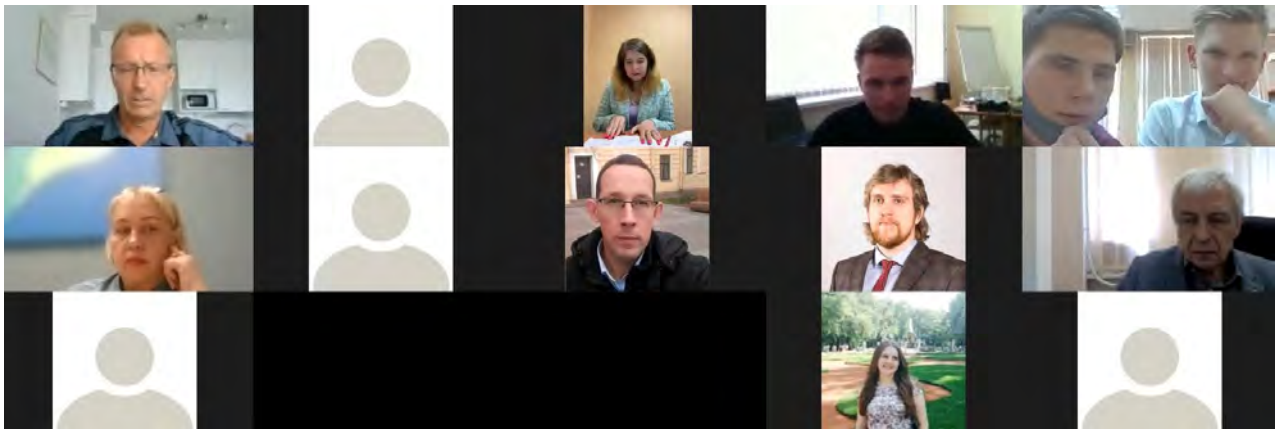
Among the main information evaluated for the driver, efficiency (fuel consumption), safety (speeding), driving style (percentage of emergency braking), technical condition of the car (standard error codes) are highlighted.

Igor Graevsky, Senior lecturer of the Department of Technical Operation of Vehicles of SPbGASU, told in more detail about monitoring the parameters of the car for this case. Any modern car is a set of connected control units (computers) that receive signals from various sensors, analyze them, and form a control effect on the actuators based on the signals. Through the video, using the ZOOM platform, Igor Graevsky showed what the diagnostic adapter looks like. Using the example of a real car, I demonstrated the OBD2 connector, and also showed an example of data monitoring through an application.



Picture 35. Diagnostic adapter, connector OBD2, mobile App (ZOOM screenshot)

Project manager of MGBot company **Bogolyubova Alexandra** told about the business case “Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)”, which is of an applied nature. Also, the documentation was transferred on a USB flash drive. The students received an educational kit (mobile robotics), which had to be assembled taking into account all the receiving devices and sensors, prescribe algorithms for the response of an unmanned vehicle to distance or heat, and then program it. An unmanned vehicle must interact with other cars, infrastructure and pedestrians using the Internet of Things, but participants can also add other elements to the data exchange between objects. MGbot provided for “communication” between two assembled unmanned vehicles “Dynamics M1”, since it is difficult to establish the interaction of several unmanned vehicles on the road, but due to the remote format of work, the algorithms for data transmission between the two cars were not prescribed by the participants. However, the participants could make their own assumptions about this.



Picture 36. Workshop from MGBot on an unmanned car (ZOOM screenshot)

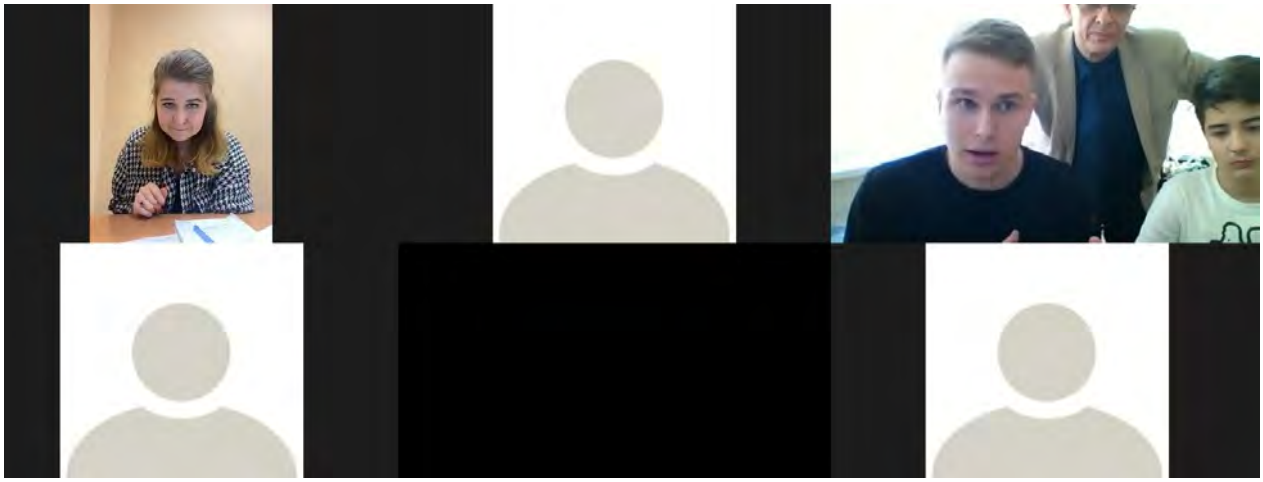
10.3. Third day (May 20, 2021)

On the third day, the individual work of the teams was carried out in separate session halls on the Zoom platform. The session rooms were attended by business case holders and engineers who answered all the questions of the participants. The work was carried out in this way on this day due to the fact that the tasks set in the cases are quite complex, and the participants were given only 3 days to solve them.

The participants were also presented with the main criteria for evaluating presentations with ready-made case solutions (Picture 37).

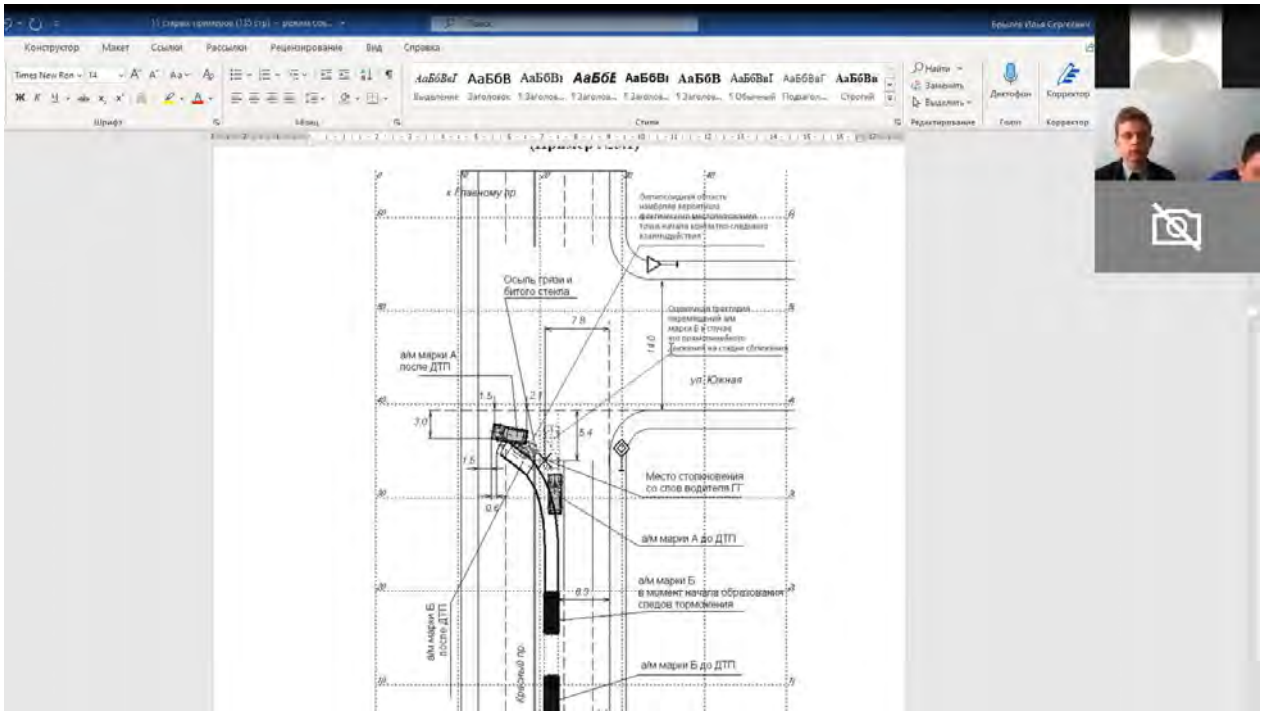
Picture 37. Criteria for evaluating presentations

Kudrovo's team had questions about the NB IoT controller, which will be able to include it in the project (Figure 38).



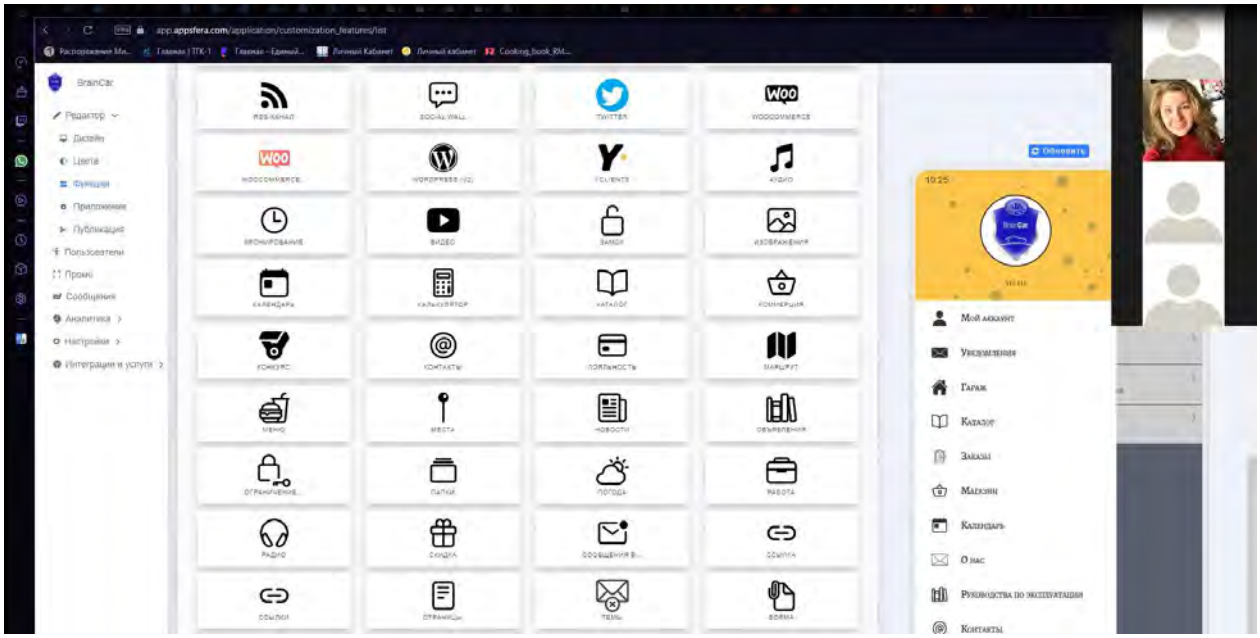
Picture 38. Kudrovo team at an individual meeting (ZOOM conference)

The team of the St. Petersburg Fire and Rescue College had a question about the way to stop in case of an accident, SPbGASU specialists consulted with the team on this issue (Picture 39).



Picture 39. St. Petersburg Fire and Rescue College team at an individual meeting (ZOOM conference)

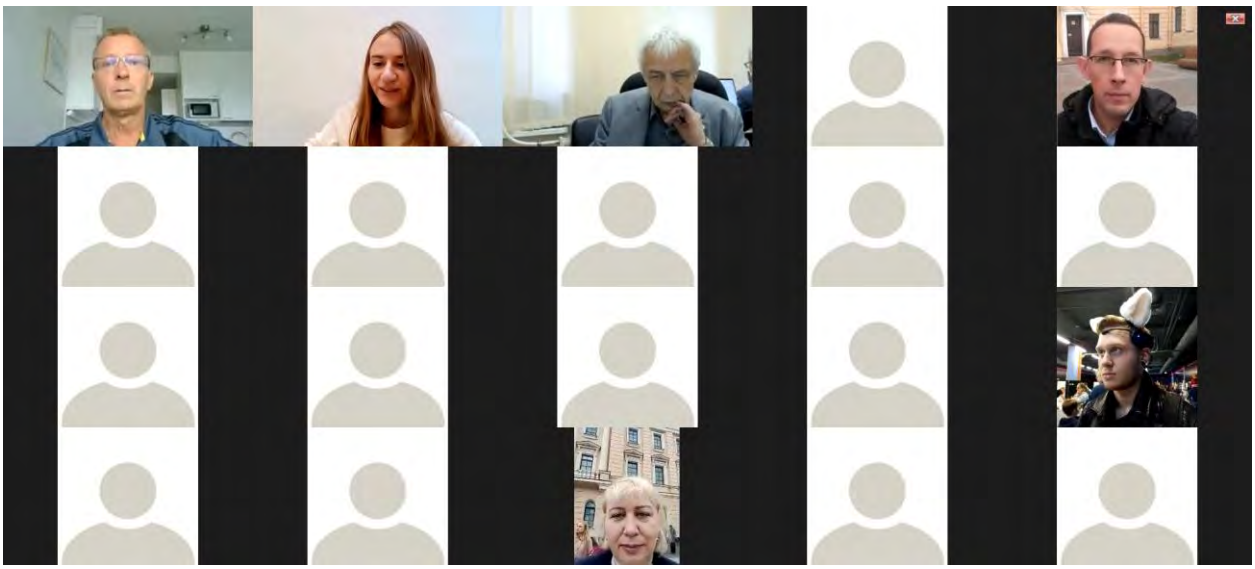
The SPbGASU team has worked out several options for solving cases for individuals and managers who own transport fleets. In addition, the team worked and discussed with representatives of the MGB more frequent maintenance depending on the area (Figure 40).



Picture 40. SPbGASU team at an individual meeting

11. Fourth day (May 21, 2021)

The final day of the Automotive Innovation Camp began with a live broadcast from the II International Transport Festival “SPbTransportFest” in 2021 in St. Petersburg, where Maya Sviridova showed the stands of leading transport companies in the field of passenger and cargo transportation (KAMAZ, MAN, IVECO, etc.). Representatives of KAMAZ PJSC, unfortunately, were not able to take a personal part in the AIC. However, they gave an interview with welcoming words for the participants.

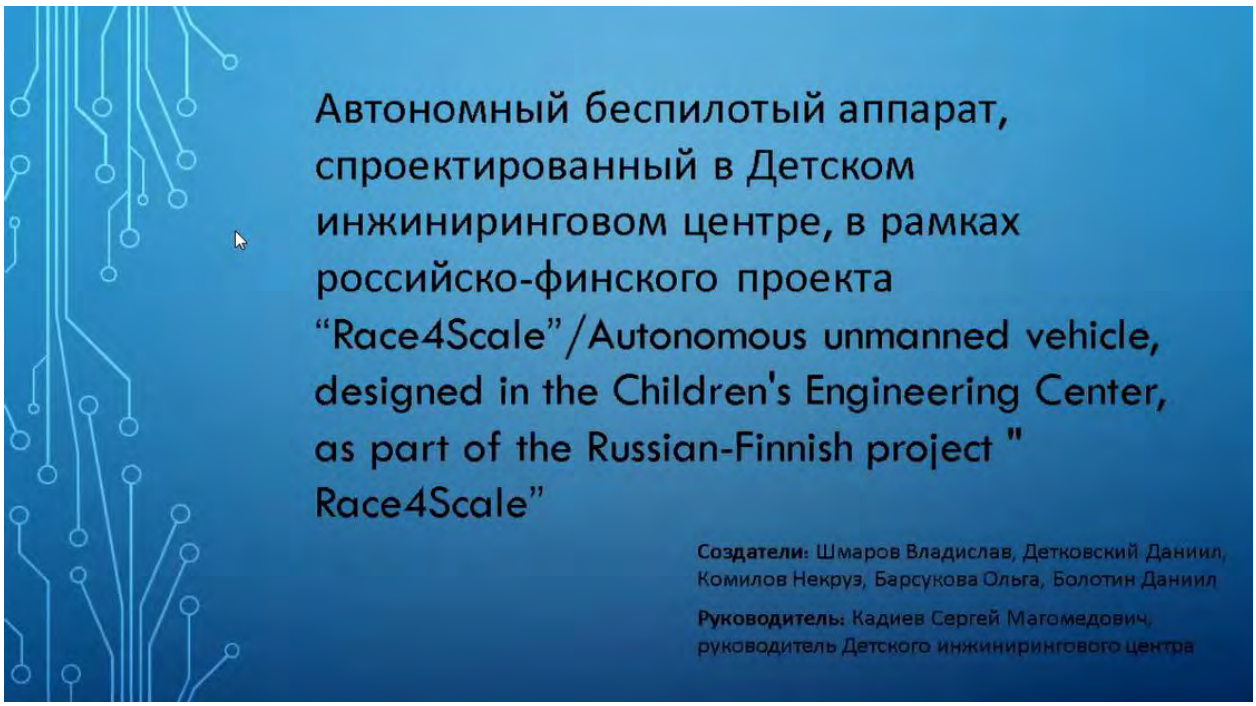


Picture 41. Live broadcast from “SPbTransportFest”

Then the participants had to present their skills and abilities in the solved business cases.

11.1. Team of the Kudrovo Technopark School – business case “Movement of an unmanned vehicle using the example of the "Dynamics M1”

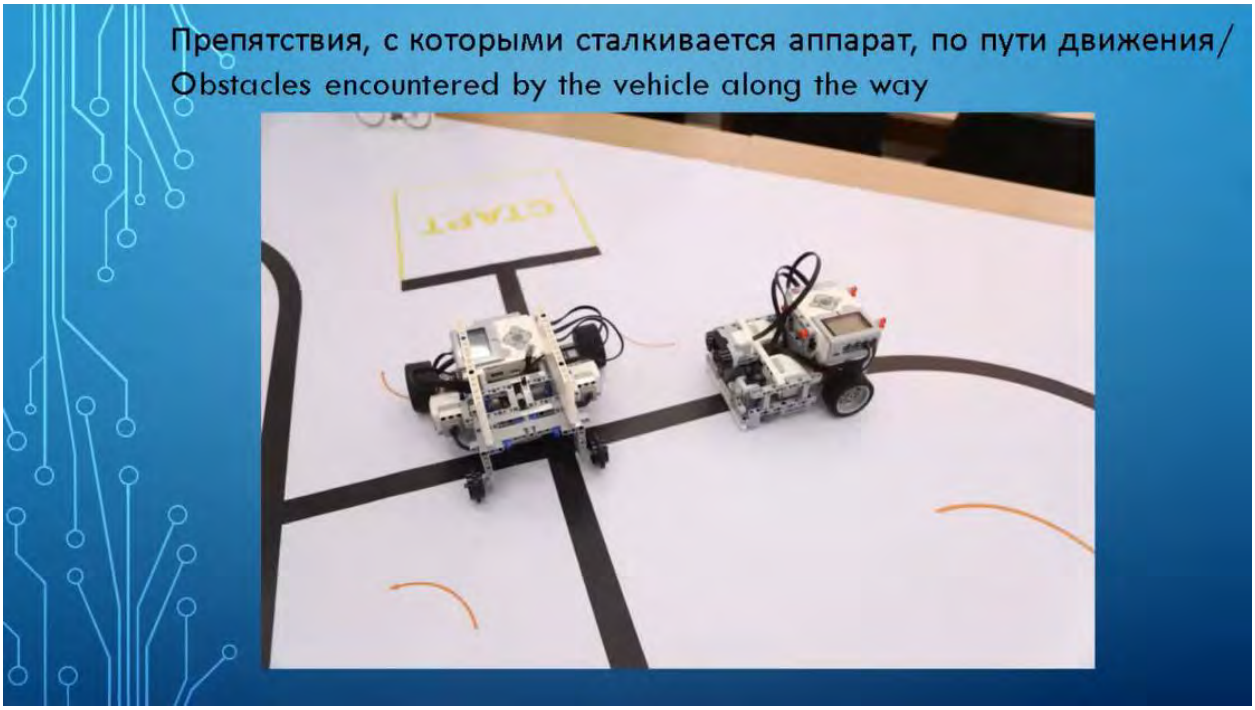
Kudrovo's team has developed a route along which the robot will move. The participants also improved the robot by adding several sensors to it: reacting to moving objects, reacting to static objects at the moment of movement. The team prepared and demonstrated a video in which the robot clearly moves along the markings, collides with a static obstacle (a cyclist) and makes a stop. Then the second robot starts, when approaching which the first robot takes safe actions and stops, after bypassing the obstacle, the movement continues. In this case, any route can be designed.



