



Aleksandr Titov

● ABOUT ME

Highly motivated PhD in Industrial Engineering with 6+ years of experience in CAD design and simulation using SolidWorks and ANSYS. Proven ability to mentor and guide students, successfully co-supervising 4 BSc and MSc projects to completion. Passionate about applying 3D design, mechatronics, and 3D printing to develop innovative solutions for real-world engineering challenges

● WORK EXPERIENCE

01/11/2021 – 15/12/2022 Rome, Italy

ASSISTANT LECTURER IN UNIVERSITY UNIVERSITY OF ROME TOR VERGATA

Two short one-month teaching courses in 2021 and 2022

- Introducing CAD software Autodesk Inventor
- Explaining basics of CAD design and mechanism modelling
- Presentation and assistance in dynamic simulation analysis
- Assistance in modelling, analysis, and report writing
- Supervising and assistance on works of more than 20 students

01/11/2017 – 30/05/2020 Reutov, Russia

SPACECRAFT DEVELOPMENT ENGINEER ROSCOSMOS

- 2D technical design
- 3D design and modelling of parts of the spacecraft in PTC Creo

05/07/2015 – 20/08/2017 Russia

RAILWAY TECHNICIAN RUSSIAN RAILWAYS

Full-time job experience during student holidays (July, August) in various regions of Russia.

- Federal railway parts manual assembly and exchange
- Railroad parts preparation

● EDUCATION AND TRAINING

01/11/2020 – 30/10/2023 Rome, Italy

PHD University of Rome Tor Vergata, Industrial Engineering Dept.

Address Via del Politecnico, 1, 00100, Rome, Italy | **Website** <https://iarm2.ing.uniroma2.it/>

01/09/2014 – 30/06/2020 Moscow, Russia

MASTER EQUIVALENT DEGREE IN AEROSPACE Bauman Moscow State Technical University, Aerospace faculty

Website <https://bmstu.ru>

● LANGUAGE SKILLS

Mother tongue(s): **RUSSIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C1	C1	C1	C1	C1
ITALIAN	B1	B1	A2	A2	A2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

PUBLICATIONS

2024

[Performance Analysis of a Gripper for Microsatellite Berthing](#)

In this paper, the grasping operation of CubeSat microsatellites is analyzed with a topological study of grasping strategies as functions of CubeSat geometry. Grasping conditions and limitations are introduced for the square-profiled bodies of CubeSats of 1U and 12U sizes. A topology search defines fingertip forms and configurations to fulfill requirements, and operational limitations are presented in terms of geometry and dynamic parameters. The grasping performance is then analyzed in the side grasp and corner grasp cases and validated with a numerical case study.

ASME Journal of Mechanisms and Robotics, 16(9), 091011

2023

[Design and Performance Characterization of a Gripper End-Effector for a Space Berthing Manipulator](#)

In this paper the task of berthing is presented with a suitable end-effector design. A geometry-based gripper is designed to capture microsatellites CubeSat on their ribs. To minimize the volume, one d.o.f.-mechanism is designed with a foldable structure. The workability of the design is tested by dynamic simulation to find and check the limitations of the construction.

M. A. Laribi et al. (Eds.): MeTrApp 2023, MMS 124, pp. 15–22

2023

[Design and Operation of a Gripper for a Berthing Task](#)

The idea of an extension of life for CubeSats is proposed to reduce space debris in a low-earth orbit. In this work, a gripper is designed for geometry-based grasping in berthing tasks. The grasping operation is outlined for square- and rectangle-profiled CubeSats. Equilibrium conditions are used to choose fingertip shape and parameters for grasping the CubeSat body. A design scheme is proposed to provide the required accuracy. A design concept is developed into a lab prototype by using low-cost 3D printing technique, and a mock-up grasping task that is representative of the berthing operation is evaluated with the lab prototype. Center-mass hanging setup for the prototype and grasped body is used to evaluate the impact of grasping, partially replicating the conditions in space by reducing the effect of gravity on the system.

