Book of Abstracts

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Analysis of lunar satellite data for site selection for future commercial in-situ resource reconnaissance drilling missions.

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The subject of this paper is the analysis of satellite data for the selection of sites for future commercial drilling missions of in situ resource reconnaissance. The presentation presents raw materials of potential economic importance that may be found on the Moon. Maps of the distribution of such raw materials as helium-3 and titanium, sites with elevated potassium (K) and phosphorus (P) content, and rare earth minerals (REE) are presented. Referred to in English literature as KREEP deposits [Warren and Wasson, 1979]. For the purpose of this engineering work, an analysis was made of the distribution of water ice deposits that can be converted into hydrogen and oxygen and then used as rocket fuel. The location of potential deposits of such ice near the poles of the Moon is presented. The main purpose of the work is to determine potential locations at the Moon's south pole, based on certain parameters. These locations may be the object of exploration in the future. In addition, the route of the rover's descent and exit to the potential deposit was determined, taking into account the degree of insolation and the degree of slope. The analyzed parameters were divided into 3 sectors: geological, geographical and technical parameters. The satellite data used in the study came from NASA's National Aeronautics and Space Administration database "LROC: QuickMap." The "Polar Water Equivalent Hydrogen" layer was used to search for water deposits on the Moon.

Space Mining Regime in Outer Space from the Perspective of UN Member States

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This paper presents analysis of opinions of UN member states on space activities regulations, including space mining. Although the Outer Space Treaty regulates this issue, it offers different interpretation options. And it is the inconsistent interpretation of individual UN members that leads to the impossibility of creating clear rules for activities in outer space, including the space mining. Moon treaty offers option how to regulate these activities but there is clearly unwillingness to accept this agreement by most UN members. As part of the research, the attitudes of individual states were analyzed, and possible solutions were evaluated. For a better understanding of the attitudes of individual states, the development over the years was also analyzed. The paper takes in consideration proposals of legal regulation of space activities presented by COPUOS members. As a result, we can divide UN member states into four categories according to their statements at COPUOS sessions. However, there is no wide acceptance of any option regarding exploitation of space resources. It seems that in some ways the problem of reaching the conclusion on some legal regime. It seems unlikely that a consensus will be reached at the UN any time soon. Unless there is a substantial change in approach, legislation will develop from customary law rather than from a legislative process achieved at the UN.

Activities and results of the lunar regolith simulant development for the electrochemical separation of regolith within the ELMORE project

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A new focus is on developing and testing exploration technologies for application both on the Moon and later on Mars. For exploration, ISRU processes are fundamental. In the joint project "closed electrochemical processes for the extraction of pure elements from lunar regolith (ELMORE) by the Fraunhofer IST and the TU Berlin a particularly energy-saving approach was chosen. Ionic liquids are used to dissolve phases of the regolith at temperatures below 200°C. Subsequently, the chemical compounds can be separated in a galvanic cell and oxygen and metals are deposited. For the realization of the project a regolith simulant was needed, which does not only correspond particle-mechanically and particle morphologically to the lunar regolith, but also regarding mineralogical and chemical properties. The simulants TUBS-M and -T were used as they were already available and well characterized. In order to be able to narrow down the reactions that take place more precisely, individual simulant supplements were developed. In the project challenges were noticed with the dissolution of the simulant in the used ionic liquids. Crystalline structures, which made up parts of the regolith simulants, are more difficult to break up chemically than amorphous ones. To address this problem, additional amorphous components were developed and tested. For this purpose,small amounts were melted into glass and prepared according to the naturally occurring glass fractions in the regolith.

Humanities and Space. Double Bind or Double opportunity?

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The new age of space conquest brings to the forefront questions that the humanities did not ask enough during the first ages of space conquest. For law and philosophy, space now appears in particular as a place to think about in terms of human occupation, and occupation that is not degrading, unjust or contaminating. For poetry, literature and theatre, space is now also a place to be reinvented, no longer as an imaginary and hypothetical frontier but as a place of everyday life. Here, the addition of these questions appears as a double opportunity for the humanities: not only are they asked to reflect on living together in a non-terrestrial environment, one of their essential subjects, especially in the creation of utopias and extraterrestrial civilisations, but it is from the most contemporary perspective, that of ethics, justice and sustainability, that this request is made.
It should be noted that the same questions and the same disciplines of the humanities are not at the forefront depending on whether one is asking the question of how to go into space (and survive there) or what to do there. In the first case, it is sociology, design, psychology, etc. In the second case, it is law, heritage sciences, modern languages. The renewal of the conquest of space thus once again confronts human beings with the challenges they faced when they discovered the Orient or America.