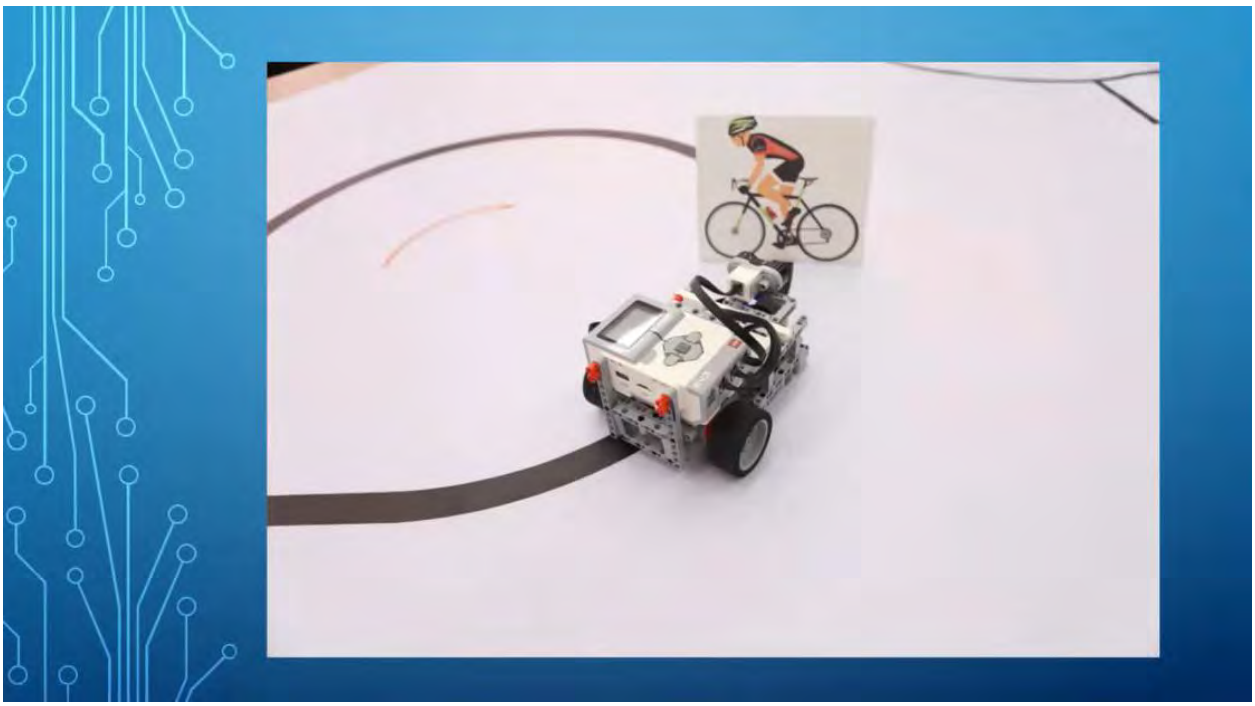
Picture 42. Presentation of the Kudrovo Technopark School team (slide 1)

Picture 43. Presentation of the Kudrovo Technopark School team (slide 2)

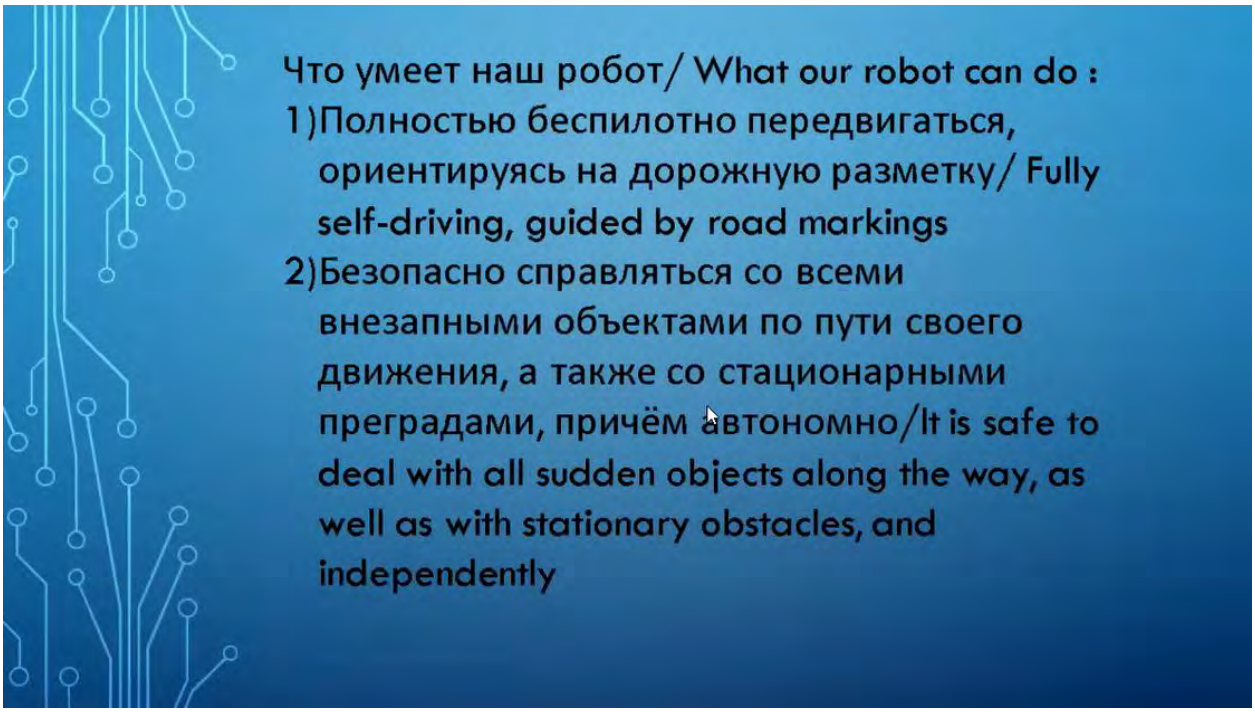
Picture 44. Presentation of the Kudrovo Technopark School team (slide 3)



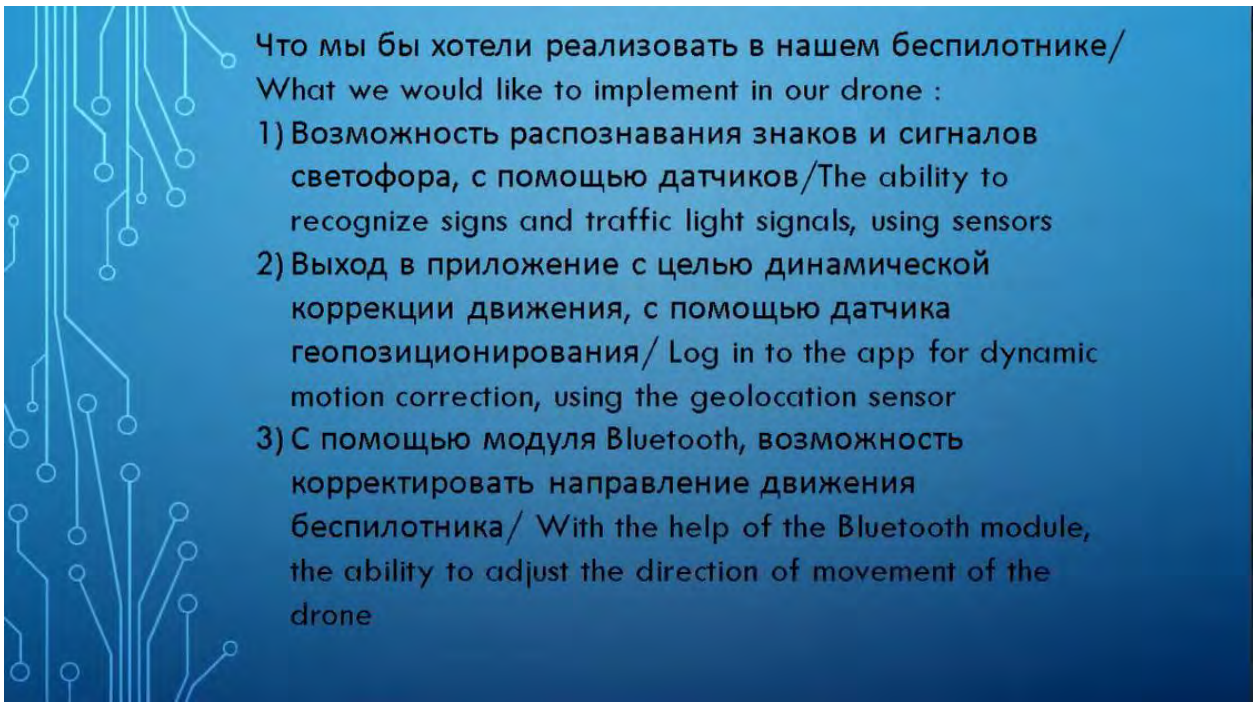
Picture 45. Presentation of the Kudrovo Technopark School team (slide 4)



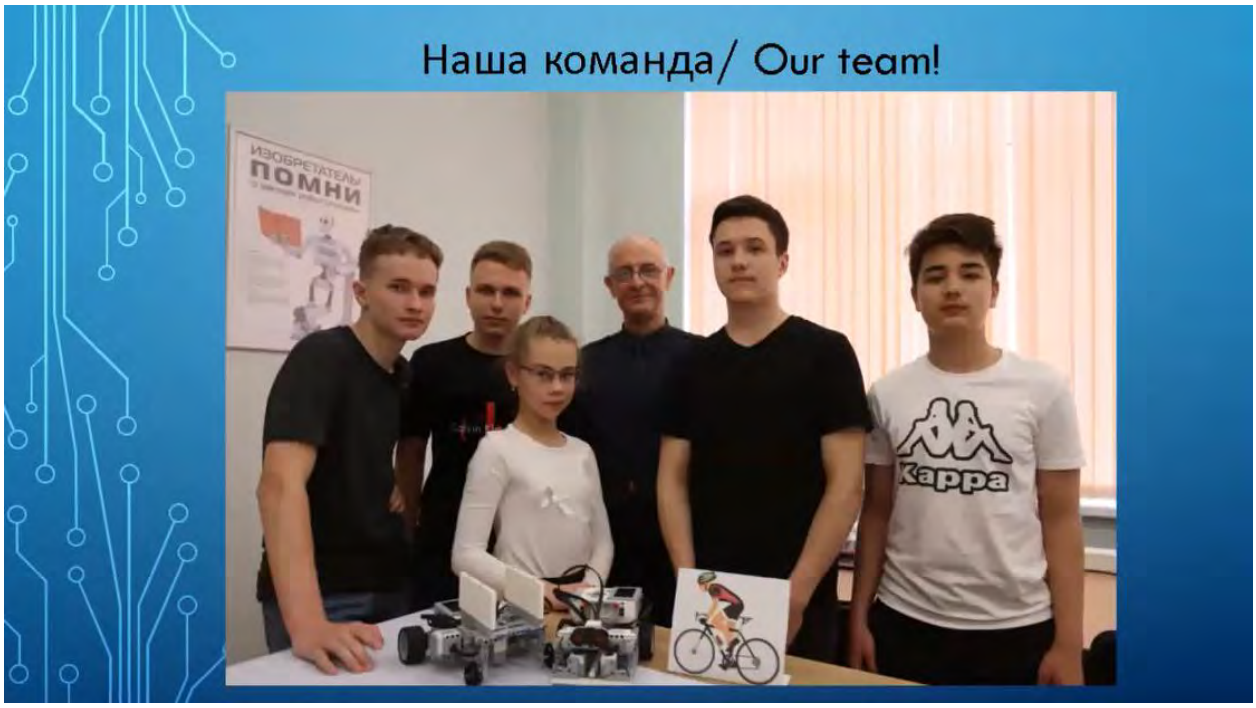
Picture 46. Presentation of the Kudrovo Technopark School team (slide 5)



Picture 47. Presentation of the Kudrovo Technopark School team (slide 6)



Picture 48. Presentation of the Kudrovo Technopark School team (slide 7)

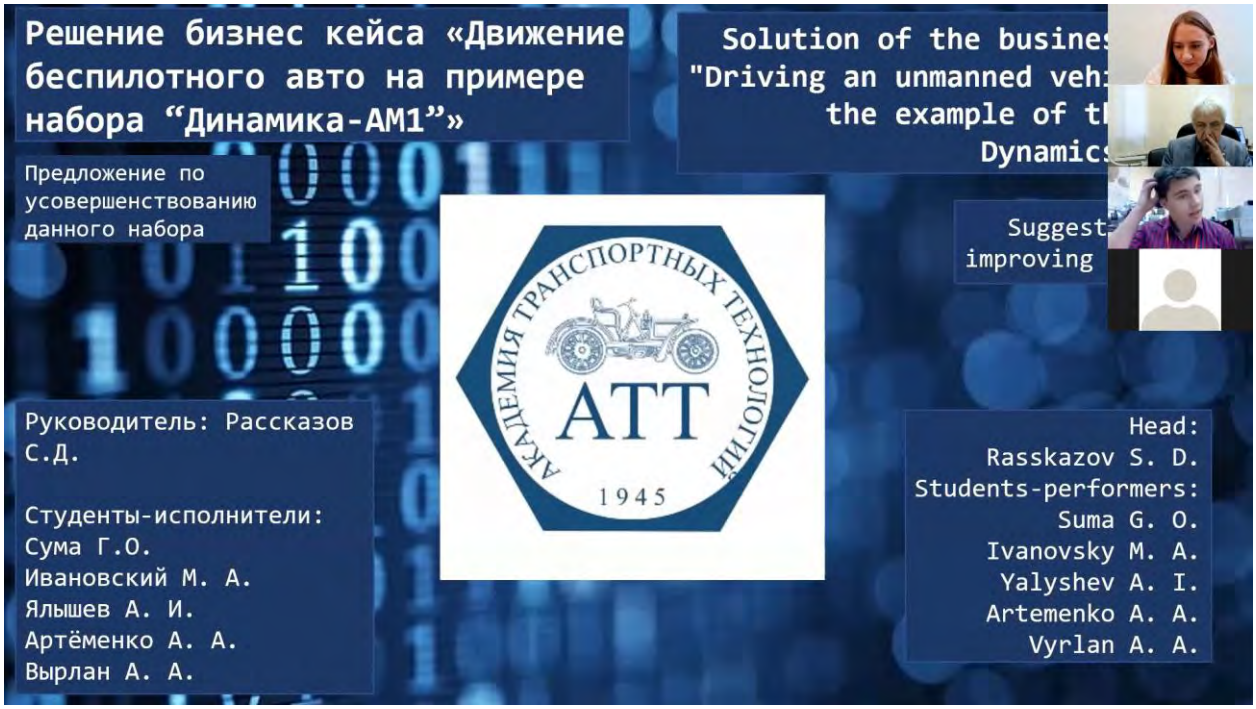


Picture 49. Presentation of the Kudrovo Technopark School team (slide 8)

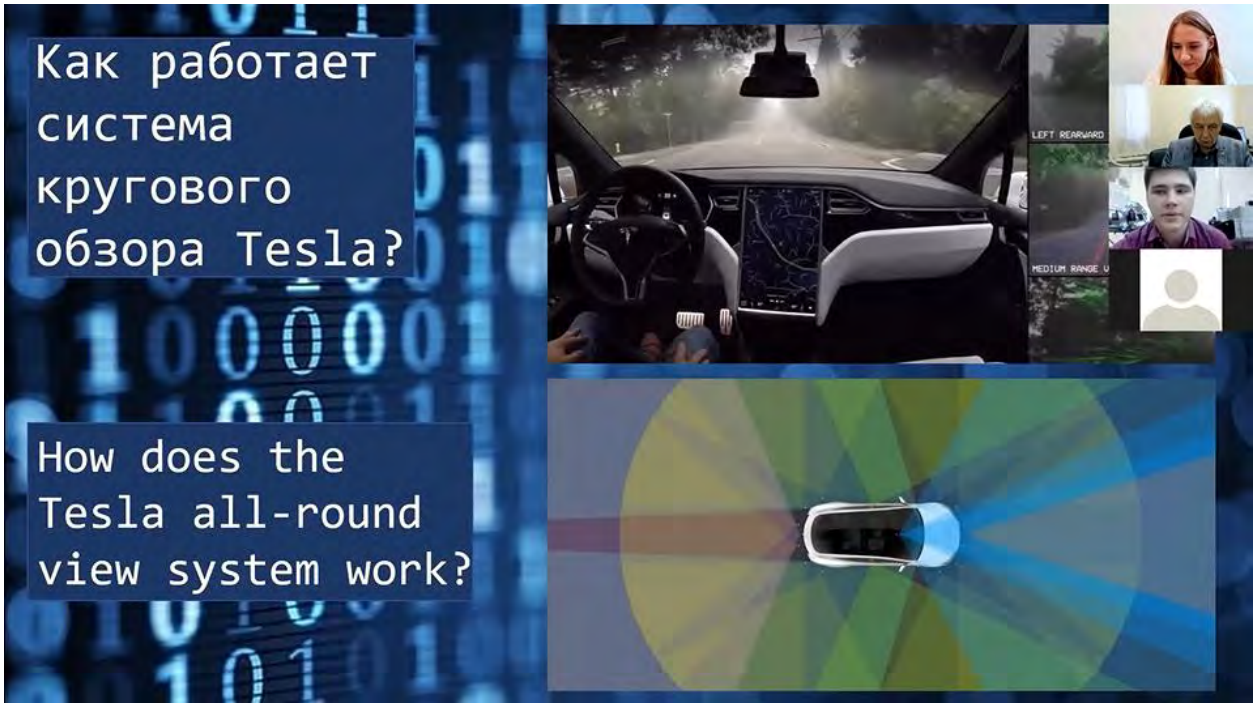
11.2. Team of the Academy of Transport Technologies – business case "Movement of an unmanned vehicle using the example of the "Dynamics M1"

The team of the Academy of Transport Technologies offered options for improving the "Dynamics M1" set. Tesla uses a circular viewing system, but in these conditions it cannot be used because of the high cost. Therefore, the team suggested using light-sensitive

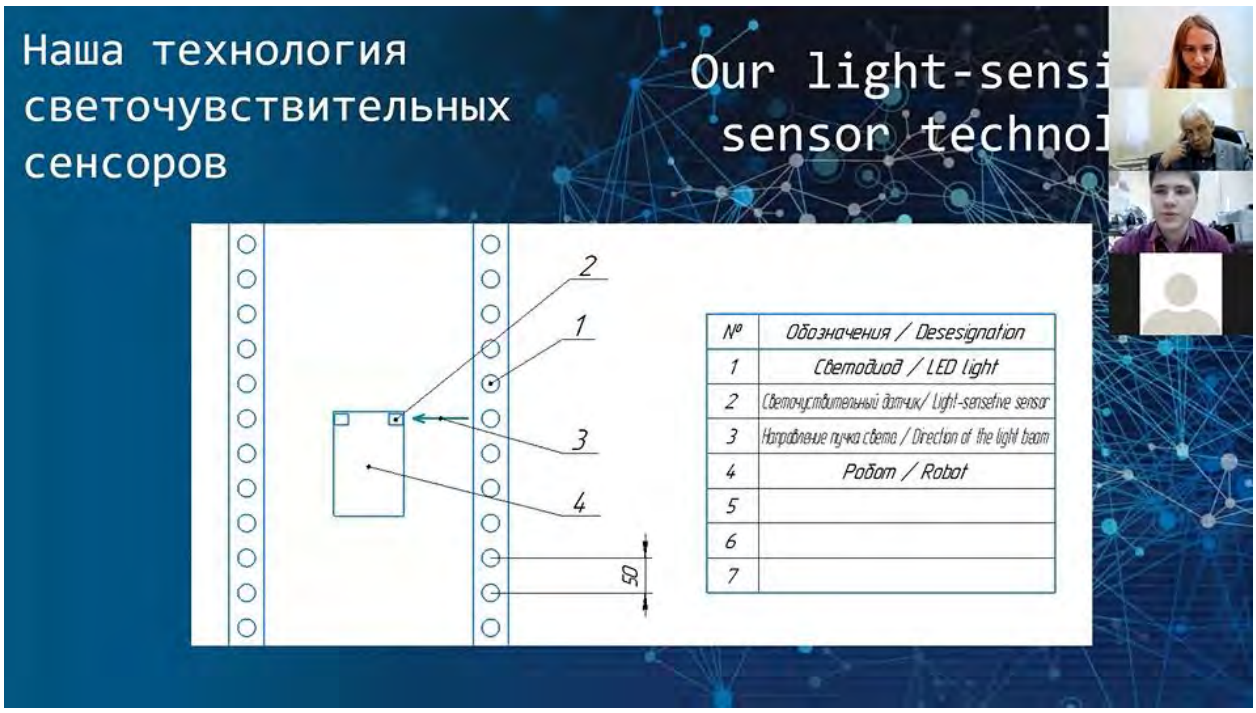
sensors as an alternative. For “communication” between unmanned vehicles, it was proposed to combine the work of GPS modules with satellite navigation.



