**Quarterly Report**

**[Modular robotic platform for modern greenhouses]**

**[Principal Investigator Last Name]**

* **Executive Summary**

[Please, provide a brief one paragraph overview of your project activities so far, i.e. the technology you are developing, societal or economic problem it might solve, what you accomplished and what key challenges a still ahead.]

We are developing an autonomous robot on an omnidirectional platform for the tomato greenhouse monitoring. Timely detecting an insect invasion or an infection in modern greenhouse is crucial, and this is exactly what we are aiming at. Prior to the grant we have created a prototype and tested its locomotion in the real environment. Now we are mostly concerned with the technical side of the project, i.e. computer vision and the mechanical platform itself.

* **Project development**

[Please, in sufficient level of details describe what research work was done in the project. Clarify the current status of the innovation and any related intellectual property. Emphasize what results you believe to indicate project future success and what key challenges did you encounter. What was your approach to manage known issues and potential risks?]

During the last quarter we have been mainly focused on the development of the chassis. We have manufactured (partially by ourselves, partially with external workforce) all the parts and then performed operations on painting, cutting, assembling, and programming the low level. In terms of the novel hardware, we have introduced high camera poles with adjustable camera mounts.

Regarding the IP, during the last period we were concerned with the paperwork related to the patents.

The main indicators of the project future success are the following. First, we have successfully tested the robot in the real environment. Second, the development of the platform goes according to plan. Third, we have obtained 2 patents and are waiting for the 3rd one.

* **Milestones**

[Please, fill in the following table]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Milestone planned for the report period | Initially outcomes expected | | Actual outcomes | Comments, proposals, potential solutions for unresolved issues |
| Patents |  | Patent application ready for submission | Patents issued (ahead of initially proposed schedule) |  |
| Cooling |  | Implemented | Implemented |  |

* **Commercialization**

[Please, write a story answering the following questions. What did you do to start commercialization of your project? Describe what you learn about market situation. How did you get this knowledge and which sources did you use?]

We have been working with the first customer, which is a big agricultural company with special interest in tomato farming. We have signed a contract for the data collection and NN training, that was finished successfully from our side.

One of the team members gave a talk on an agricultural conference, presenting our work to the potential customers from the Krasnodarsky region in Russia. A number of them were interested in the autonomous platform. Now we are working on the establishment of the contact with them.

* **Intellectual property**

[Please, explain if you submitted technology disclosure to KTO or were involved in other IP related activities? Describe other object of IP, such as IP of competitors, which you have studied during the reporting period.]

Two patents were issued, one more is on the way.

* **Budget and resources**

[Please, fill-in the table below and explain how you managed resources?]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type expenditure of | | Approved budget | Actual figures | Comments |
|  |  |  |  |  |

* **Team and collaborations**

List team members and clearly explain their personal contributions. Explain if you used partner support and what they exactly did for the project?]

Ilya Osokin was responsible for the system integration, general shaping of the technical solutions. He has worked with all the other team members, assuring that the parts and subsystems merge properly. Also he has handled the paperwork, conference presentations, business meetings, and media coverage of the project.

Sina Moghimi has worked on the electrical subsystem of the robot, including low-level programming of the microcontrollers, welding and fixing driver boards. Along with that he has been busy gathering a ROS2 package for the robot.

Ilya Ryakin was involved in the data markup and NN training. He has conducted experiments with several modern architectures, trained them and evaluated their performance. He has researched the market of the Global Shutter cameras, ordered and tested them in the outdoor environment.

Sergei Davidenko has voluntarely participated in the camera pole model development. He has proposed several designs, carried out their static load simulation and modal analysis. Also he was involved in brainstorming the choice of the motor.

Mikhail Patrikeev has voluntarely (after his involvment under PSA was complete) participated in the brainstorming the choise of the motor and the development of the camera pole. He has given useful recommendations regarding the troubleshooting in the robot.

Pavel Osinenko was handling the business and administraive sides of the project. He was involved in the paperwork, presentations, and meetings with the customer. Generally, Pavel’s major role is in project supervision and quality management of the overall work.

* **Plans for next period**

[Please, explain key tasks for next project period what, when and how do you plan to achieve? What should and planned to be done differently as compared with described period?]

The main tasks to be solved during the next quarter are the following.

First, we have to install the cameras to the camera poles.

Second, cable management in the robot should be performed.

Third, extra attention to the application for Skolkovo residence should be paid. It will require lots of paperwork, but still, the plan is to finish the application in Q3.