How space-based data contribute to sustainability in developing countries

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The scientific community has an essential role in attaining the UN's Sustainable Development Goals, of which at least five are directly related to the Earth and Space sciences. From a practical point of view, the cornerstone to progress is our ability to observe, collect & interpret data from natural systems over a wide range of spatial and temporal scales, combining measurements, from space-based techniques to ground-based networks. Examples of research programs that use remote-sensing data and that involve developing countries will be illustrated, with an emphasis on the consequences for social and economic progress.

Multimessenger astrophysics with CTA

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The Cherenkov Telescope Array (CTA), a next generation ground-based very-high-energy gamma-ray observatory, will be a key instrument for multimessenger astrophysics in the VHE (> 100 GeV) range, owing to its unprecedented sensitivity, rapid response, and capability to monitor a large sky area via a scanning mode of operation. The detection of electromagnetic emission following the gravitational wave event GW170817 provided the first direct evidence that at least a fraction of binary neutron star mergers are progenitors of short Gamma-Ray Bursts. GRBs also emit VHE photons, as proven by the recent MAGIC and H.E.S.S. detections. The spatially and temporally correlated observations of the flaring gamma-ray blazar TXS 0506+056 and a high-energy neutrino detected by IceCube as well as the detection of high-energy neutrinos from the active galaxy NGC 1068 by IceCube are the most compelling evidence for the high-energy neutrino point sources so far. One of the challenges for future multimessenger observations will be the detection of VHE emission from GRBs in association with GWs and from steady or flaring sources in association with HE neutrinos. We present the CTA GW and neutrino follow-up programs, with a focus on the searches for short GRBs possibly associated with BNS mergers, as well as steady sources and flaring blazars associated with neutrinos from IceCube. We investigate the possible observational strategies and outline the prospects for detection of VHE EM counterparts.

Preventing Musculoskeletal Injuries in Astronauts: Insights from Current Research

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Astronauts face a range of musculoskeletal injuries during spaceflight, including bone loss, muscular atrophy, and back pain. While physical medicine and orthopedic-trained physicians and therapists are essential for preventing and treating these injuries, it may not be possible to include them in long-duration space missions due to logistical challenges. Remote consultations with physical therapists may also be difficult or impossible. As a result, it is crucial to develop prevention strategies and in-flight physiotherapy protocols to minimize the risk of musculoskeletal injuries during spaceflight. Repetitive motions and overhead work should be minimized, while optimized spacesuit design can help reduce the risk of injury. The Advanced Resistive Exercise Device (ARED) has been shown to prevent muscle atrophy and bone degradation during flight but may also cause post-flight back pain. Therefore, it is important to carefully monitor astronaut health during spaceflight and develop effective prevention strategies for overuse injuries. To this end, developing tools that can detect overloads before they become injuries will be critical for ensuring astronaut health during long-duration missions. Overall, this paper provides valuable insights into how to promote musculoskeletal health among astronauts during spaceflight while acknowledging the challenges of providing physiotherapy support in remote environments.

Products, Commodities, Materiel and Fuel - What's the legal status of processed space resource

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The discussions around space resources and the lagality of space mining are mostly concerned with the interpretations of Article II and VI of the Outer Space Treaty of 1967, or the current status of the Moon Agreement of 1979 or the Artemis Accords of 2019. There is however too much discussion on the concept of "national approriation", and too little on chattel property creation. This presentation shall discuss the concept of "space-made product" as well as the problem with space manufactured objects, produced with the use of space resources, which are not considered "Space Object" under contemporary space law.

Space Exploration Perception in EU and USA - project presentation and initial results

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During this presentation the outline of a two year long project regarding perception of space exploration will be presented.

The projects aim is to investigate how general population perceive space projects in terms of its importance, value and expectancy of its success.