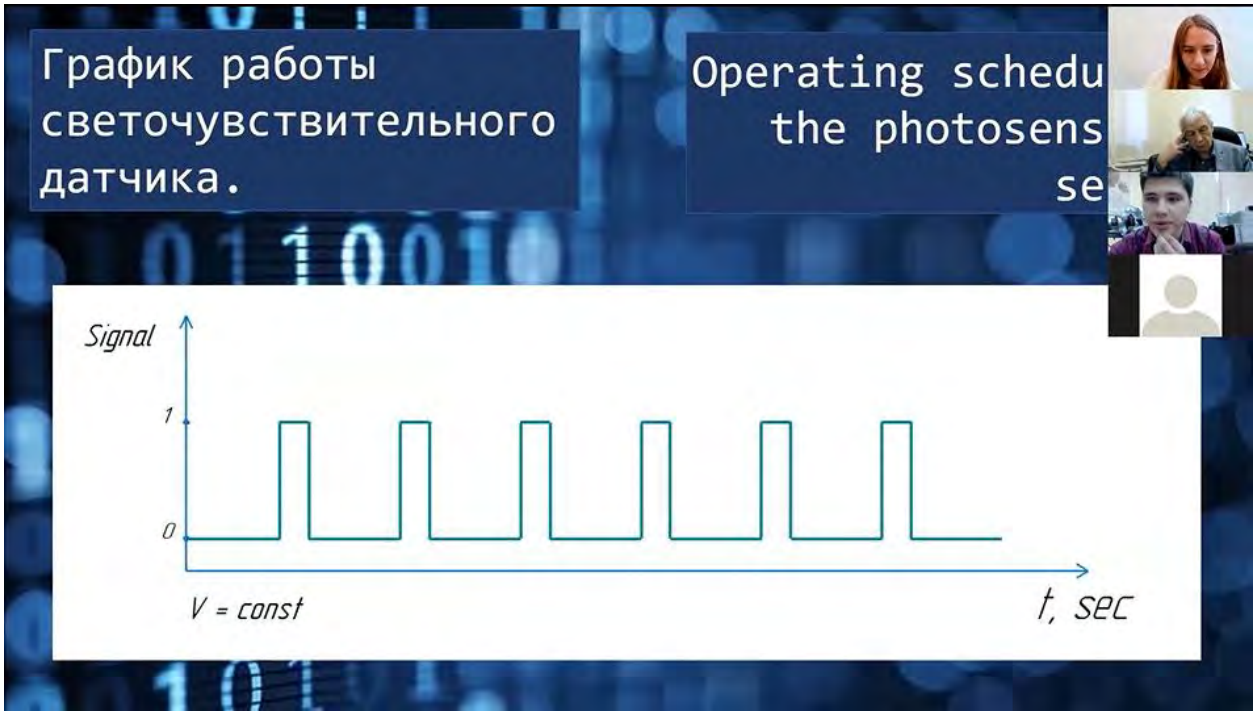
Picture 50. Presentation of the Academy of Transport Technologies team (slide 1)



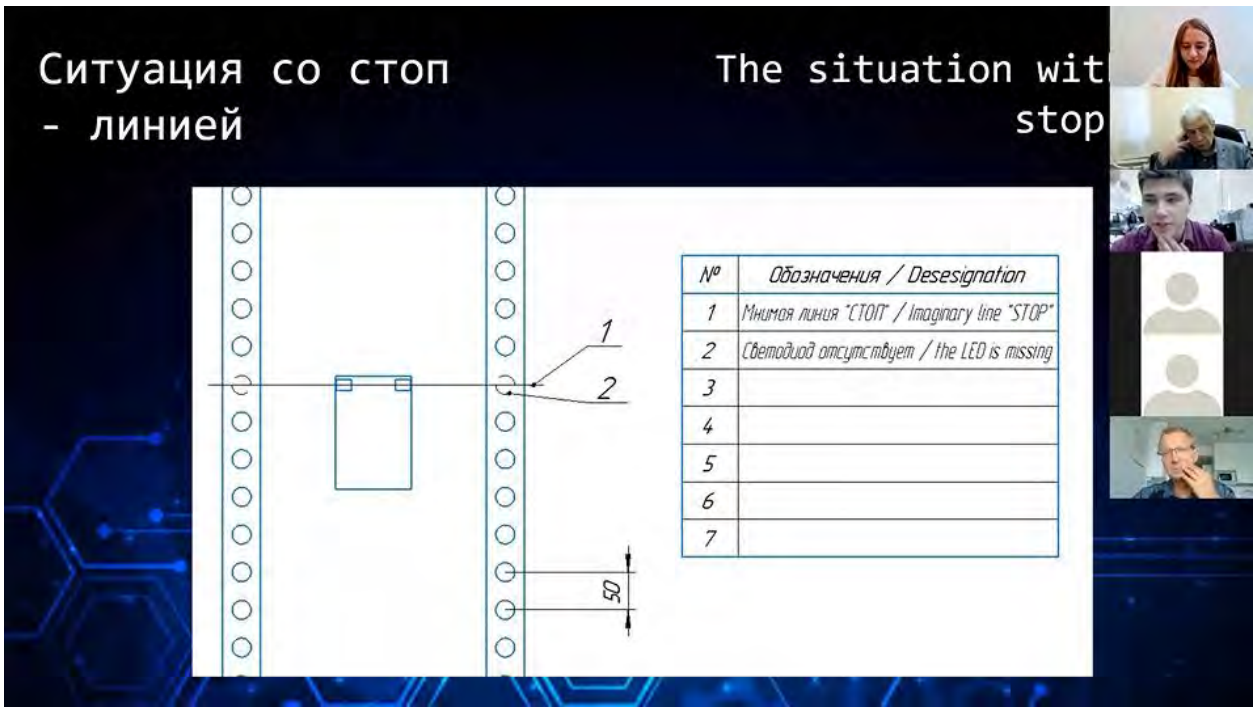
Picture 51. Presentation of the Academy of Transport Technologies team (slide 2)



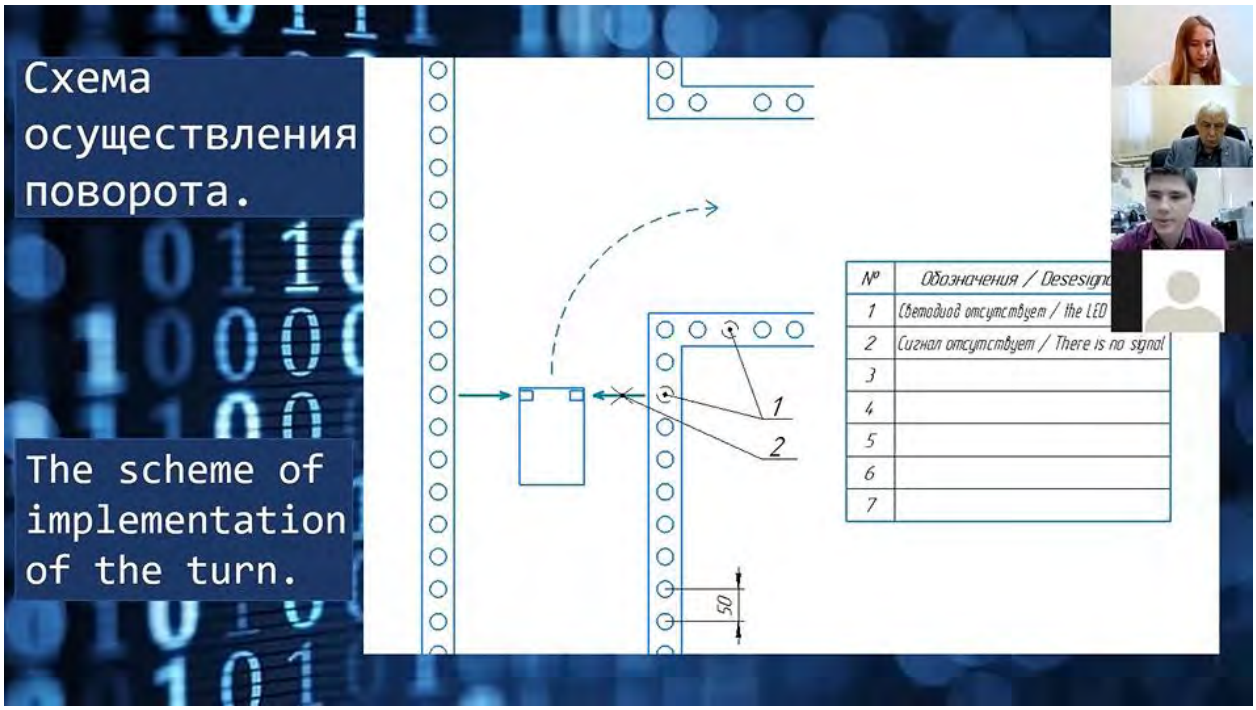
Picture 52. Presentation of the Academy of Transport Technologies team (slide 3)



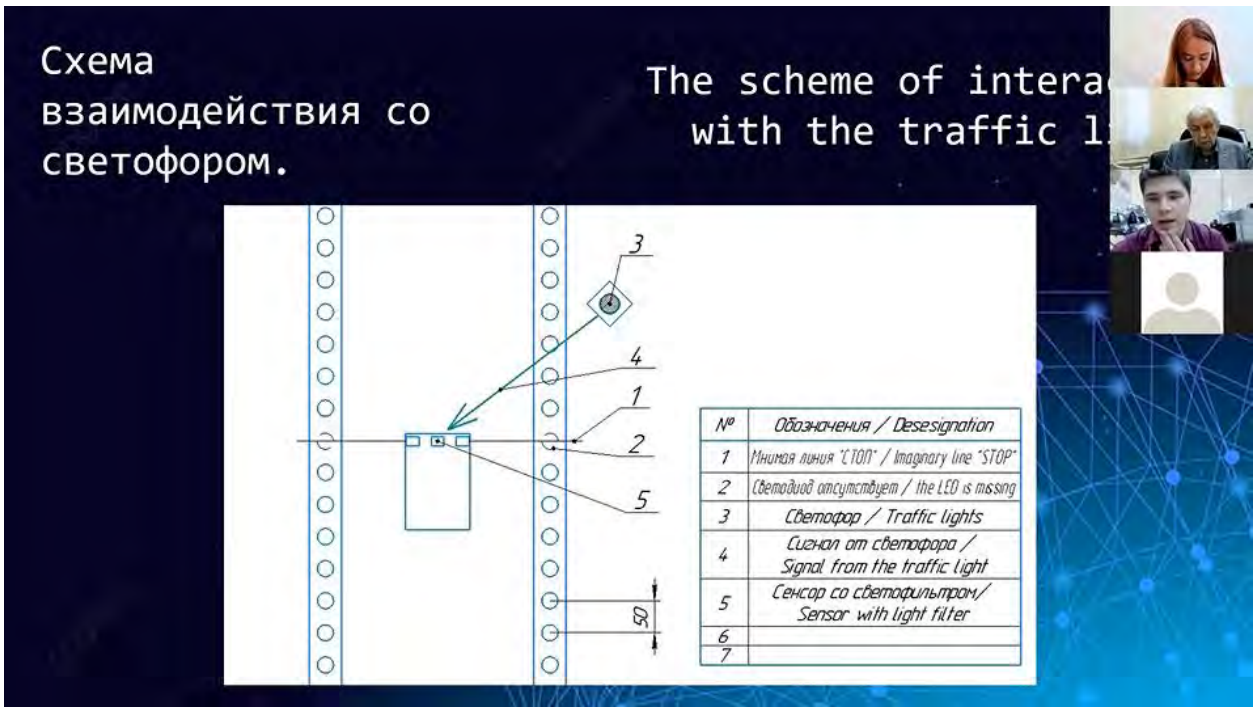
Picture 53. Presentation of the Academy of Transport Technologies team (slide 4)



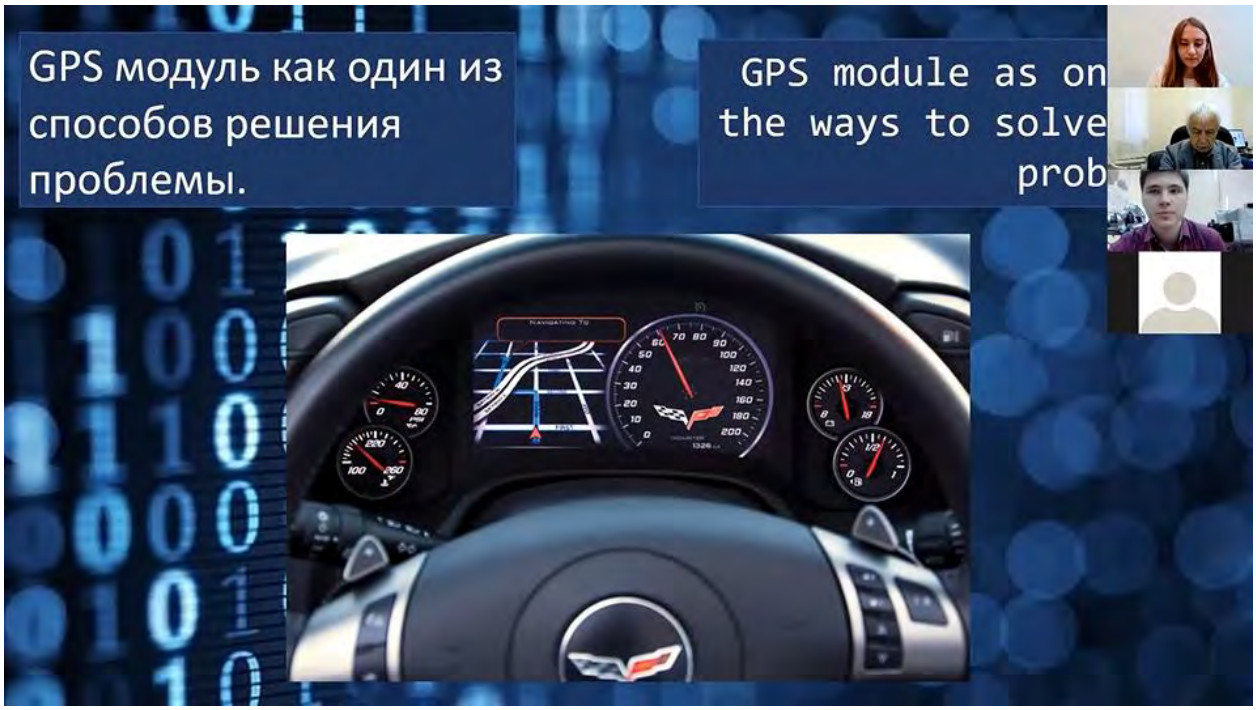
Picture 54. Presentation of the Academy of Transport Technologies team (slide 5)



Picture 55. Presentation of the Academy of Transport Technologies team (slide 6)



Picture 56. Presentation of the Academy of Transport Technologies team (slide 7)



Picture 57. Presentation of the Academy of Transport Technologies team (slide 8)

11.3. Team of the St. Petersburg Fire and Rescue College – business case "Automotive expertise of road traffic accident"

FIRE AND RESCUE COLLEGE

SAINT PETERSBURG RESCUE TRAINING CENTER

Address: 193315, St. Petersburg, Bolshevikov Ave., 52, building 1, lit.

EXPERT OPINION

based on the materials of inspection by KUSP No. 300 dated 05/20/2021 on the fact of an accident that took place on 05/18/2021 on Zeleny Prospekt, in the direction from Tikhiy Prospekt towards Shirokiy Prospekt

May 21, 2021 № 777 / 2-5 / 13.1

The examination started: at 11:00 on May 18, 2021.

The examination is over: at 11:00 on May 20, 2021.

The expertise is entrusted to: Students of the St. Petersburg State Budgetary Professional Educational Institution "Fire and Rescue College" St. Petersburg Rescuer Training Center A.S. Paramonov, D.O. Machekhina, V.A.Tropin, E.A. Kirinchuk, Kletsko E.V., 1st year students of the department "Auto mechanic"

From the forensic autotechnical expert, candidate of technical sciences, associate professor of the department of ground transport and technological machines - Bryley I.S., for the production of autotechnical expertise to investigate the circumstances of the accident, materials were received from the KUSP No. 300 of 05/20/2021.

THE QUESTIONS ARE POSED BY THE EXPERT:

1. What was the speed of the A car in this traffic situation, before the start of braking?

2. How should the driver act in this traffic situation in accordance with the requirements of the Road Traffic Regulations?

3. Was the driver technically able to prevent this road accident?

4. Did the driver's actions comply with the requirements of the Road Traffic Regulations?

5. How should a pedestrian act in this traffic situation in accordance with the requirements of the Road Traffic Regulations? Did his actions comply with the requirements of the Road Traffic Regulations.