New Advances in Mechanisms, Transmissions and Applications. MeTrApp 2023, MMS, pp. 15–22

2023

[Design and Performance of a Berthing Space Manipulator](#)

This paper presents a 5R1T manipulator design for berthing tasks with the satellite type CubeSat. The proposed lightweight low-cost solution is capable of holding and transferring objects up to 24 kg. The berthing task is presented to grasp the satellite and moving it to the berthing port in a dynamic simulation using the Autodesk Inventor package. For defined positions of the satellite and the berthing port, the positions of the end-effector are assumed, and the angular positions of the other joints are measured. The problems of grasping and slipping of the satellite are outlined and solved by changing the geometry of the fingertips.

M. Ceccarelli et al. (Eds.): TORVEASTRO 2023, MMS 130, pp. 140–147

2022

[Requirements and Problems for Space Berthing System](#)

In this paper a berthing task is introduced with a system which considers a station and a CubeSat-like satellite. In the presented task a manipulator is used to catch, to move the micro-satellite towards berthing port, and to dock it with interfaces activation. The requirements are discussed for the system in terms of issues for design, control, and sensorization. According to the requirements, possible problems are formulated with characteristic parameters. A conceptual CAD solution for the berthing manipulator is presented with a gripper, and a dynamic simulation for basic movements is elaborated for characteristic results.

I. Doroftei et al. (eds.), Proceedings of SYROM 2022 & ROBOTICS 2022, MMS 127, pp. 127–135

2022

Problems and Requirements for Docking Operation in Orbital Stations

The task of docking objects in space is considered for small satellites. Among different mating schemes docking non-androgynous is investigated by looking at the problems on the existing solutions. The requirements for small satellites docking are discussed in terms of control, navigation, and capturing issues. Different types of adaptive systems for docking male and female parts are presented in different combinations for comparison. In terms of impact and working area effects two adaptive systems were chosen as an option for future work. The fixture task is characterized in a planar wedge conceptual model, and its working is checked in the laboratory test.

IFTToMM Italy 2022: Advances in Italian Mechanism Science pp 159–167

2022

Design and Performance of L-CaPaMan2

The improved solution of L-CaPaMan design is elaborated with solutions for low-cost lightweight features. A new prototype is presented as a result of design improvements by using market components and 3D printing manufacturing. The new prototype as L-CaPaMan (Light CaPaMan) is characterized with new components for a new slider solution and light-structure links. The prototype construction is discussed up to a testing layout for design validation and operation characterization. Results of testing are discussed to outline the operation performance of L-CaPaMan by using Arduino controller with basic sensors for motion and action monitoring.

Appl. Sci. 2022, 12, 1380

2021

Design and Performance of a Motion-Assisting Device for Ankle

This paper presents a new design for a motion-assisting device as an exoskeleton for ankle articulation. The proposed design is characterized by a light weighted structure with adaptable geometry to different users with low-cost and easily wearing features. The exoskeleton assistance is obtained with three linear electric actuators to provide the three motions of an ankle. A CAD model is elaborated for design details and for simulation whose results give data for feasibility of the proposed design and its characterization in basic operation performance.

Proceedings of IFTToMM Asian MMS 2021, MMS 113, pp. 659-668

2021

Prototype and Testing of L-CaPaMan

A new version of CaPaMan design is elaborated with solutions for low-cost lightweight features. A new prototype is presented as result of design improvements by using market components and 3D printing manufacturing. The new prototype as L-CaPaMan (Light CaPaMan) is characterized with new components for a new slider solution and light-structure links. The prototype construction is discussed up to a testing layout for design validation and operation characterization. Results of testing are discussed to outline the operation performance of L-CaPaMan by using Arduino controller with basic sensors for motion and action monitoring.

TMM 2020: Advances in Mechanism Design III pp 249–258

2021

L-CaPaMan Design and Performance Analysis

This paper presents a solution for low-cost lightweight design of L-CaPaMan by using market components and 3D printing manufactured parts. The aim of this new solution is to provide a parallel manipulator prototype for research and formation activities, such as for performance evaluation and education of parallel manipulators. The proposed CAD design is used in dynamic simulation whose results are discussed in terms of advantages and limitations of the designed solution.