Another aspect covered in research project is perceived conflict between space research and other social goals specifically Sustainable Development Goals (SDG) formulated by United Nations to be achieved in 2030.

Dependent variable measured in the study are:
- general support for space exploration
- support for expenses for space exploration
- support for education in the field of space exploration
- support for citizen science projects
- engagement intention in space science acquisition

Other variables included in the study are:
- gender
- nationality
- level of education
- type of education
- political persuasion
- religiosity
- prior knowledge of space science

During the conference initial results will be presented as well as overall plan and scope of the research project. Next phases of the project entails experimental design and inclusion of other European countries in the sample.

This project is a joined collaboration of Faculty of Humanities and Space Technology Centre at AGH University of Science and Technology.

Space Exploration Perception and Engagement Intention Among STEM University Students – Results from a Mixed Method Study

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Space exploration is currently gaining momentum. This interest is crucial for attracting students to space sciences. We present the results of a qualitative and quantitative study on space exploration perception among university students. Our study showed that participants are interested in space sciences, but their intention to engage in space education is low. Female and male students did not differ in terms of general attitude and interest in space and were equally (not) likely to engage in space education and career. Our findings have practical value for designing interventions to enhance students' engagement in space education.

5000 years of space exploration - astronomy for the most part

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5000 years of space exploration --astronomy for the most part -- in mutual exchange with the SHS and the resulting insights for man's view of his own near and distant environment.

Society and Space, Space Education, Sustainability Session

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Education and capacity-building are of central importance to mandates within the United Nations system, including that of the Office for Outer Space Affair of the Secretariat. The Office, for instance, runs an Access to Space For All Initiative, partnering with space agencies, research institutions and industry, to provide opportunities to access space through gradual learning steps and hands-on opportunities. Recognizing the need for developments in law and policy to keep pace with rapid scientific and technical advances, the Office also provides legal advisory services. As a whole, the Office holds workshops, symposia, webinars; conducts technical advisory missions; maintains online portals, hosts e-learning tools, and supports multilateral processes, covering a wide range of scientific, technical, legal and policy areas, with all these efforts falling under the umbrella of ensuring equitable access to the benefits of the exploration and use of outer space, supporting the achievement of the Sustainable Development Goals and making sure nobody is left behind.

While space sustainability is interdisciplinary in nature and is mainstreamed throughout the work of the Office, some of the targeted efforts on the topic include support to an ongoing related multilateral process and implementation of a project that raises awareness and builds capacity related to the implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities.

Analysis of accelerations occurring during the stratospheric balloon flight

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Stratospheric balloons are a tool used for high-altitude meteorological data collection. Researchers use them to study Earth's atmosphere and magnetic field, space radiation and air composition [1]. Using a balloon gondola as a platform for other research provides conducted experiments with the exceptional environment – space radiation level is notably higher than on the ground level, the temperature drops below -20°C and pressure ranges from 1 to 100 mbars, depending on the altitude.

However, especially for lightweight gondolas, the mentioned winds might cause rapid flight direction changes. This in turn may cause sudden hypergravity increases for the carried payload, which may negatively affect results of some experiments. Analogous situation may occur during landing, which may even cause destroying of the gondola.

Above-described situations may be avoided while considering typical acceleration profile of stratospheric balloon flight. We measured 3-axis acceleration during two typical balloon missions. Additional measurements were done with usage of damping systems - one based on memory-foam technology and second based on system of coil springs to see if there is a noticeable difference with usage of such [2]. Proposed suspension systems were to dampen impacts resulting from sudden movements of the balloon and the gondola.

[1] Pfotzer, G. (1972). History of the use of balloons in scientific experiments.

[2] Michalczyk, J. (1990). Dynamika maszyn górniczych. Cz. 1.