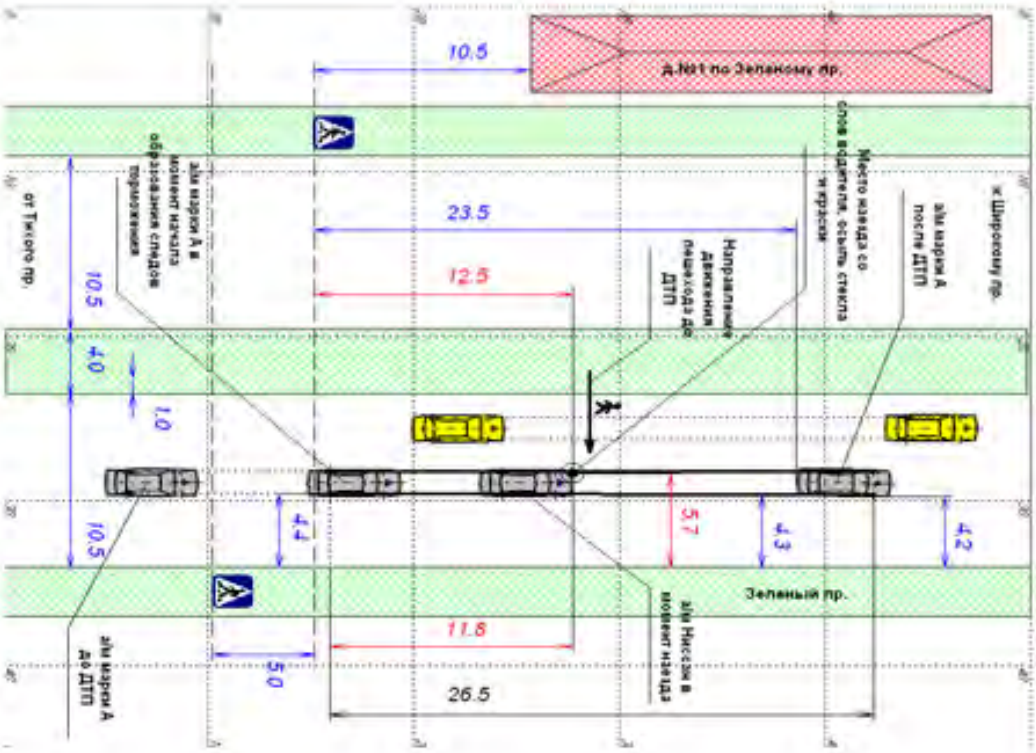
Picture 58. Expert opinion of Fire and Rescue College on the solution of the business case by the team (page 1)

IDENT

XX XXXX 200xg. about XX hour. XX min. driver BB, driving a car of brand A, license plate XXXXX, followed in the second lane (according to the driver of BB) along Zelyoniy pr. in the direction from Tykhoy pr. towards Shirokoy pr. in daylight conditions of the road, unlimited visibility, asphalt dry.

In the area of d. No. 1 on Zeleny Prospect, the driver of the BB, moving at a speed of about 60 km / h (according to the driver of the BB), outside the pedestrian crossing zone, hit a pedestrian VV (36 years old), who, crossing the carriageway from left to right relative to the direction of movement of the brand A car went (according to the victim - at the pace of a quick step) into the lane of the brand A vehicle because of the vehicle moving in the same direction of movement with the A car, in front of and to the left of it (see. explanations of the driver of the BB and the witness GG - the driver of the passing car).

On the roadway there are traces of braking from the wheels of A brand cars, about 26.5 m long (see the accident diagram). Loading a car of brand A - 3 passengers, 3 bags in the luggage compartment.



Picture 59. Expert opinion of Fire and Rescue College on the solution of the business case by the team (page 2)

RESEARCH

On the first question:

The speed of the A car in this traffic situation, before the start of braking, was about Va.... km / h:

$$V_a = 1{,}8 \cdot t_з \cdot j + \sqrt{26 \cdot j \cdot (S_T - Б)}$$

- St - traces of skid from the wheels of a brand A, St = 26.5 m (see the accident diagram);
- t3, j - braking characteristics of a / m brand A in this TTS, t3 = 0.35 s [1-3], j = 6.3 m / s2 [1-3];
- B - base of the Nissan Premier brand, B ≈ 2.7m [1-3].

$$V_a = 1{,}8 \cdot 0{,}35 \cdot 6{,}3 + \sqrt{26 \cdot 6{,}3 \cdot (26{,}5 - 2{,}7)} = 66{,}4 \text{ км/ч}$$

Result on the first question: the speed of a brand A car is 66.4 km / h

On the second question:

In this road traffic situation, the driver of the A, BB brand had to act in accordance with the requirements of clauses 10.1, 10.2 of the RF Traffic Rules, namely:

-*p.10.1ch.1* of the SDA: The driver must drive the vehicle at a speed not exceeding the established limit, taking into account the traffic intensity, features and condition of the vehicle and cargo, road and meteorological conditions, in particular visibility in the direction of travel. The speed should provide the driver with the ability to constantly monitor the movement of the vehicle in order to comply with the requirements of the Rules.

-*p.10.1ch.2* of the SDA: If there is a danger to traffic that the driver is able to detect, he must take possible measures to reduce the speed until the vehicle stops.

-*p.10.2* SDA: In settlements, vehicles are allowed to move at a speed of no more than 60 km / h, and in residential areas, bicycle zones and in courtyards no more than 20 km / h.

Note: By decision of the executive authorities of the constituent entities of the Russian Federation, an increase in speed (with the installation of appropriate signs) on road sections or lanes for certain types of vehicles may be allowed, if road conditions ensure safe movement at a higher speed. In this case, the value of the permitted speed should not exceed the values established for the respective types of vehicles on the motorways.

On the third and fourth question:

The presence of a driver of a car of brand A, BB, the technical ability to prevent a collision with a pedestrian in a given road traffic situation, at the maximum permissible speed in this TTP, can be expressed by the following inequality:

So <Sy,

Picture 60. Expert opinion of Fire and Rescue College on the solution of the business case by the team (page 3)

- So - stopping distance of a car of brand A during emergency braking, with the maximum permissible speed Vd in a given traffic situation, equal to 60.0 km / h, see paragraph 10.2 of the RF SDA.
- Sy - removal of the A-brand vehicle from the place of collision with the pedestrian, recorded on the road accident diagram, at the moment of braking, at the actual speed of the A-Va brand vehicle, determined in the study on the first question.

Let us determine, as an estimate, the stopping distance of a brand A car in a given TTS, during emergency braking, at the maximum permissible speed VD in a given road transport situation, which is about SO = ... m:

$$S_o = (t_1 + t_2 + 0.5 \cdot t_3)\frac{V_Д}{3,6} + \frac{V_Д^2}{26 \cdot j} \approx \ldots . \quad м$$

- t1 is the reaction time of the driver of the BB in this TTS, t1 = 1.0 s [1-3];
- t2 - braking characteristics of a car of brand A in this TTS, t2 = 0.1 s [1-3];
- t3, j, VД - see above research on the first question.

$$S_o = (1c + 0,1c + 0.5 \cdot 0,35c)\frac{60км/ч}{3,6} + \frac{60\ км/ч^2}{26 \cdot 6,3\ м/с^2} \approx 35,7$$

Let us determine, as an estimate, the distance of the A-brand car from the place of the collision with the pedestrian, recorded on the road accident diagram, at the moment of the start of braking, at the actual speed of the A-Va car, which in this case is a distance of the order of Sy ≈ ... m:

$$S_y = (t_1 + t_2 + 0,5 \cdot t_3) \cdot \frac{V_a}{3,6} + S_t' - Б - L_{ПС} \approx \ldots . \ м$$

- t1, t2, t3, j - (see above);
- Va, B - see above, research on the first question;
- St '- brake track of a car of brand A from its beginning, recorded at mark 4.4 m from the right edge of the carriageway (in the direction of movement of a car of brand A) to the place of collision with a pedestrian, recorded on the road accident diagram at mark 5, 7 m from the right edge of the carriageway (in the direction of the A-car before the accident), estimated, St '= 11.8 m (see the scale diagram of the accident);
- Lps is the length of the front overhang of a brand A, Lps 0.8 m [1-3].

$$S_y == (1c + 0,1c + 0.5 \cdot 0,35c)\frac{66,4\frac{км}{ч}}{3,6} + 11,8 - 2,7 - 0,8 = 31,8$$

The result on the third question: thus, we have: So ≈ 35.7 m> Sy ≈ 31.8 m, which means that in this road transport situation, at the maximum permissible vehicle speed (Vd = 60.0 km / h [x]), the driver of a car of brand A, g / n XXXXX, BB, did not have the technical ability to prevent a collision with a pedestrian in this traffic situation.

However, as can be seen from the study on the first question, the speed of the car of brand A, g / n XXXXX in this road transport situation, before the start of braking was about Va ≈ 66.4 km / h.

Consequently, in this road transport situation, the actions of the driver of a car of brand A, g / n XXXXX, BB did not meet the requirements of clause 10.1 h.1, 10.2 of the RF Traffic Rules (see above).

Picture 61. Expert opinion of Fire and Rescue College on the solution of the business case by the team (page 4)

On the fifth question:

In the current traffic situation, the pedestrian VV had to act in accordance with the requirements of clauses 1.3, 1.5, 4.3 of the Traffic Rules of the Russian Federation, namely:

-*p.1.3* SDA - Road users are obliged to know and comply with the requirements of the Rules, traffic signals, signs and markings related to them, as well as follow the orders of the traffic controllers acting within the limits of their rights and regulating traffic with established signals;

-*p.1.5* SDA - Road users must act in such a way that they do not create danger for traffic and do not cause harm.

It is forbidden to damage or contaminate the road surface, remove, block, damage, unauthorized installation of road signs, traffic lights and other technical means of organizing traffic, leave objects on the road that interfere with traffic. The person who created the obstacle is obliged to take all possible measures to eliminate it, and if this is not possible, then using available means to ensure that traffic participants are informed about the danger and inform the police;

-*p.4.3* SDA - Pedestrians must cross the road at pedestrian crossings, including underground and aboveground ones, and in their absence - at intersections along the line of sidewalks or roadsides.

At a regulated intersection, it is allowed to cross the carriageway between opposite corners of the intersection (diagonally) only if there are markings 1.14.1 or 1.14.2, indicating such a pedestrian crossing.

(the paragraph was introduced by the Decree of the Government of the Russian Federation of 02.04.2015 N 315)

If there is no crossing or intersection in the visibility zone, it is allowed to cross the road at right angles to the edge of the carriageway in areas without a dividing strip and fences where it is clearly visible in both directions.

This clause does not apply to cycling areas.

As can be seen from the materials of the accident check, provided for the study, xx.xx.200xg. about xx.xxx driver BB, driving a car of brand A, license plate XXXXX, followed at a speed of about 60 km / h (according to the driver BB) along Zelenyy pr. in the direction from Tikhoy pr. towards Shirokoy pr. in conditions daylight road illumination, unlimited visibility, asphalt

In the area of d. No. 1 on Zeleny Prospect, the driver of the BB, moving in the second row (according to the driver of the BB, see also Assignment to a specialist), outside the pedestrian crossing zone, hit a pedestrian BB (36 years old), who was crossing the carriageway on the left to the right relative to the direction of movement of the A-brand vehicle (at the pace of a quick step - according to the victim) into the traffic lane of the A-brand vehicle due to the vehicle moving in the same direction as the A-vehicle, in front and to the left of it (according to the explanation of the driver BB and the witness GG - the driver of the passing vehicle).

The driver of a car of brand A, BB, applied emergency braking, but did not avoid a collision with a pedestrian. On the roadway there are traces of braking from the wheels of A brand cars, about 26.5 m long (see the accident diagram).

The location of the collision with a pedestrian is estimated to be in the traffic lane of a brand A car and is recorded on the road accident diagram, according to the driver, in the area of glass and

Picture 62. Expert opinion of Fire and Rescue College on the solution of the business case by the team (page 5)

paint chips, at an elevation of about 5.7 m from the right edge of the Zeleny Prospect carriageway, relatively direction of movement of a / m brand A (see the diagram of the accident). The width of the roadway of Zeleny Prospekt, estimated in the area of the accident site, is a distance of about 10.5 m (see the accident diagram).

Therefore, taking into account the above, in the current traffic situation, the actions of the pedestrian explosive did not meet the requirements of paragraphs 1.3, 1.5, 4.3 of the RF Traffic Rules

The literature used in the study:

1. Evtyukov S.A., Vasiliev Ya.V. Forensic auto-technical expertise. Theory and practice. Volume 1 - St. Petersburg: Petropolis Publishing House, 2018.

2. Evtyukov S.A., Vasiliev Ya.V. Forensic auto-technical expertise. Research examples. Reference data. Volume 2 - St. Petersburg: Publishing House Petropolis, 2018.

3. Puchkin V.A. Basics of expert analysis of road accidents: Database. Expert technique. Solution methods. - Rostov-on-Don: IPO PI SFU, 2010 -- 400 p.

4. Traffic rules of the Russian Federation (2020)

CONCLUSIONS:

1. The speed of the A car in this DTS, before the start of braking, was about Va = 66.4 km / h.

2. In this TPA, the driver of the BB had to act in accordance with the requirements of clauses 10.1, 10.2 of the RF Traffic Rules.

3. In the current DTS, the driver of the BB did not have (or had) the technical ability to prevent a collision with a pedestrian (indicate the correct option, based on the answer to question 3).

4. In this TPA, the actions of the BB driver did not meet the requirements of clause 10.2 of the RF Traffic Rules, but did not contradict the requirement of clause 10.1 of the RF SDA

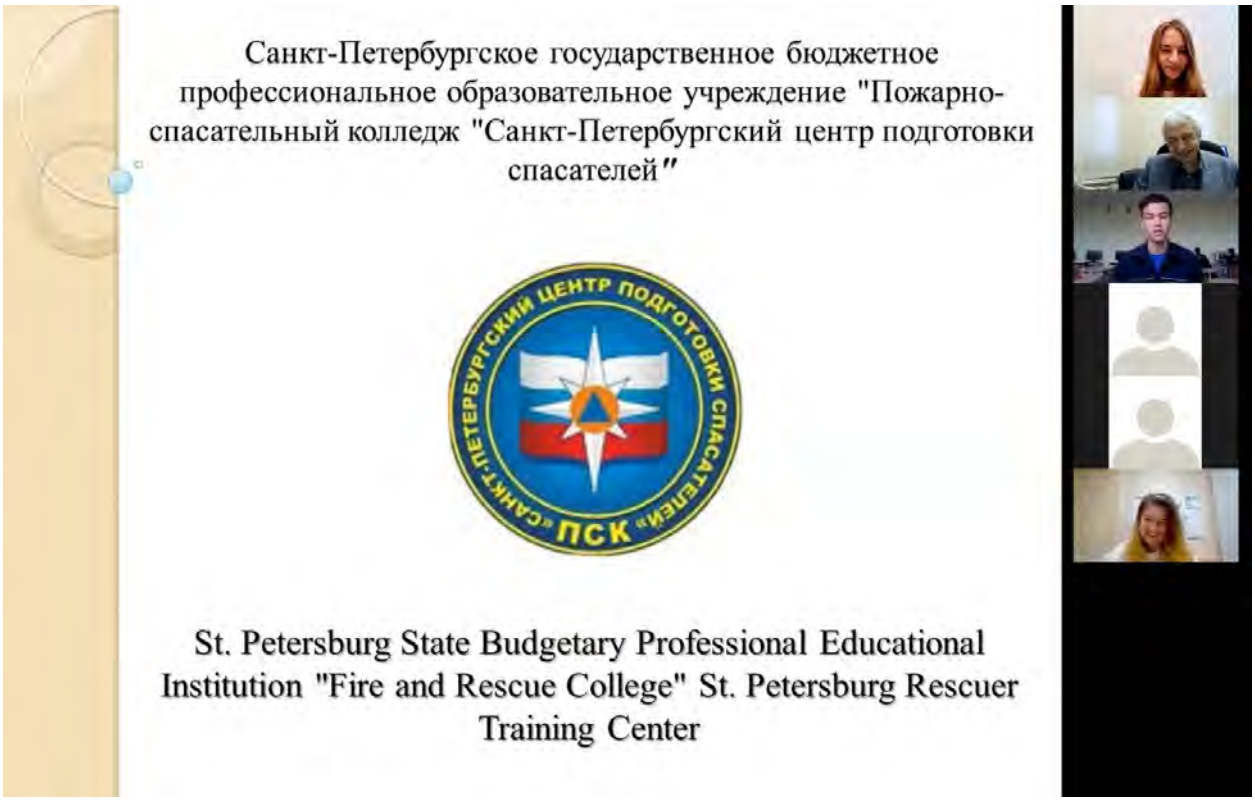
5. In this DTS, a pedestrian VV had to be guided by the requirements of clauses 1.3, 1.5, 4.3 of the RF Traffic Rules.

In the current DTS, the actions of the pedestrian explosive did not meet the requirements of clauses 1.3, 1.5, 4.3 of the RF Traffic Rules.