KOD 2021: Machine and Industrial Design in Mechanical Engineering pp 569–576

2020

Maneuvers Possibility for the Spacecraft Equipped with Liquid-Fuelled Engines Operating with Different Kinds of Fuel

This paper compares possibility for the spacecraft equipped with liquid-fuelled rocket engine to change orbital plane for purposes of space debris collection. The simple method of orbital plane rotation angle calculation is described. Also recommendations for fuel components selection made using possible orbital plane rotation angle as the main factor.

EuCoMeS 2020 - New Trends in Mechanism and Machine Science; MMS 89, pp. 389–396

2019

3D Application for Modeling of Involute Gear Manufacturing as the Assistance Solution for TMM Training

In this paper the description of special educational experiment carried in Bauman Moscow State Technical University is given. The attempt to develop demo application for modeling of 3D model of involute gear manufacturing was taken by

students of Institute of Modern Educational Technologies and Robotics and Complex Automation department. While development of the application advantages of 3D game development kits were used to improve both understanding of applied mechanics, CAM-processes and 3D programming.

IFTToMM WC 2019: Advances in Mechanism and Machine Science pp 813–823

2018

Free and Open Source Software for Technical Texts Editing, Its Advantages and Experience of Usage on TMM Training in Bauman University

Creation of the documentation is practically hardest part of any engineering, software development or scientific project containing large amount of knowledge. In Bauman University every TMM project includes main document (thesis) which contains explanation of all calculations performing through development of the project. To reduce time of preparation for such technical texts the complete software solution with formulae support needed. In this paper usage of LaTeX (as common free solution) is considered in comparison with most known free and proprietary solutions such as MS Word, Open Office and T-Flex DOCs.

New Trends in Educational Activity in the Field of Mechanism and Machine Theory; MMS 64 pp. 208–215

● **NETWORKS AND MEMBERSHIPS**

01/12/2020 – 30/10/2023 University of Rome Tor Vergata, Rome, Italy

LARM2

- Working on 2 projects
- Management and maintaining the laboratory equipment
- Ideas exchange with colleagues
- Brainstorming in projects

● **CONFERENCES AND SEMINARS**

24/05/2023 – 26/05/2023 Chasseneuil du Poitou, France

6th IFTToMM International Conference on Mechanisms, Transmissions, and Applications

- Author and presenter of the work "Design and Performance Characterization of a Gripper End-Effector for a Space Berthing Manipulator"

Link <https://metrapp2023.sciencesconf.org/>

17/11/2022 – 18/11/2022 Iasi, Romania

Joint International Conference of the 13th IFTToMM International Symposium on Science of Mechanisms and Machines (SYROM 2022) and the XXV International Conference on Robotics (ROBOTICS 2022)

- Author and presenter of the work "Requirements and Problems for Space Berthing System" (online)

Link <https://syrom-robot.upt.ro/>

07/09/2022 – 09/09/2022 Naples, Italy

The Fourth International Conference of IFTToMM ITALY

- Author and presenter of the work "Problems and requirements for docking operation in orbital stations"

Link <https://www.iftommitaly.it/ift2022/>

10/06/2021 – 12/06/2021 Novi Sad, Serbia

International Conference on Machine and Industrial Design in Mechanical Engineering

- Author and presenter of the work "L-CaPaMan Design and Performance Analysis" (online)

Link <https://iftomm-world.org/conferences/kod-2021/>

30/06/2019 – 04/07/2019 Krakow, Poland

IFTToMM World Congress on Mechanism and Machine Science

- Participation as a co-author of the work "3D Application for Modeling of Involute Gear Manufacturing as the Assistance Solution for TMM Training"

23/11/2017 – 24/11/2017 Madrid, Spain

2nd International Symposium on the Education in Mechanism And Machine Science

- Author and presenter of the work "Free and Open Source Software for Technical Texts Editing, Its Advantages and Experience of Usage on TMM Training in Bauman University"

Link http://www.ic-iftomm.org/japanese/paper/cfp_ismms_2017.pdf

PROJECTS

15/01/2022 – 30/10/2023

Docking and berthing operation for microsatellites CubeSat

Research project of ways for CubeSat microsatellites mating.