Analysis of accelerations occurring during the stratospheric balloon flight

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United Nations Office for Outer Space Affairs

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1. Education and capacity-building are of central importance to mandates within the United Nations system, including that of the Office for Outer Space Affair of the Secretariat. The Office, for instance, runs an Access to Space For All Initiative, partnering with space agencies, research institutions and industry, to provide opportunities to access space through gradual learning steps and hands-on opportunities. Recognizing the need for developments in law and policy to keep pace with rapid scientific and technical advances, the Office also provides legal advisory services through its Space Law for New Space Actors project. As a whole, the Office holds workshops, symposia, webinars; conducts technical advisory missions; maintains online portals, hosts e-learning tools, and supports multilateral processes, covering a wide range of scientific, technical, legal and policy areas, with all these efforts falling under the umbrella of ensuring equitable access to the benefits of the exploration and use of outer space, supporting the achievement of the Sustainable Development Goals and making sure nobody is left behind.
2. While space sustainability is interdisciplinary in nature and is mainstreamed throughout the work of the Office, some of the targeted efforts on the topic include support to an ongoing related multilateral process and implementation of a project that raises awareness and builds capacity related to the implementation of the Guidelines for the Long- term Sustainability of Outer Space Activities.
3. The Committee on the Peaceful Uses of Outer Space, including its subcommittees and working groups, supported by the Office for Outer Space Affairs, is the prime multilateral forum for international cooperation in the peaceful uses of outer space. The steady increase in Committee membership (current membership includes 102 States members, with over 50 observer organizations supporting Committee work), and the depth and breadth of agenda items considered and information shared, demonstrate the relevance of the body. Participation in Committee work can in itself also be viewed as a capacity- building endeavor.
4. The adoption, in 2019, of the Guidelines for the Long-term Sustainability of Outer Space Activities (A/72/20, annex II) was a landmark achievement in policymaking by the Committee. This adoption followed on nearly a decade of work and negotiations by dedicated Working Group.
5. The preamble and the 21 Guidelines recognize space activities as essential tools for achieving the Sustainable Development Goals, as well as the reality that Earth’s orbital environment constitutes a finite resource that is being used by an increasing number of entities. The Guidelines provide guidance on policy and regulatory frameworks; the safety of space operations; international cooperation, capacity-building and awareness; as well as scientific and technical research and development. They address, inter alia, space weather models and tools, pre-launch conjunction assessment, space debris monitoring information and the registration of space objects. While voluntary in nature, they carry strong political legitimacy.
6. The Office implements a project that raises awareness and builds capacity related to the implementation of the Guidelines. In this connection, the Office has organized multi- stakeholder events; created a case study database; published a stakeholder study report; and is currently developing a related e-learning tool.
7. Further multilateral work on the long-term sustainability of outer space activities also continues. A new working group on the topic is currently: identifying and studying challenges and considering possible new guidelines; sharing experiences, practices and lessons learned from voluntary national implementation of the adopted Guidelines; and raising awareness and building capacity, in particular among emerging space nations and developing countries.

High-temperature materials for space technologies

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A few groups of ceramic high-temperature materials are used for space applications, including Ceramic Matrix Composites (CMC), Ultra-High Temperature Ceramics (UHTC), Thermal Barrier Coatings (TBC) or Thermal Protection Systems (TPS).

Ceramics for space applications shall often withstand extreme conditions, including thermal shocks, erosion and corrosive chemical environments. However, their main drawback is brittleness and low fracture resistance.

This work presents the properties of ceramic-metal composites, including, among others, Al2O3-Nb and MgO-Nb as potential new components for space applications. Nb was added to brittle ceramics as it possesses a high melting point of 2504oC and thermal expansion coefficient of 7.1·10-6 K-1 (comparable to ceramics) which lowers the risk of thermal stress formation. Materials were produced by applying arc plasma, and characterized in terms of their structure and microstructure.

This work was partially supported by the statutory funds of the Faculty of Materials Science and Ceramics, AGH, Kraków, no. 16.16.160.557, and partly by the funds of The National Centre for Research and Development, Grant no. LIDER/14/0086/L-12/20/NCBR/2021
(Principal Investigator: I. Jastrzębska).

MXene Nanomaterial-based Sensors for Space Applications

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The use of nanomaterials over the past two decades has led to its applications in energy storage, sensing, actuation, energy conversion, etc. Among the nanomaterials, MXenes are a family of two-dimensional nanomaterials first reported in 2011. Tunable electronic and chemical properties by altering compound chemistry make MXenes a very attractive choice of material for space applications. Though MXenes offer various advantages, the major challenge for extensive applications is environmental stability. Environmental stability of MXene material here implies variation of physical properties upon exposure to humidity, oxidation, and other physical parameters.