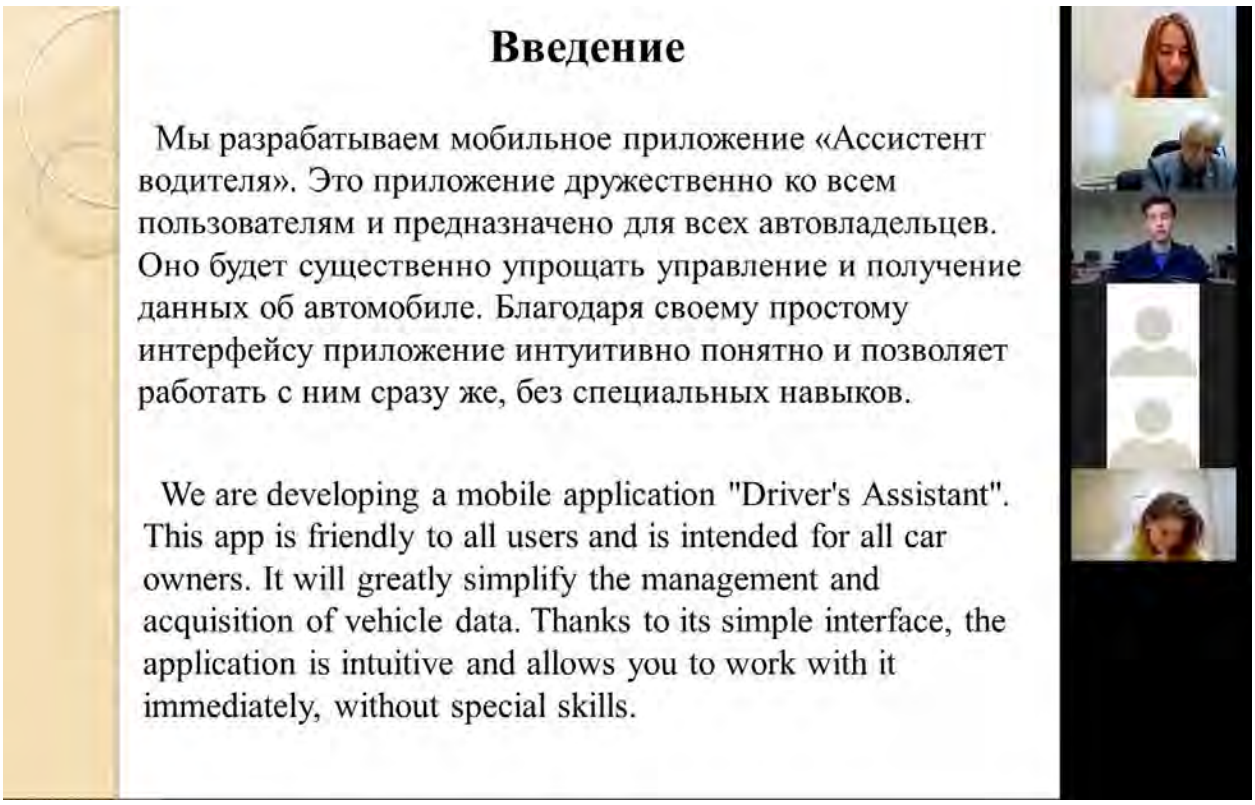
05/21/2021

Picture 63. Expert opinion of Fire and Rescue College on the solution of the business case by the team (page 6)

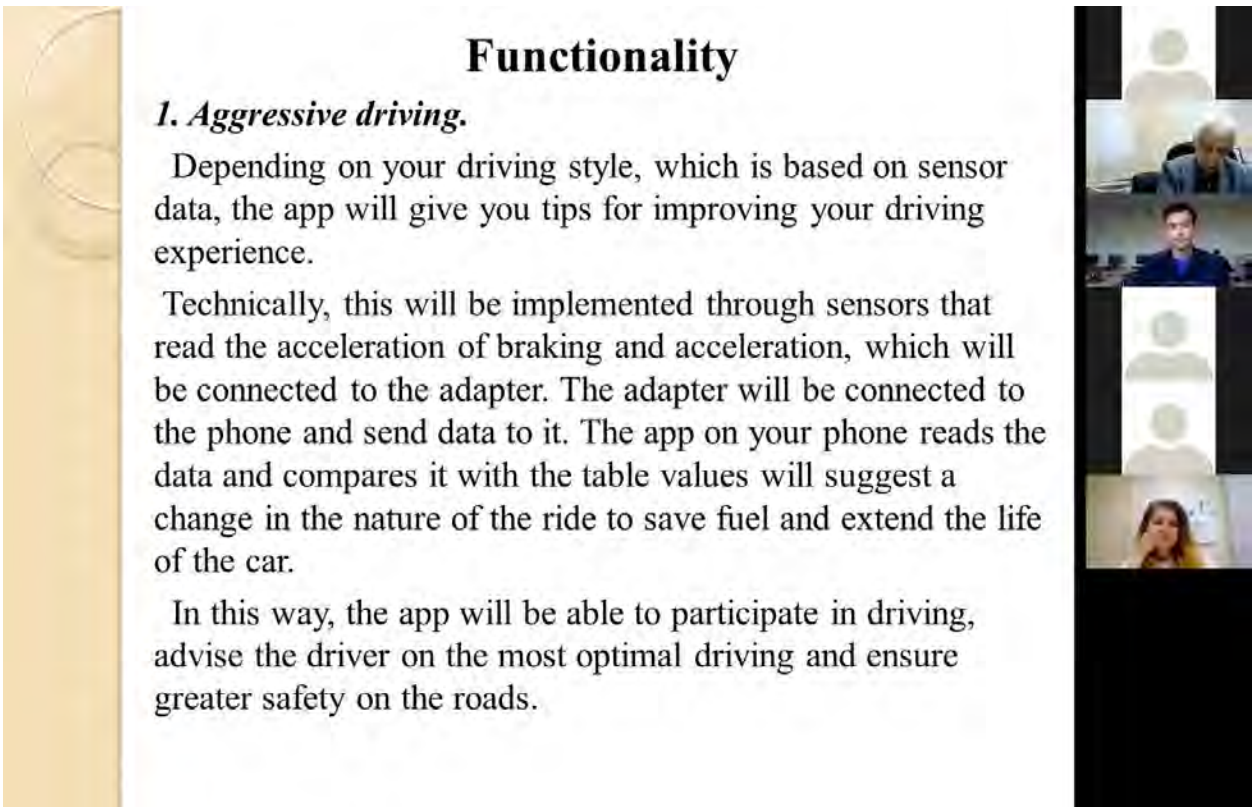
11.4. Team of the St. Petersburg Fire and Rescue College – business case "Mobile App "Driver's Assistant"



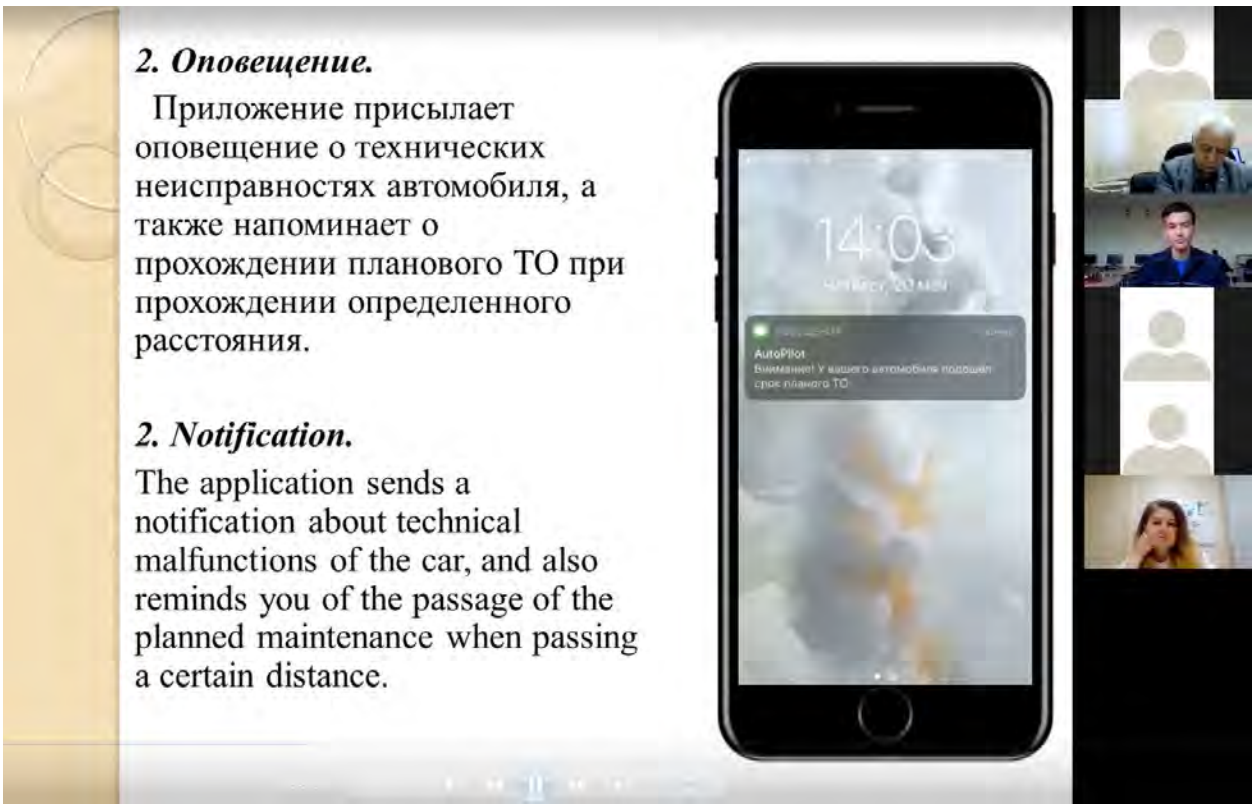
Picture 64. Presentation of the Fire and Rescue College team (slide 1)



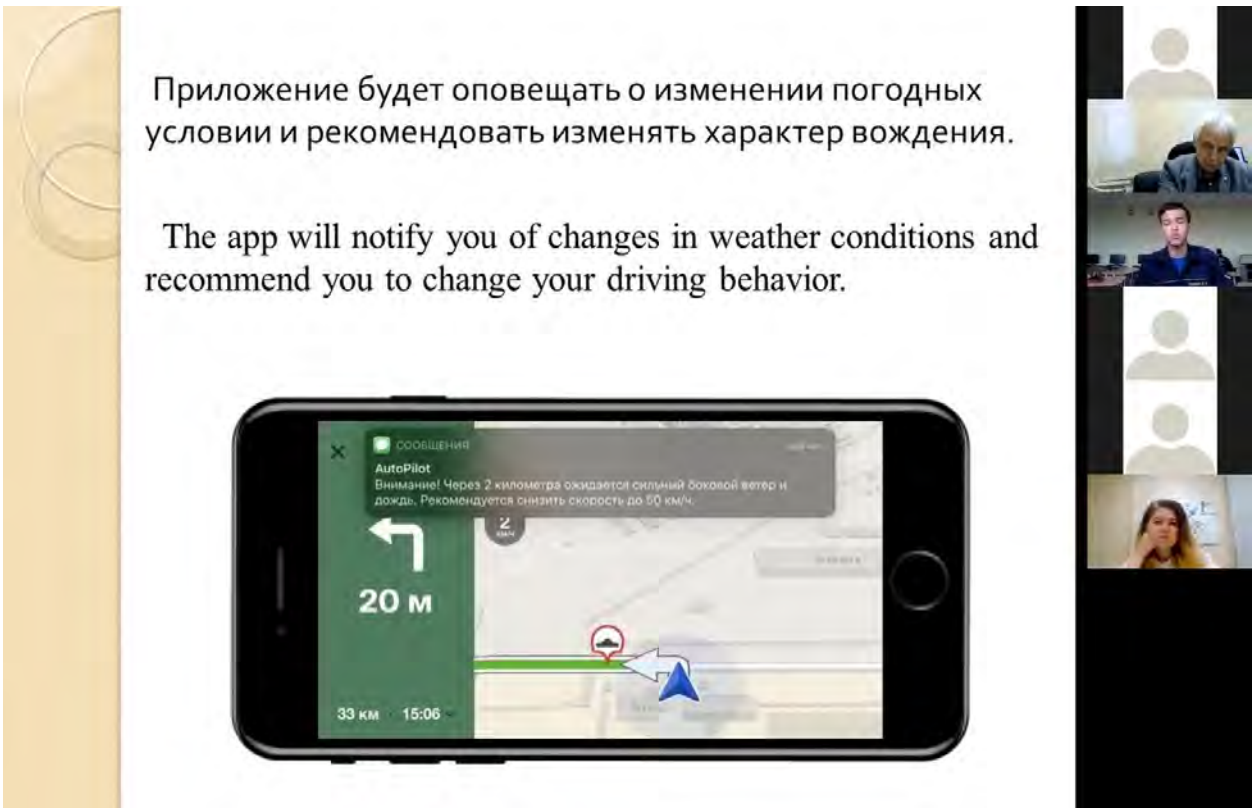
Picture 65. Presentation of the Fire and Rescue College team (slide 2)



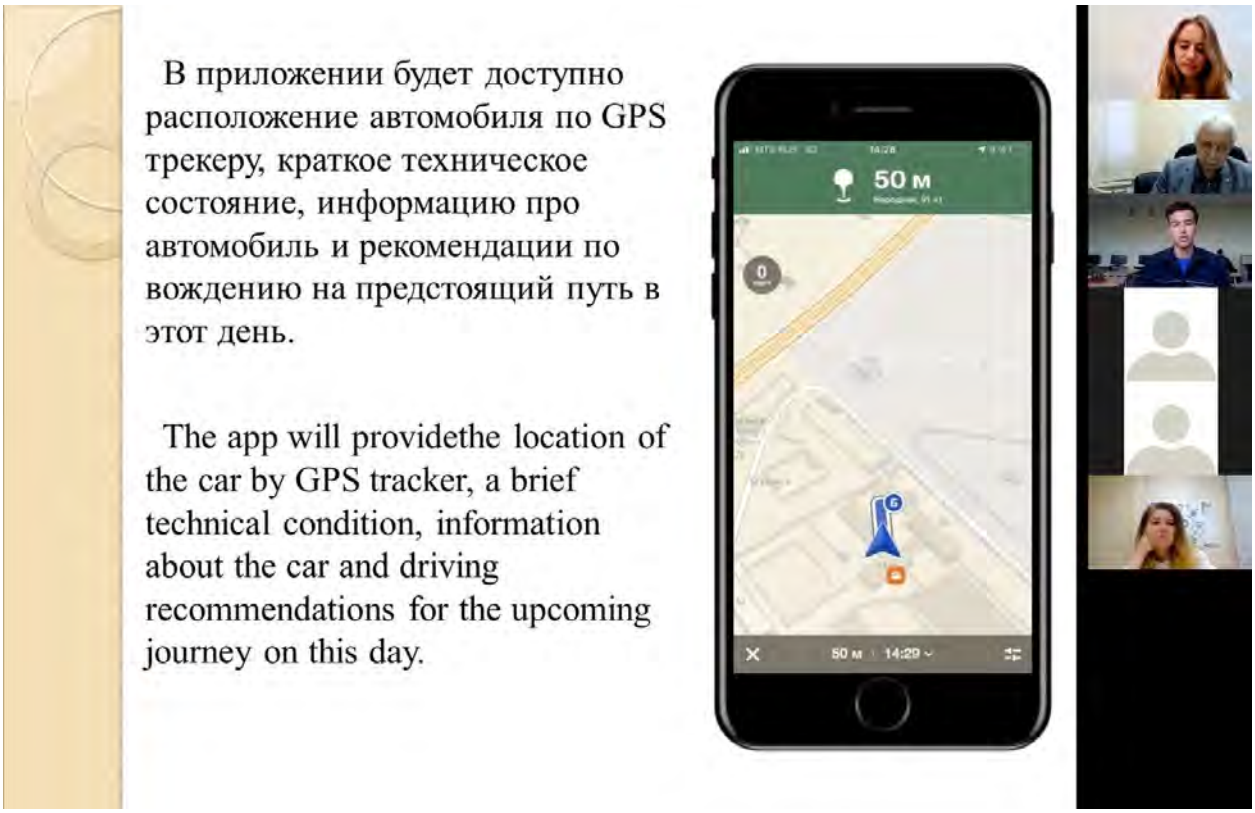
Picture 66. Presentation of the Fire and Rescue College team (slide 3)



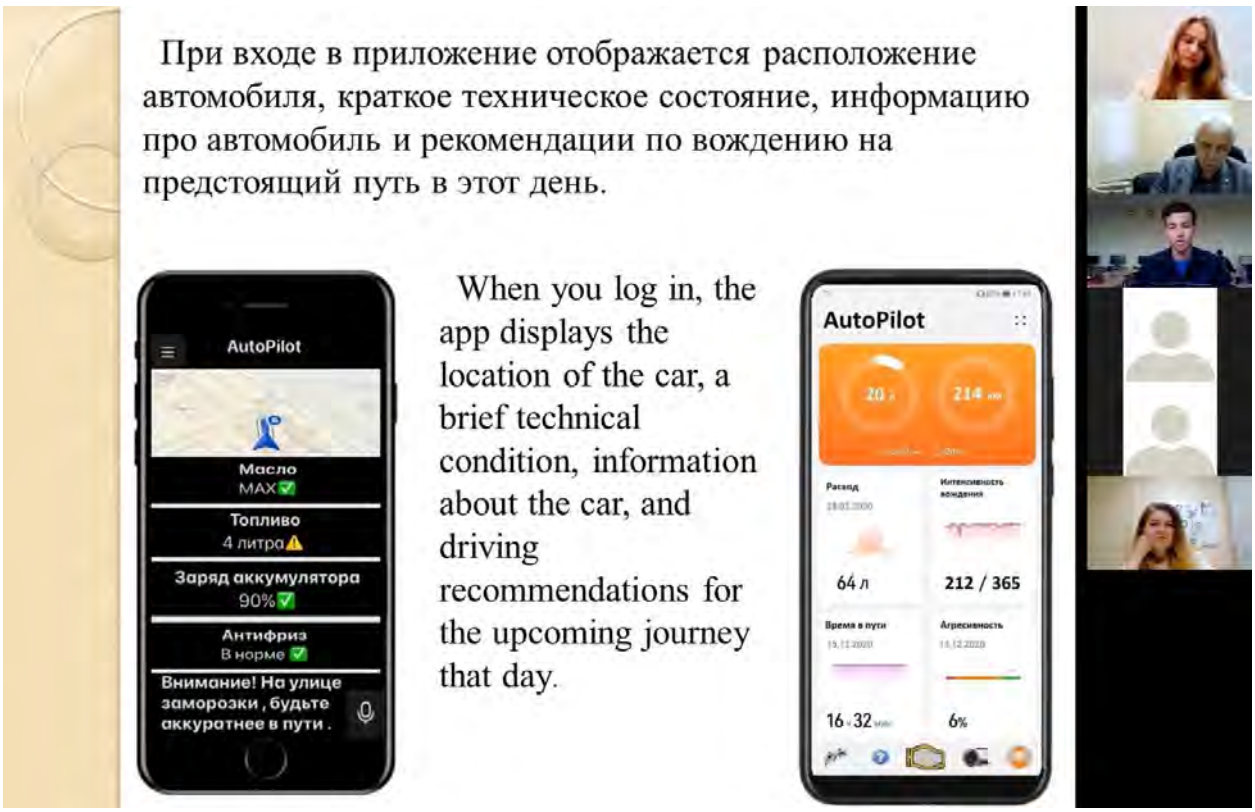
Picture 67. Presentation of the Fire and Rescue College team (slide 4)



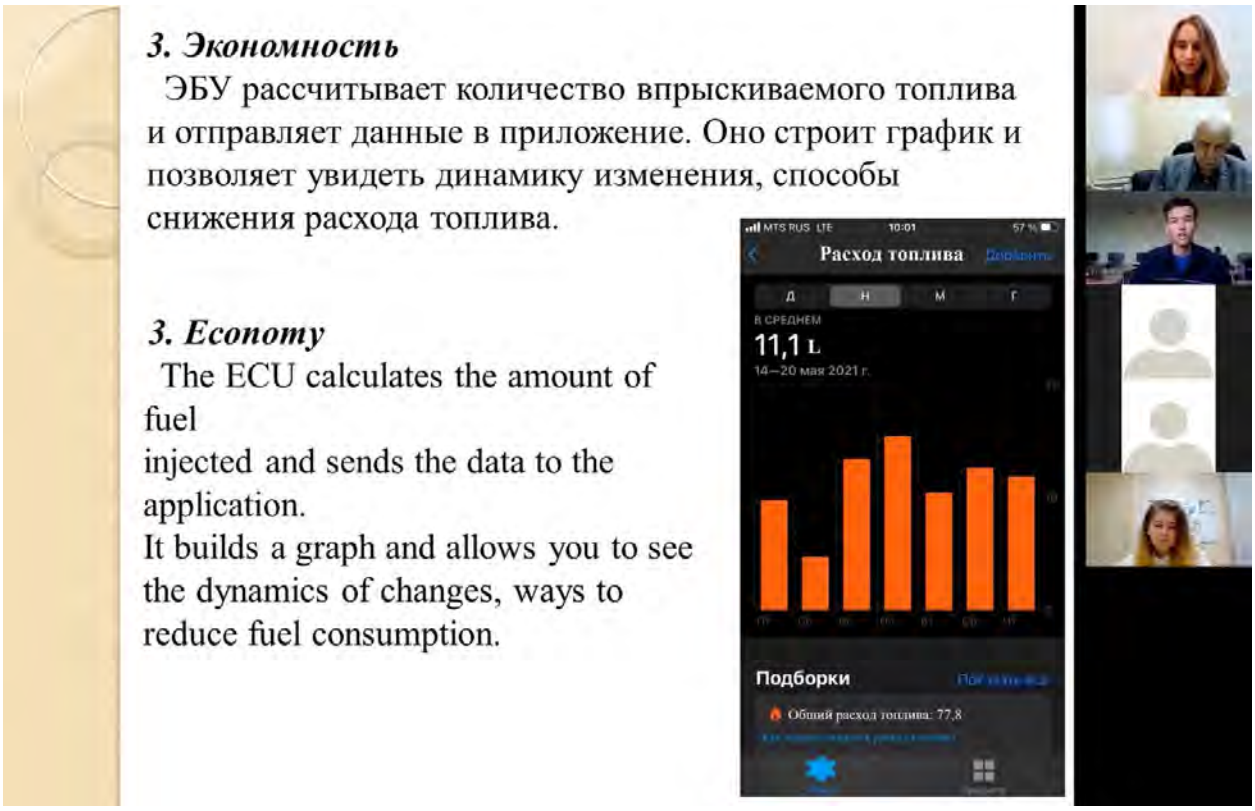
Picture 68. Presentation of the Fire and Rescue College team (slide 5)