PhD thesis "DESIGN AND GRASP ANALYSIS OF A BERTHING SYSTEM FOR CUBESAT SATELLITES"

Link https://www.researchgate.net/publication/378747048_DESIGN_AND_GRASP_ANALYSIS_OF_A_BERTHING_SYSTEM_FOR_CUBESAT_SATELLITES

[378747048_DESIGN_AND_GRASP_ANALYSIS_OF_A_BERTHING_SYSTEM_FOR_CUBESAT_SATELLITES](https://www.researchgate.net/publication/378747048_DESIGN_AND_GRASP_ANALYSIS_OF_A_BERTHING_SYSTEM_FOR_CUBESAT_SATELLITES)

08/01/2021 – 15/01/2022

L-CaPaMan

A low-cost improvement of CaPaMan (Cassino Parallel Manipulator)

01/09/2019 – 30/03/2020

Space debris collector design and evaluation

- The master thesis project
- Design of a bucket-form spacecraft to collect space debris in low-earth orbit
- Conference paper "Maneuvers possibility for the spacecraft equipped with liquid-fuelled engines operating with different kinds of fuel" In *New Trends in Mechanism and Machine Science: EuCoMeS 8* (pp. 389-396) (2020)

15/11/2016 – 30/11/2017

Open-source software for technical texts editing

- An experiment of the integration of open-source software in educational practice
 - A research of LaTeX as a software for technical report writing in Bauman Moscow State Technical University
- The result is presented in the work "Free and Open Source Software for Technical Texts Editing, Its Advantages and Experience of Usage on TMM Training in Bauman University"

HONOURS AND AWARDS

12/05/2023

Bronze medal of the ISSSP competition – Beijing Institute of Technology

Name of competition "International Space Science and Scientific Payload Competition"

Topic "Innovative Design of Space Payload Experiment"

Project "TORVEASTRO"

02/10/2022

Startup mentorship of NASA Space Apps Challenge – Regione Lazio

Being a team "Birth of Venus" member, won a mentorship from Regione Lazio to organize a startup from a project of maintaining a spacecraft on a surface of Venus

MANAGEMENT AND LEADERSHIP SKILLS

Co-supervisor in the research lab

- Maintained and managed 4 student projects in LARM2 laboratory (2 ongoing projects) with Epson SCARA robot
- Led 2 students to finish their thesis projects
- Fixed the hardware problem of SCARA caused by the student and found another way to operate the robot

HOBBIES AND INTERESTS

3D printing

- More than 2 years of experience with printing
- Multibody mechanism design for printing
- Rapid-prototyping design for printing
- Low-cost translational joints design for printing in PLA
- Learning how tolerances, temperature, infillment, supports and other parameters affect on the final model
- Experienced user of 2 printers and 4 software for slicing

CAD design

- Different approaches of modelling
 - Modelling of parts
 - Bottom-up and top-down design approaches knowledge
- Design and simulation knowledge
- Experienced user of Autodesk Inventor, Solidworks, Onshape, PTC Creo, FreeCAD, MSC Adams
- Modelling for 3D printing
- Conducted 2 short teaching courses of design and dynamic simulation in Autodesk Inventor software at the university

Open-source software and hardware user

- Experienced Arduino user
 - Created a low-cost parallel manipulator L-CaPaMan
- Experienced Linux user (Ubuntu, Mint, Debian, Manjaro, Puppy, Knoppix)
- Experience in LaTeX - open-source software for documentation
 - Presented a project "Free and Open Source Software for Technical Texts Editing, Its Advantages and Experience of Usage on TMM Training in Bauman University" in 2017
- Open-source 3D CAD software user of FreeCAD
- Experience of maintaining a server based on open-source microPC OrangePi Zero
- Created an open-source NAS server based on Nextcloud and Orange Pi Zero

Music

- Playing guitar, bass guitar, ukulele
- Participating in rock-band in 2011-2014
- Finished guitar class of the music school in 2015
- Song writer and music composer

Photographer

- Photographer of landscapes, nature, animals
- Event photographer (amateur level)

Cycling

- Bike trip from Moscow to St. Petersburg on the folding bike
- Bike trip from Rome to Florence
- Filming and editing while traveling (amateur level)

● VOLUNTEERING

13/10/2019 – 16/10/2019 Moscow, Russia

State Student 60-year Anniversary Event

- Helped in the organizing and holding the event for student organization on 10000 people
 - Logistic and resource management for the event
 - Made an idea for the unofficial mascot for the event
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