

• **Introduction**

First, out of hopefully many our reports as a team, will begin with addressing how everyone of us is focused and optimistic about this project. We received the car on 11th of December, and since then we have been working on it every day, as much as we could. When we received it, our priority was to see it working, which we did the day after. More about all the other activities and challenges we faced, will be written in the next few sections of this report.

• **Planned activities**

Below can be found the enumeration of all the activities planned at the beginning of the reported period.

1. Starting the car and making sure that it works properly.
2. Giving every member of the team their set of activities
3. Cleaning hard-to-reach parts and greasing the differentials
4. Achieving smooth driving mode by adjusting cogwheels
5. Implementing logical component on Nucleo – battery percent left
6. Finding and modification of lane detection algorithm and its implementation on the car

• **Status of planned activities**

Here is the description of the planned activities, progress, research results and detailed descriptions of our development stage.

1. We successfully started the car and checked if mechanical and electronic parts are working properly – completed

2. Every member of the team has his own activity that he is a part of – we had some problems in the beginning as we did not define our tasks clear.

Ivan Stojanovic is working on lane detection algorithm and OpenCV library for image processing with Lazar Zubovic and Rastko Ivanovic.

Lazar Zubovic and Jovan Vukojevic are having a great time with hardware and it's in their top priority that everything fits and works perfectly!

Pavle Jovanovic, Rastko Ivanovic and Ivan Stojanovic have a challenge that involves the understanding of the brain code, embedded platform and implementation of our code on it.

And also we couldn't have finished this report without the managerial skills of our duo Jovan Vukojevic and Pavle Jovanovic! – we can say that this part is 100% completed.

3. As we wrote before our team members made sure that every part of this car is working perfectly and without any problems. Our goal was to follow the instructions from the documentation and check the integrity of all hardware components. We had some minor problems when it came to greasing the differential, as it's shell has been glued together, just as is with the Servo motor. – 80 % completed.

4. Also one part of the hardware challenge was to make the car run smoothly and we managed to do it by greasing and adjusting the distance between cogwheels. – 100% completed

5. Implementation of the new logical component on Nucleo has just started, but as we know, the beginning is the hardest part of the process, we got an idea what we should implement and we know how to make a new component and build it on Nucleo, but we just didn't have enough time to experiment, we can say that this activity is 40% completed.

6. We looked into many lane detection algorithms, and in the end we decided to use the Sliding windows algorithm. We implemented the algorithm through a python script. As we didn't have

enough time to make recordings with our car and test the algorithm on them, we only tested it on real-world examples. The next steps would be to connect the algorithm through brain and to adjust it to our testing environment. – 60% completed

- **General status of the project**

Below is the description of the actual status of the entire project.

As a conclusion for this report we can say that we are positively surprised about our progress. Car is running smoothly enough, still experiencing few problems at the differentials, but as we read it's a manufacturing problem so we tried to minimize it; we are familiar with its hardware and software (not every aspect of it, but we will be soon), which was actually our main goal to achieve for these 11 days we had. We faced some challenges and problems, as we said before with differentials and with finding the right algorithm for lane detection. After these ones, maybe the biggest challenge for us was to understand and get a clear picture of what the brain does and how it is functioning, we are still onto this and we are doing pretty well. We understood how the Nucleo (the core of our system) works and how to use it for good.

- **Upcoming activities**

Here is the enumeration of activities planned for the next reporting period.

Firstly, we would like to overcome hardware issues and ensure proper functionality of the Servo motor and the differential, by reaching through its sealed plastic shell. (As instructed in the competition documentation) Secondly, we would conduct calibration of the car's movement and ensure proper camera interconnection with the rest of the system, for some simple real-time image processing capabilities.

Also in the next reporting period, we plan to implement basic autonomous driving features such as lane following and traffic sign recognition.

We will add new debugging and monitoring components on the Nucleo board to better track the car's internal state.

Additionally, we aim to optimize the existing codebase to improve performance and system stability.

We also plan to enhance sensor integration, improve communication between system modules, and perform extensive testing of the vehicle.

What's more we aim to become a more organized team by dividing tasks into smaller traceable units and have a goal of making better documentation of the system code as well as our development process.

And also we plan to keep being ambitious as we have been since the first day and to keep our spirits as high as they are right now!