Picture 69. Presentation of the Fire and Rescue College team (slide 6)



Picture 70. Presentation of the Fire and Rescue College team (slide 7)

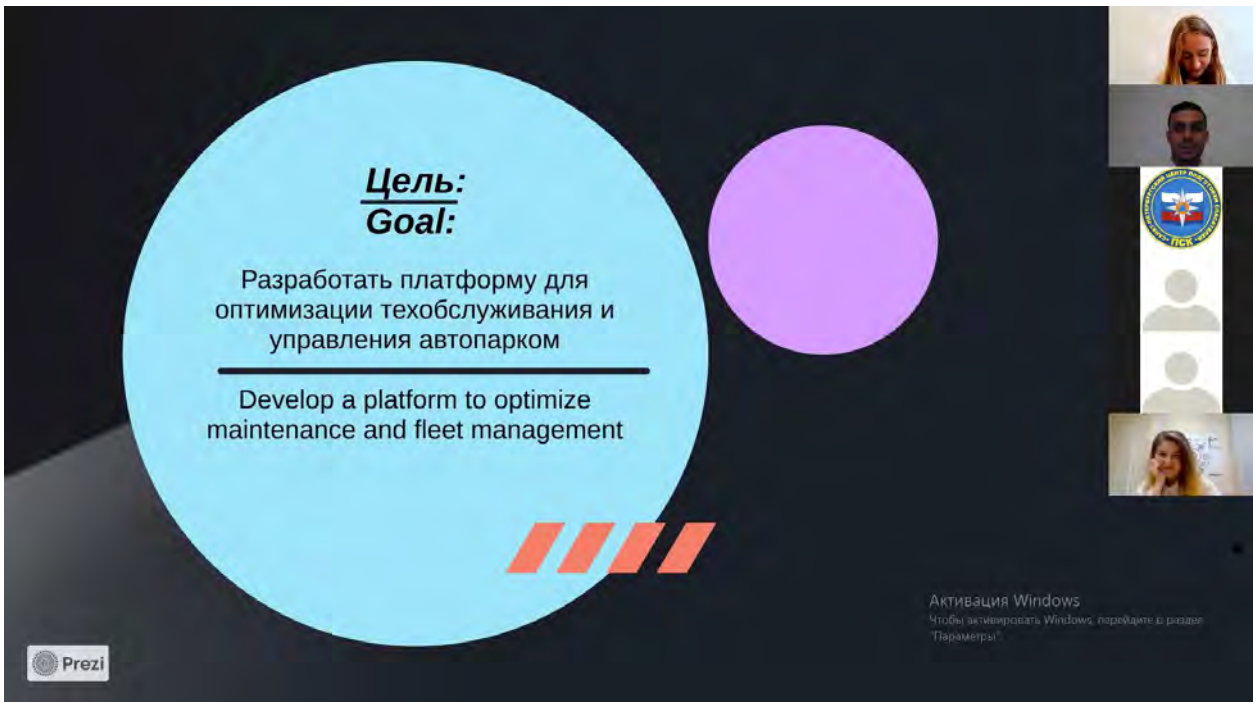


Picture 71. Presentation of the Fire and Rescue College team (slide 8)

Picture 72. Presentation of the Fire and Rescue College team (slide 9)

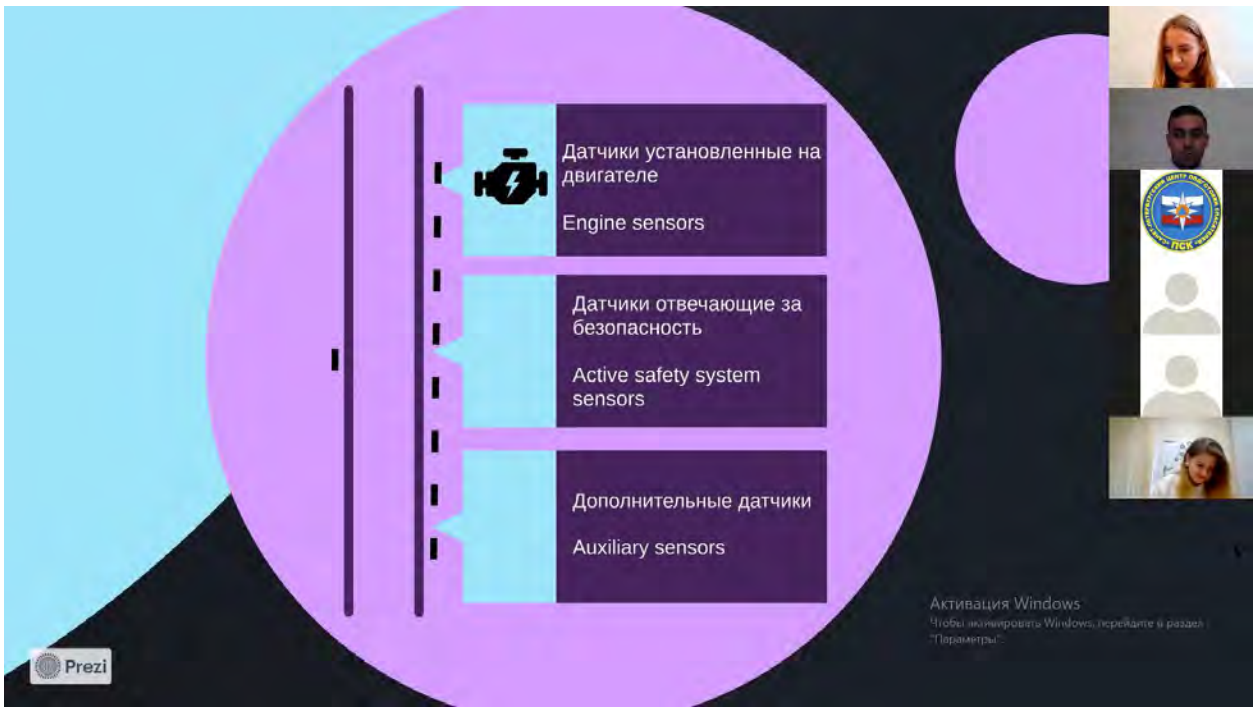
11.5. Team of the SPbGASU – business case "Maintenance optimization and vehicle fleet management platform using IoT"

Picture 72. Presentation of the SPbGASU team (slide 1)

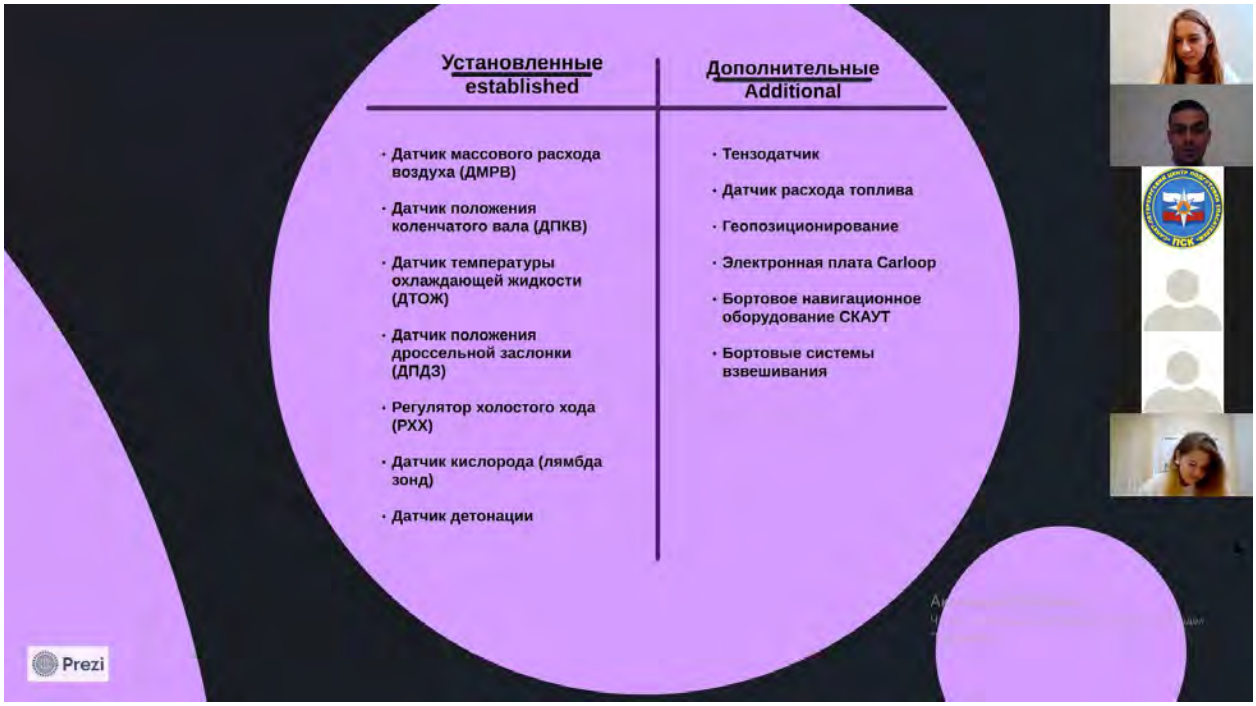


Picture 73. Presentation of the SPbGASU team (slide 2)

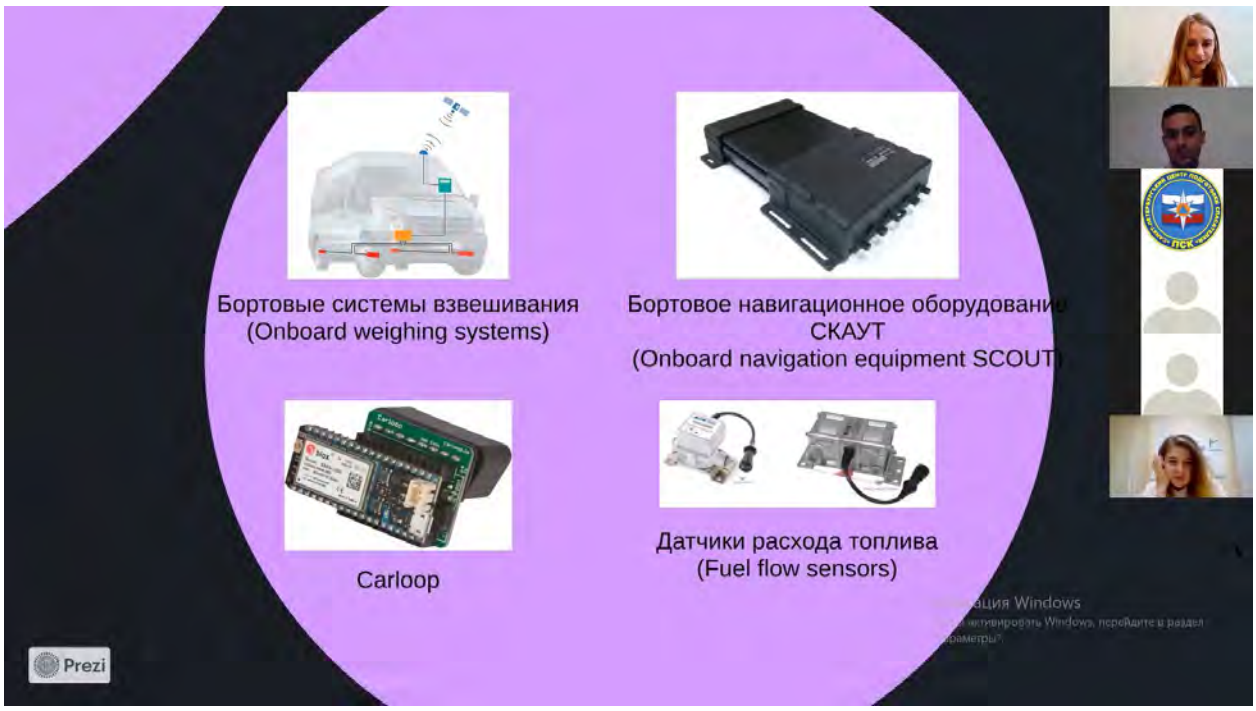
Picture 74. Presentation of the SPbGASU team (slide 3)



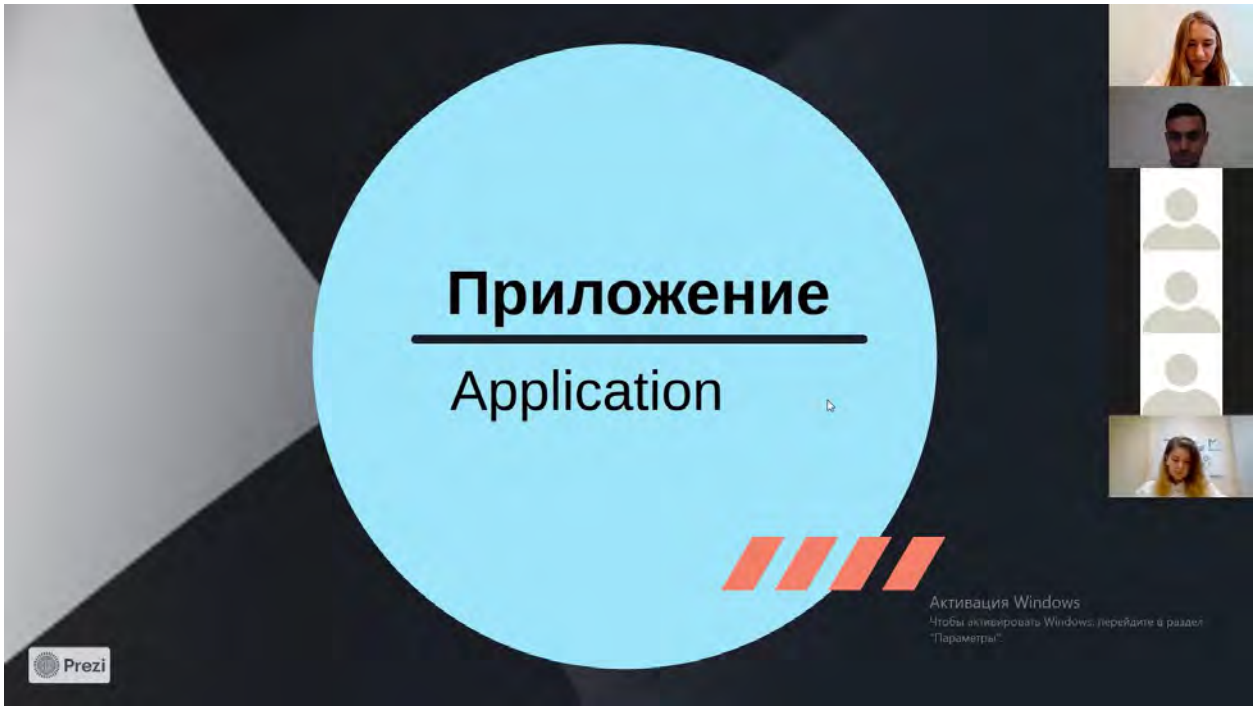
Picture 75. Presentation of the SPbGASU team (slide 4)



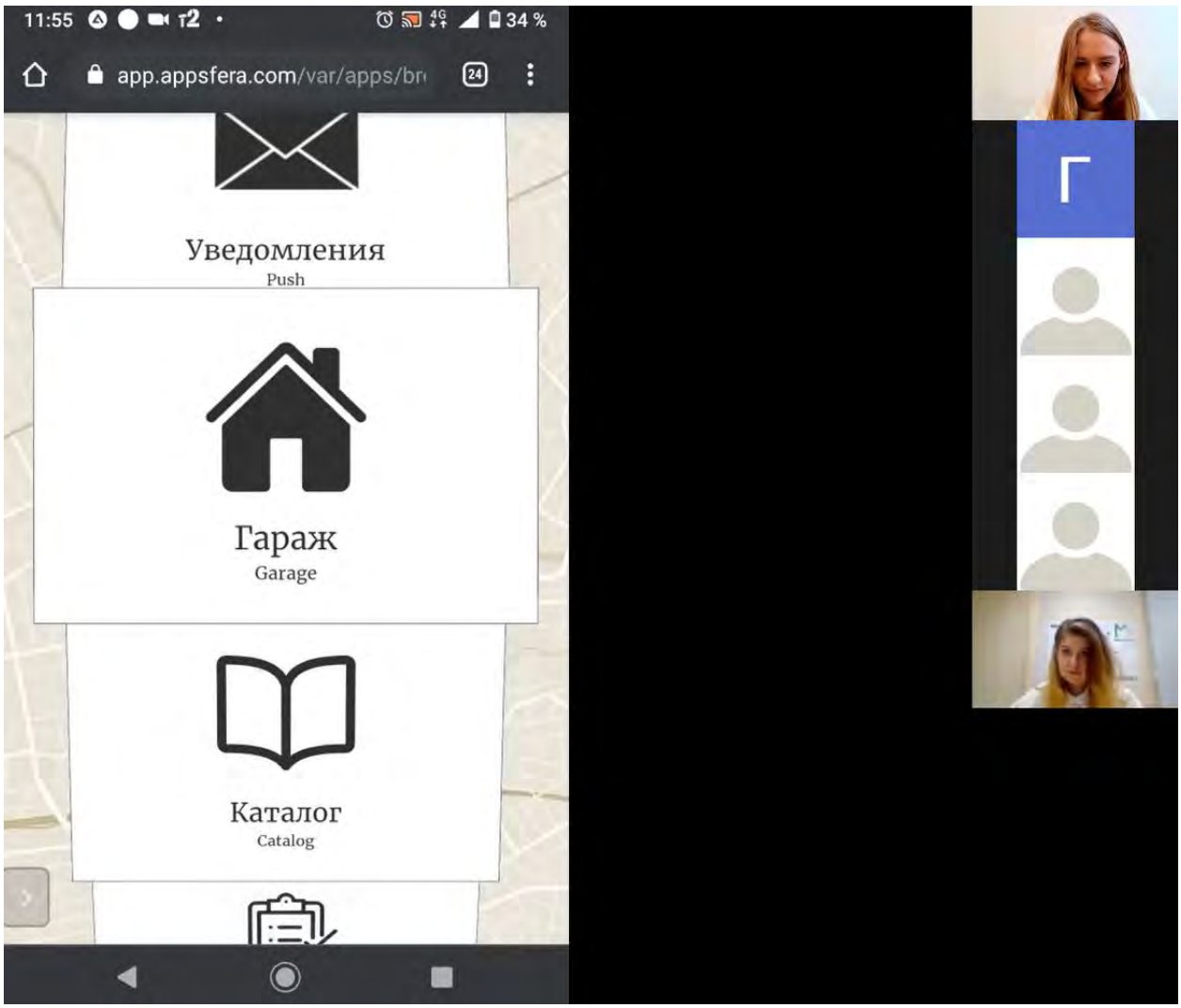
Picture 76. Presentation of the SPbGASU team (slide 5)



