**Presentation**

**0. Beginning**

Good morning / Good afternoon everyone! We are “MSU\_Space” and our challenge is called “UP, OUT AND AWAY”. Our main aim is to create a simulation that will describe the motion of heaven bodies and James Webb’s trajectory to the point Lagrange2 in Solar System. Before starting, we want to mention that everything was created without physics engine!

**1. Slide**

In the slide you can see the image that describes the motion of all bodies in our system.

**2. Slide**

Then we have created a system of differential equations that describes our system. However, we didn’t take into account the radiation of the sun and that the Earth is not spherical. Due to limitations in time we had to simplify our model. Then we have solved this system of differential equations using numerical methods.

**3. Slide-Video (Result)**

This is the latest version of our program, but not final. We are going to develop it in the future. Now you can see the Earth, the Moon, the Sun, James Webb St and point L2 on our video. On the left side we see magnified image of the Moon, Earth and James Webb. You can see that near to the Moon, James Webb did the gravitational maneuver and as a result of this it got an additional velocity. To reach the desired orbit we have used the impulse maneuver. When James Webb reaches the point L2 it will synchronize its coordinates and velocities with point L2. Although automatically it will be able to stay there infinitely long time, the real model will not.

**Possible Questions and Answers**

**1. What kind of numerical method have you used?**

We have used fourth-order Runge-Kutta scheme.

**2. Why haven’t you used ready ephemerids?**

We want to give freedom for users. They will be able to change masses, velocities, distances and to see how the behavior of the system will change. That’s why we didn’t use the ephemerids. Our model makes it possible.