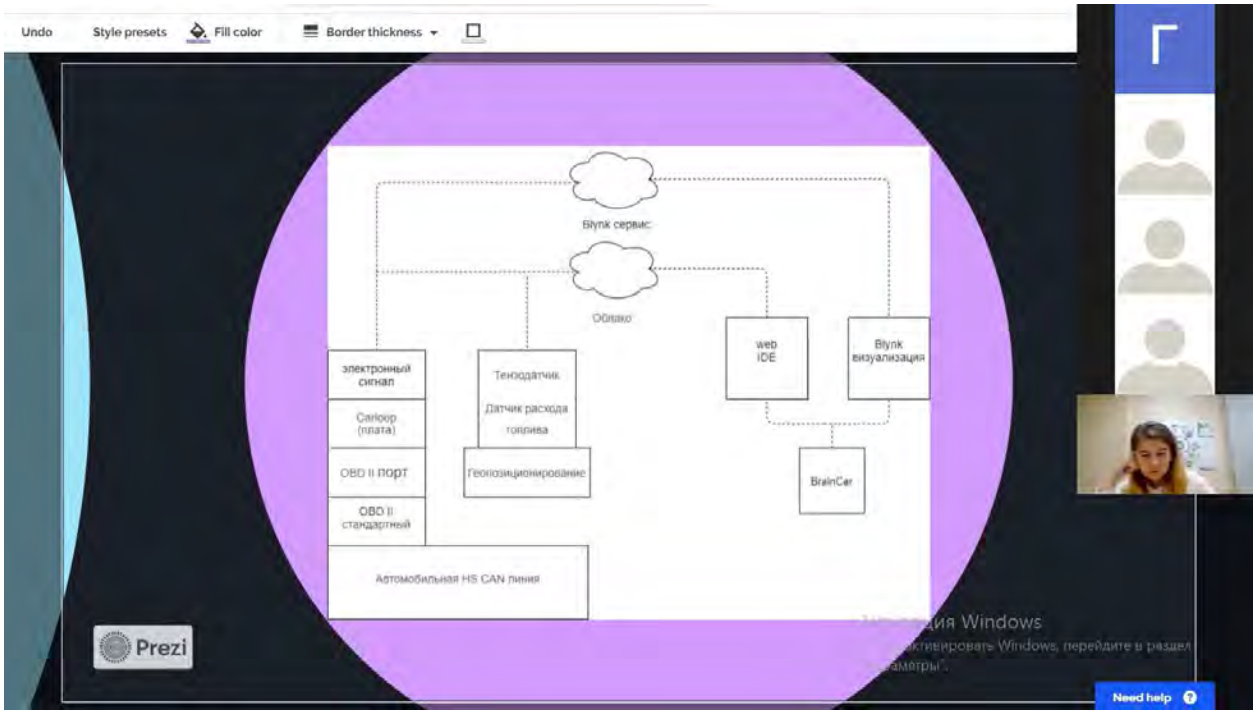
Picture 77. Presentation of the SPbGASU team (slide 6)



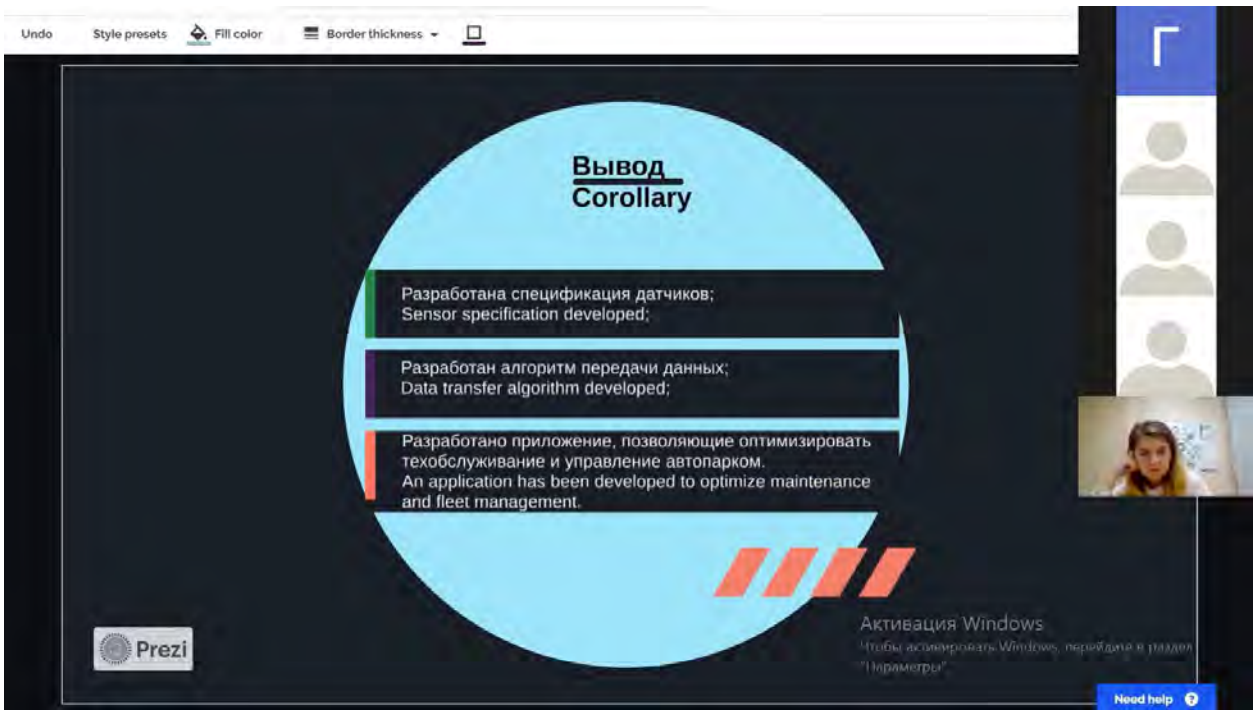
Picture 78. Presentation of the SPbGASU team (slide 7)



Picture 79. Presentation of the SPbGASU team (slide 8)



Picture 80. Presentation of the SPbGASU team (slide 9)

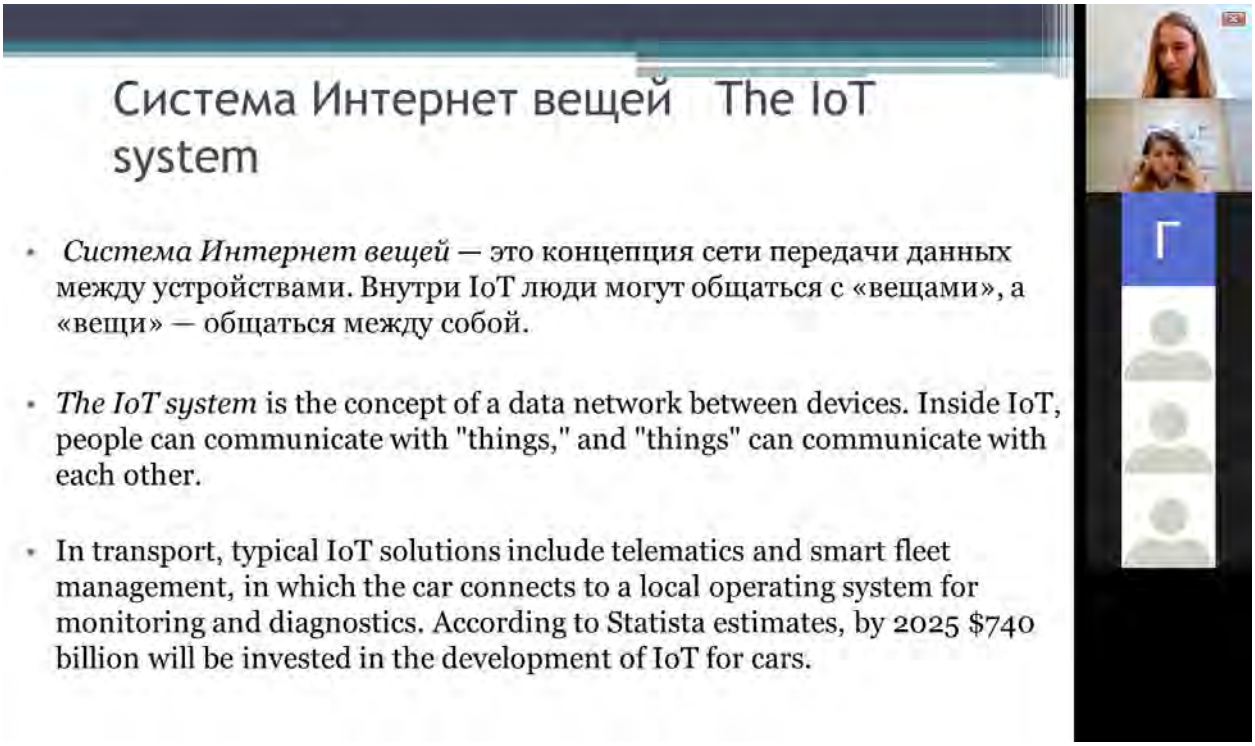


Picture 81. Presentation of the SPbGASU team (slide 10)

11.6. Team of the Ryazan Institute (branch) of the Moscow Polytechnic University – business case "Maintenance optimization and vehicle fleet management platform using IoT"

Picture 82. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 1)

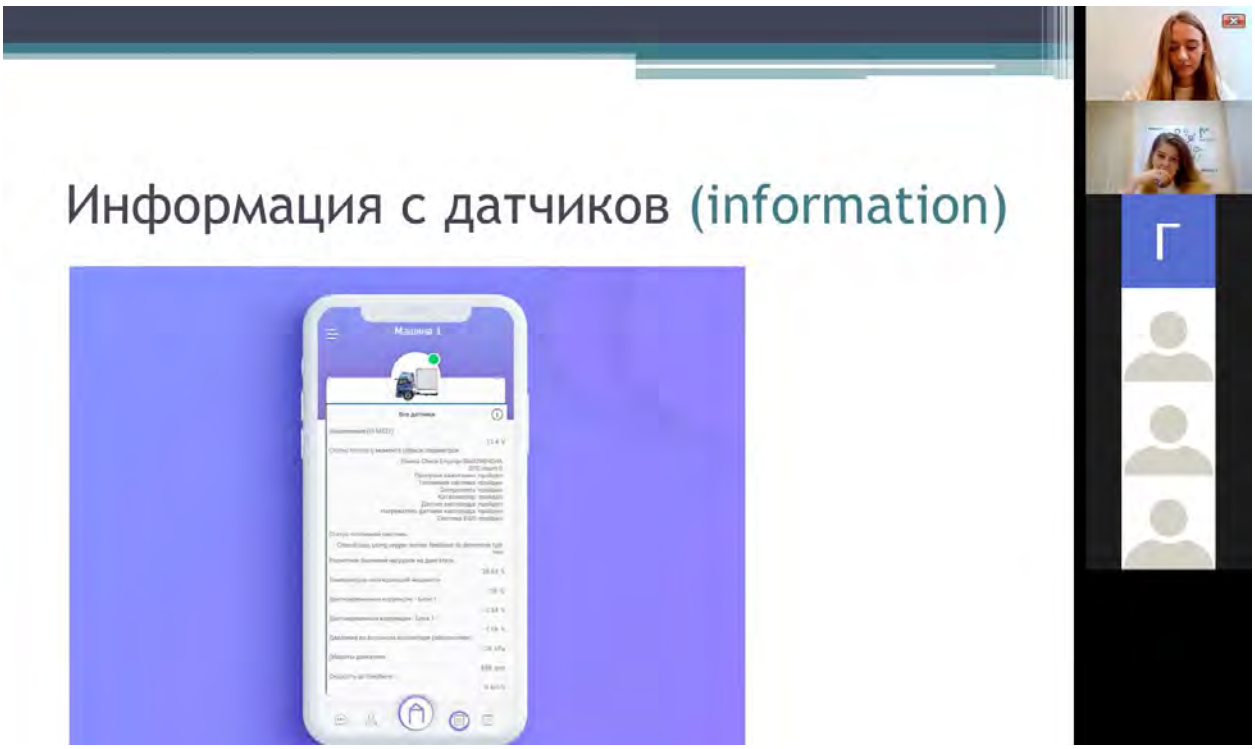
Picture 83. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 2)



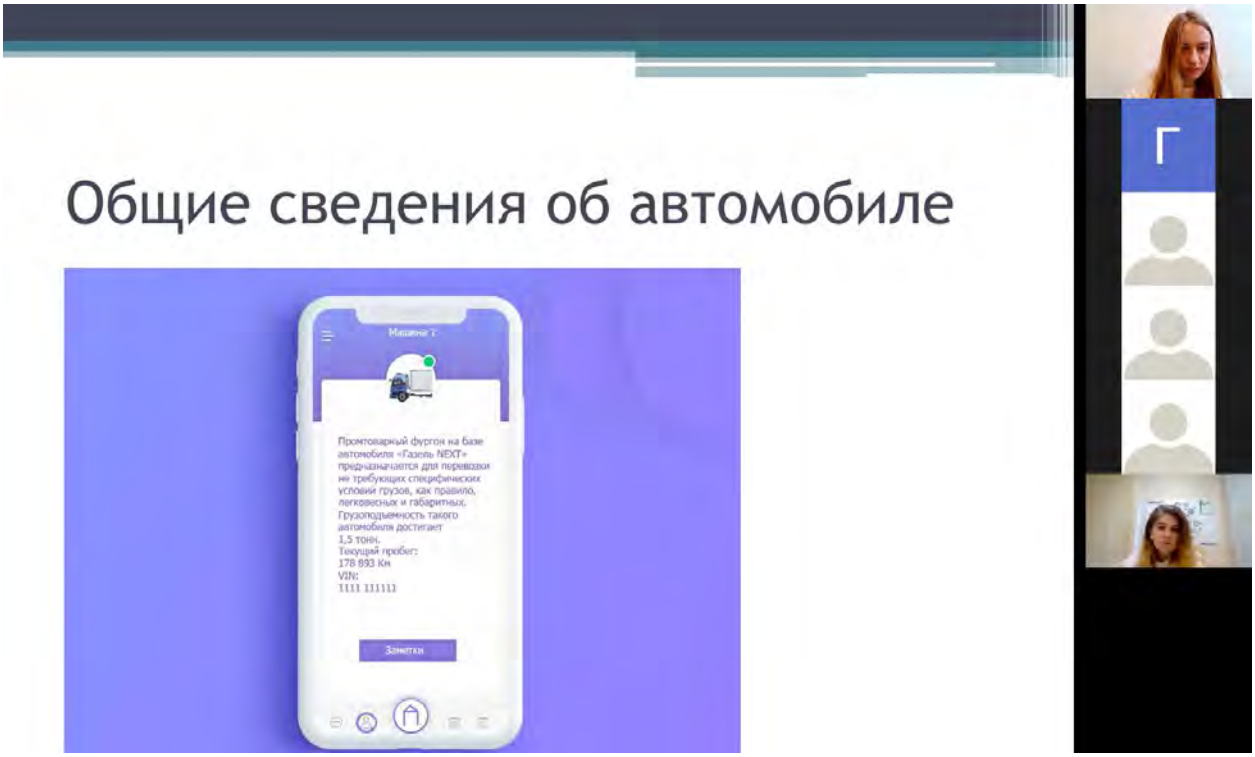
Picture 84. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 3)

Picture 85. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 4)

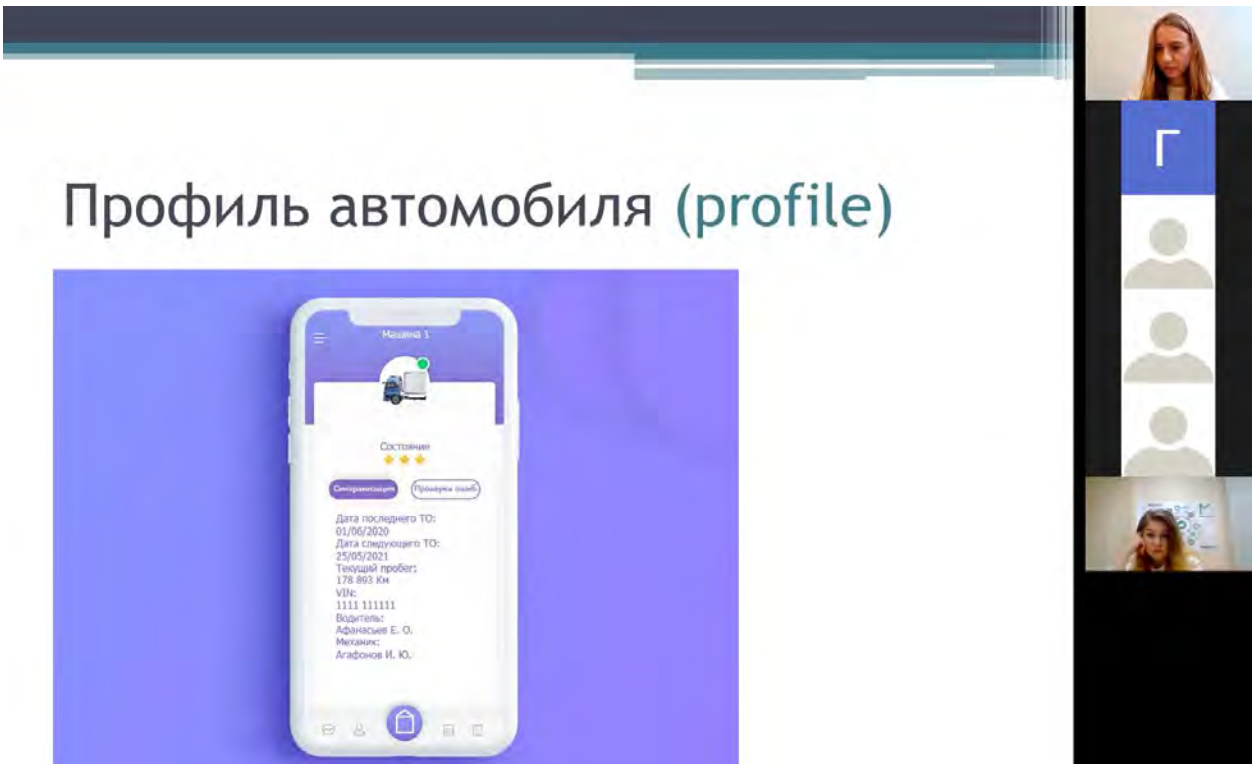
Picture 86. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 5)



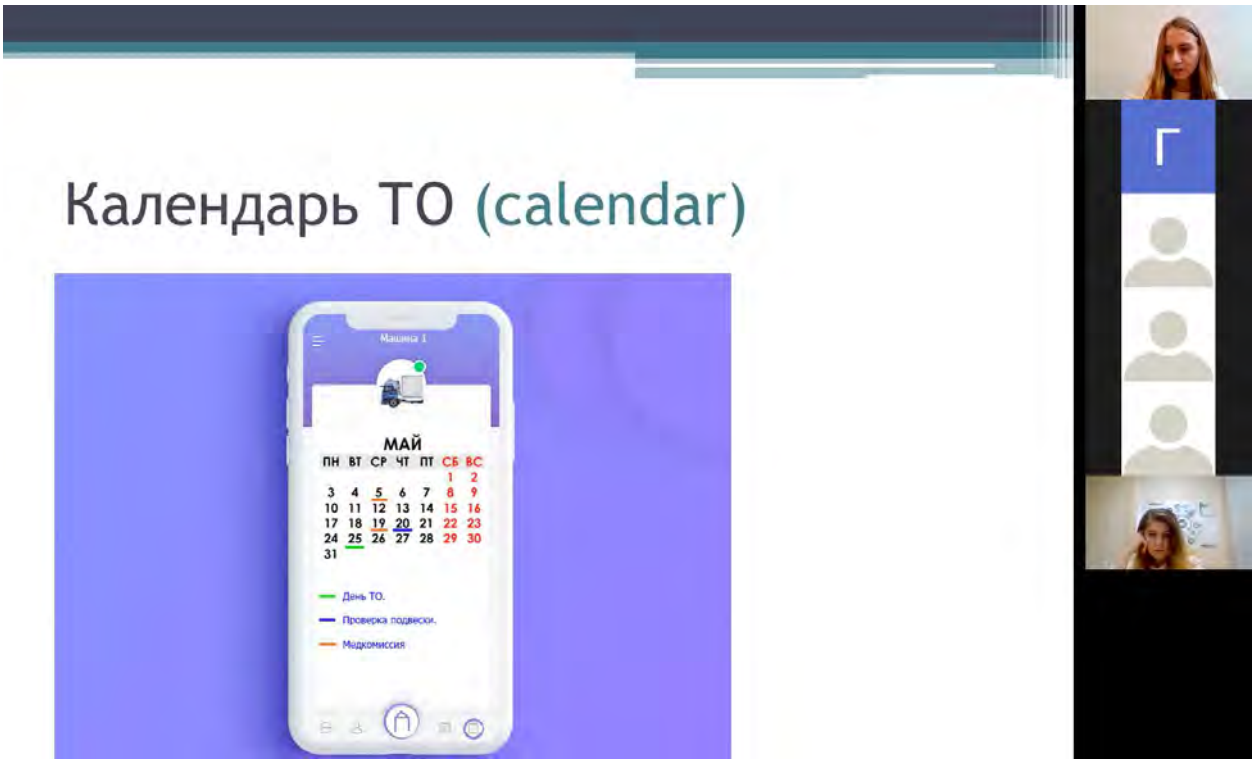
Picture 87. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 6)



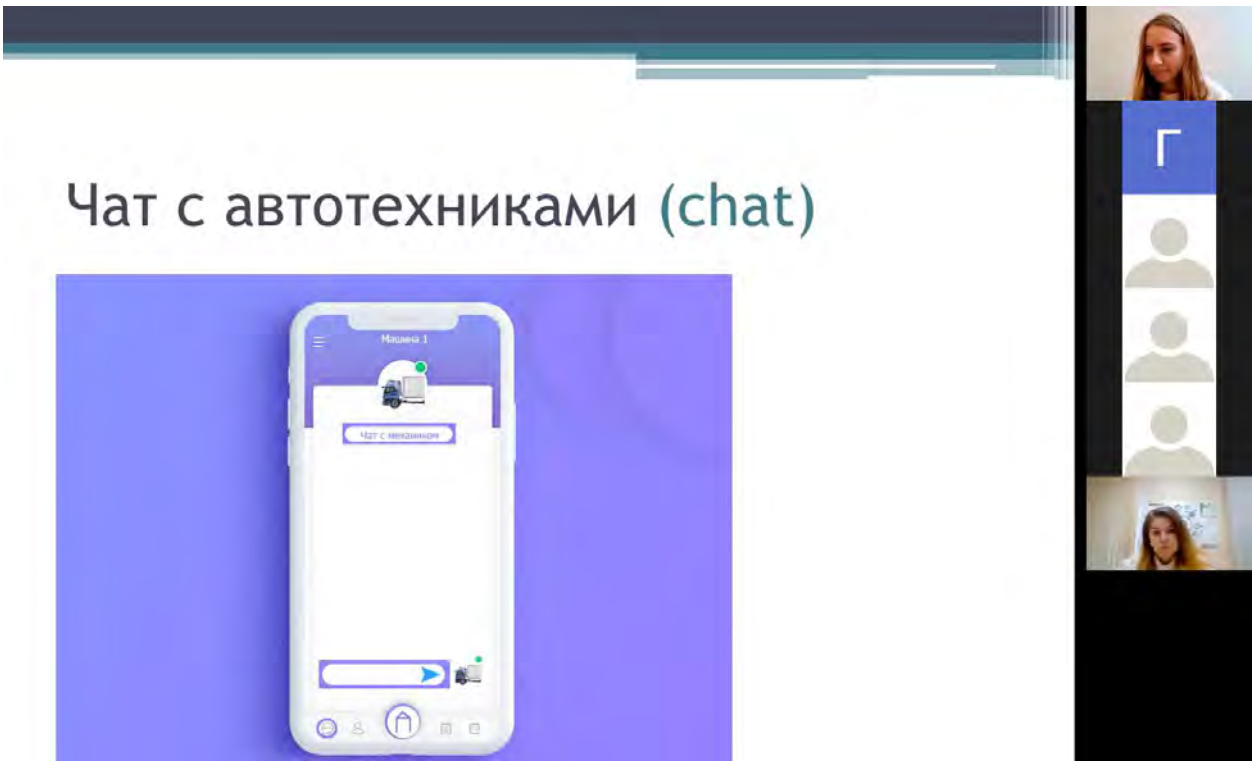
Picture 88. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 7)



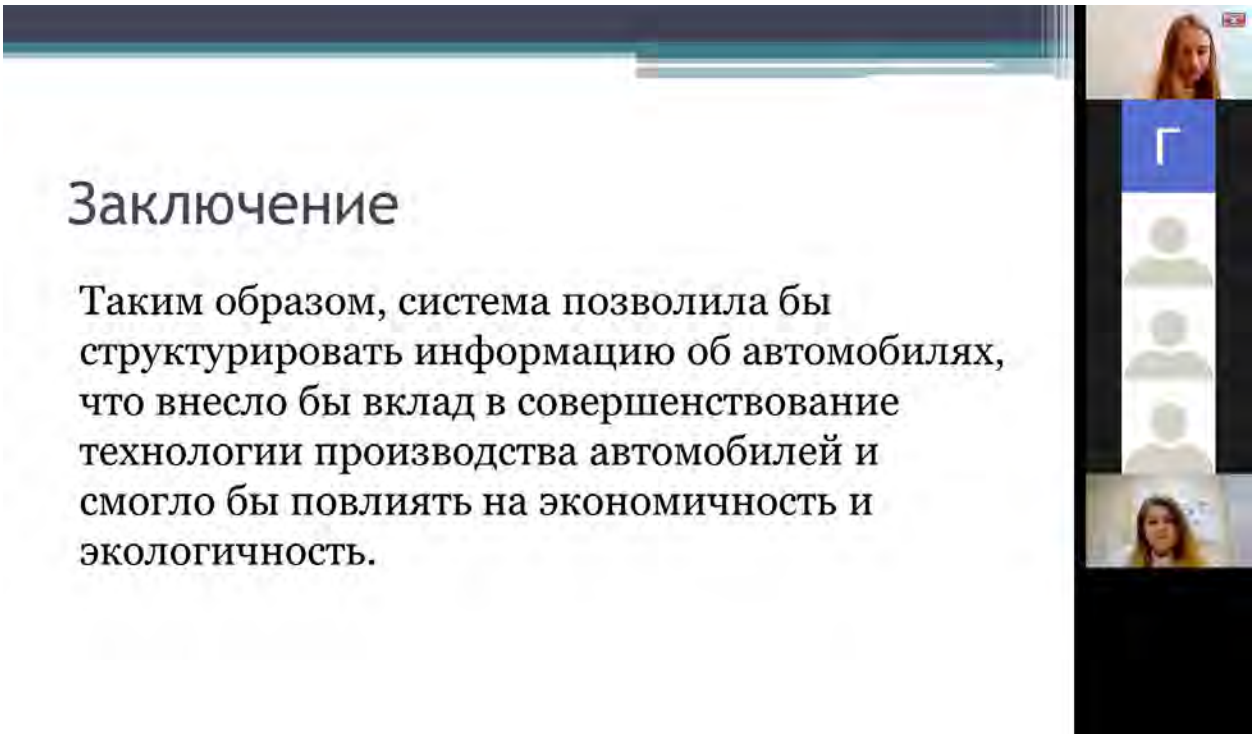
Picture 89. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 8)



Picture 90. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 9)



Picture 91. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 10)



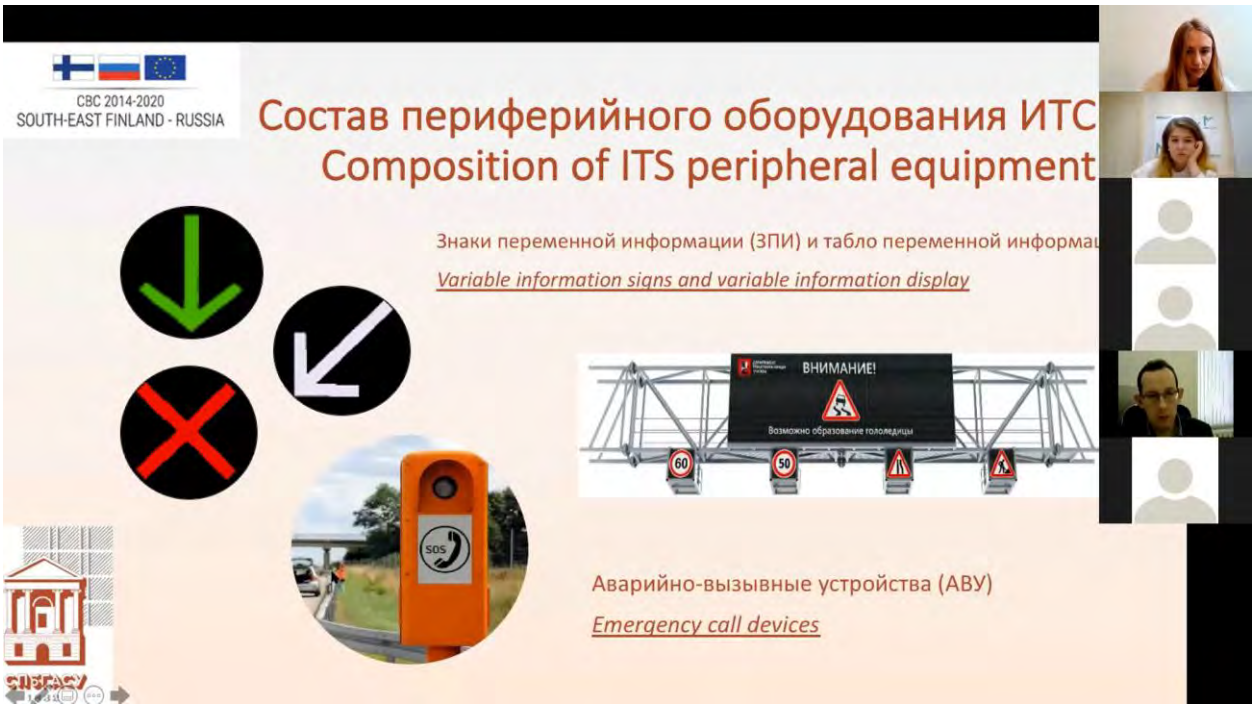
Picture 92. Presentation of the Ryazan Institute (branch) of the Moscow Polytechnic University team (slide 11)

11.7. Team of the SPbGASU – business case “Intelligent transport systems on the "Scandinavia" road section”

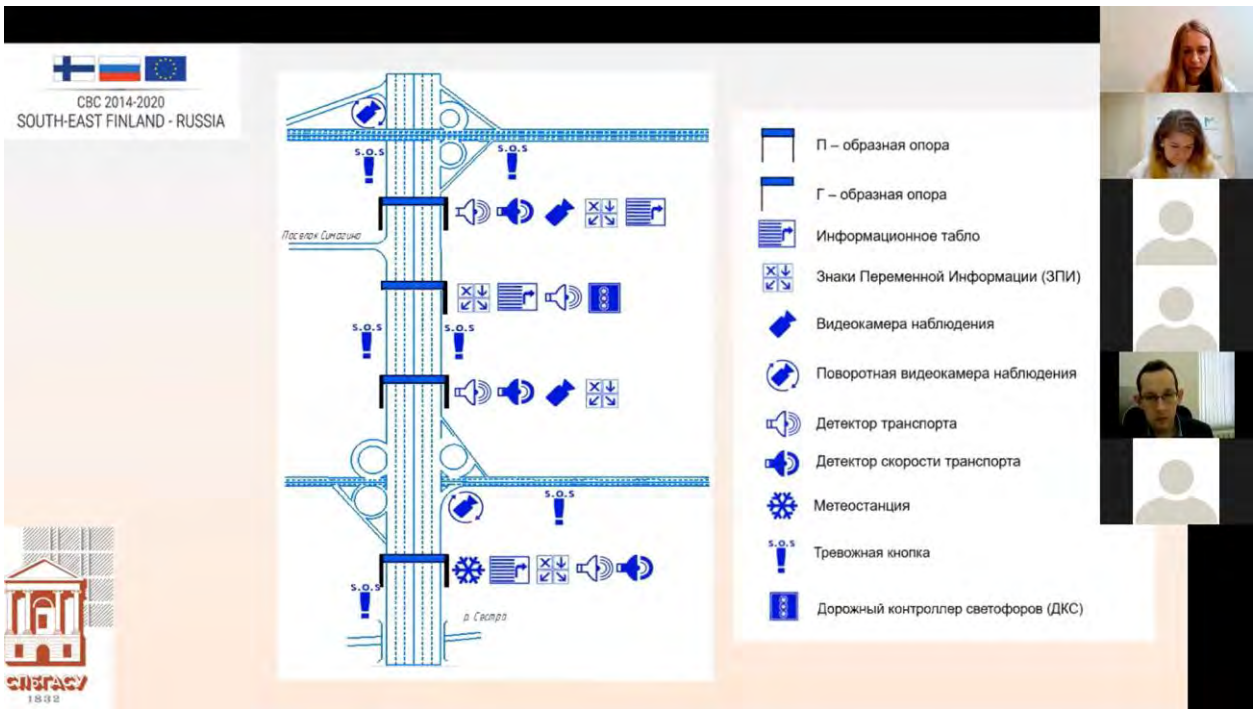
Picture 93. Presentation of the SPbGASU team (slide 1)

Picture 94. Presentation of the SPbGASU team (slide 2)

Picture 95. Presentation of the SPbGASU team (slide 3)



Picture 96. Presentation of the SPbGASU team (slide 4)



Picture 97. Presentation of the SPbGASU team (slide 5)

Picture 98. Presentation of the SPbGASU team (slide 6)

12. Professional assessment of business cases

All the teams defended themselves at a fairly high level, demonstrating their professional competencies as future specialists. The Expert Board of AIC conducted a professional assessment of the works in the nominations. The results are presented in table 5.

Table 5. Results of Automotive Innovation Camp

Teams	Business-case	Nomination	Class	TOTAL	Rewarding
Kudrovo Techopark School: 1. Barsukova Olga 2. Bolotin Daniel 3. Garayev Danila 4. Zhukov Artyom 5. Shmarov Vladislav	Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)	Innovative transport systems	Grade 10	4,22	2nd degree diploma
Academy of Transport Technologies: 1. Suma Grigory 2. Ivanovsky Maxim 3. Yalyshev Airat 4. Artyomenko Artem 5. Vyrlan Anton	Movement of an unmanned vehicle using the example of the "Dynamics M1" (educational set)	Innovative transport systems	DR-82	4,25	1st degree diploma
St. Petersburg Fire and Rescue College: 1. Machekhina Daria 2. Paramonov Alexander 3. Kirinchuk Evgeny 4. Tropin Vladislav 5. Kletsko Evgeny	Automotive expertise of road traffic accident	Road safety	300	3,76	2nd degree diploma
Pskov engineering and linguistic gymnasium and Palkinskaya secondary school (Joint team): 1. Roman Nosov 2. Ivshin Yaroslav 3. Tsaro Daniel 4. Orlov Egor 5. Vasiliev Sergey	Automotive expertise of road traffic accident	Road safety	9 "B" PELG 9 "G" PELG 9 "B" PELG 10 "A" Palkino 9 "A" Palkino	4,08	1st degree diploma
St. Petersburg Fire and Rescue College: 1. Afanasyev Konstantin 2. Kuzmakov Dmitry 3. Tyurin Vladimir 4. Farafonov Ivan 5. Yushkov Nikita	Mobile App “Driver’s Assistant”	Man and car: innovative modes of transport and infrastructure	300	4,25	1st degree diploma
SPbGASU: 1. Belsky Georgy 2. Razumov Pavel 3. Goncharov Vladislav 4. Maiorov Maxim 5. Shevelev Andrey	Maintenance optimization and vehicle fleet management platform using IoT	Man and car: innovative modes of transport and infrastructure	1-ETMKm-1	4,51	2nd degree diploma
Ryazan Institute (branch) of the Moscow Polytechnic University: 1. Kashin Dmitry 2. Komarov Sergey 3. Bulychev Dmitry 4. Motorin Mikhail 5. Timakov Alexey	Maintenance optimization and vehicle fleet management platform using IoT	Man and car: innovative modes of transport and infrastructure	181R51 181R51 191R51 191R51 201R61	4,58	1st degree diploma
SPbGASU: 1. Stepanov Mikhail 2. Tambulatova Ekaterina	Intelligent transport systems on the "Scandinavia" road	Innovative transport systems	2-TTP-2	4,46	1st degree diploma

3. Gruk Nikolay 4. Pashilov Sergey 5. Ermilov Valery	section				

13. Rewarding participants

Diplomas and memorable prizes for participation in the Automotive Innovation Camp were sent to all participants. For the competition, diplomas of I and II degrees (pictures 99-100) were developed for teams, as well as diplomas for participants (picture 101).

Picture 99. Ist degree diploma (sample)

Международный конкурс Программы Приграничного Сотрудничества "Россия - Юго-Восточная Финляндия 2014-2020" проекта Race4Scale по решению бизнес-кейсов в автомобильной индустрии и мотоспорте

ДИПЛОМ II СТЕПЕНИ

награждается

команда _____

в составе _____

_____

_____

в номинации

_____

_____

Директор
Союза "Автопром Северо-Запад" Свиридова М.Е.

Санкт-Петербург

ППС 2014-2020
Россия - Юго-Восточная Финляндия

АВТОПРОМ
СЕВЕРО-ЗАПАД
ПРОМЫШЛЕННЫЙ КЛАСТЕР

Picture 100. 2nd degree diploma (sample)

ДИПЛОМ

участника

Международного конкурса Программы Приграничного Сотрудничества "Россия - Юго-Восточная Финляндия 2014-2020" проекта Race4Scale по решению бизнес-кейсов в автомобильной индустрии и мотоспорте

награждается:

Директор
Союза "Автопром Северо-Запад"

Свиридова М.Е.

Санкт-Петербург

ППС 2014-2020
Россия - Юго-Восточная Финляндия

АВТОПРОМ
СЕВЕРО-ЗАПАД
ПРОМЫШЛЕННЫЙ КЛАСТЕР

Picture 101. Diploma of the participant (sample)

14. Overall results

In total, 66 people took part in the Automotive Innovation Camp, 40 of them were schoolchildren and students of educational organizations. Among the participants 41 are under 24 years old, 18 are over 45 years old.

Following the results of the event, a post-release was prepared by the participants and partners of the Race4Scale project:

- Website of the Union "Artoprom North-West" (Russian version) - https://nwasz.ru/deyatelnost/novosti/194-s-18-po-21-maya-2021-g-sostoyalsya-automotive-innovation-camp-aic.html
- Website of the Union "Artoprom North-West" (English version) - https://nwasz.ru/race4scale/198-results-of-the-automotive-innovation-camp.html
- XAMK website - https://www.xamk.fi/en/research-and-development-blog/innovation-camp-2021-in-russia/
- Website of ETU “LETI” - https://etu.ru/en/university/news/leti-students-took-part-in-an-automotive-innovation-camp
- Website of the St. Petersburg Cluster Development Center - https://spbcluster.ru/2021/05/26/automotive-innovation-camp-aic/
- Website of the Consortium for the Development of School Engineering and Technical Education - http://surl.li/agmev
- Website of the Kudrovo Technopark school - https://educentr-kudrovo.vsevobr.ru/index.php/novosti/9-novosti/1423-pobeda-na-mezhdunarodnom-konkurse-automotive-innovation-camp-2
- Pskov News Feed Website - https://m.pln24.ru/society/415120.html
- Pskov State University website - https://pskgu.ru/page/034d61ff-a443-4776-8512-6cf7902c83ec