In the present study, pristine Ti3C2-MXene material is exposed to the stratosphere environment with different density, solar radiation, temperature, and pressure, etc., from terrestrial environment. Printed Ti3C2-MXene devices are mounted to the payload, which in turn is attached to a high-altitude balloon (HAB). The effect of physical parameters of temperature, pressure, altitude, and UV-ray exposure during the HAB experiment on the electrical properties of Ti3C2-MXene devices is reported. The HAB experiment is compared with ground tests. A stability study is performed for the entire flight duration, and the results are compared with the terrestrial environment behavior of Ti3C2-MXene material. This novel study forms the initial steps for developing MXene devices for sensor design for space structures health monitoring.

Robotics is the future of a Space exploration

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From year-to-year engineers and inventors works on new technologies for space exploration. Robotics is one of the most important industries which helps astronauts in space, or even does some work instead of them. First of all, this systems helps astronauts to navigate in Space, find information, record the results and help to perform different scientific work.
 Robotics unlike people can work at low temperatures, without presence of gravity, under the influence of radiation and without air. For exploration of other planets can be used construction that names «Mars rover» or «Lunar rover» or special moving platforms where can be installed robotics manipulators. One of this system is presented. Construction of this robotic system was designed for industry, but can be easily adopted for using while Space exploration. The main purpose of this robotic manipulator is to take and analyze soil from the surface of the planet or move it for another object. Size and characteristics of this robot can be vary depending on use, or can be design a new one model. This invention has lots of technological advantages: high reliability, easy to use and programing, good maintainability. Robot have three independent axis and gripping device.
 In conclusion, this invention is very important for future Space exploration, and can help astronauts on Space Shuttle or during exploration of other planets.

DSn. Oleh Onysko. Department- computerized mechanical engineering. Full professor.

A SIMULATION-OPTIMIZATION MODEL FOR CITY AUTOMATED PARCEL LOCKERS NETWORK DESIGN

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Self-collection delivery systems represent an improvement for both courier firms and customers, since they provide time flexibility while reducing overall mileage, delivery time, and, as a result, gas emissions. The supply chain disruptions caused by the SARS-CoV-2 pandemic have inevitably addressed the need of alternate last mile options in Urban Logistics. The presented hybrid modeling approach for automated parcel lockers network design incorporates a system dynamics simulation to estimate e-commerce demand in a city and takes into account the model's scalability for every metropolis. We present a lexicographic approach to the bi-criteria facility location problem. The simulation and demand forecasting were done with Anylogic simulation software, and the optimization was done with the Java-based CPLEX solver.

The use of multi-gas networks and alternative energy sources in space

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In the long-term perspective, there are plans to explore new planets and extract useful minerals from them, as well as create settlements and cities. It is uncertain what scientists will face on another planet.
When exploring new planets and building colonies, it is important to ensure uninterrupted energy supply. The technology that can provide this stability and diversity of energy sources is Smart Gas Networks. They include a wide range of improvements compared to modern natural gas supply systems.

When we start producing organic waste, it needs to be processed into biogas. In space conditions, it is necessary to conserve and use any waste and materials, so biogas will be a good method for converting organic waste and human waste into a useful resource.

Solar energy is already being used in space through solar panels, which will remain relevant and become a step towards the development of gas networks. In the event of finding water in large quantities on a planet, attention should be paid to the production of green hydrogen using solar energy.

Environmental neutrality and will be an important factor for new settlements, as clean air is a vital component.

In conclusion, smart gas networks have great potential and broad application not only on Earth, but also on other planets. Their stability and diversity of energy sources are the main advantages compared to traditional networks, and environmental friendliness is not just a feature, but a vital necessity in space.

Exploring Deep Space with DSAC and Pulsars

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When using spacecraft, accurate and reliable navigation systems are of a critical need. Although the Global Positioning System (GPS) made revolution in navigation on Earth, its functionality is limited from low Earth orbit to the surface of our planet.
Existing IPIN (Interplanetary Internet) and Promixity-1 protocols were developed specifically for interplanetary data transfer along with their work in near space. Their operability is ensured by a group of satellites located in the Earth's orbit, and another in the orbit of Mars. Proximity-1, a rover control protocol, is being developed and being used together with IPIN.
For the navigation of a spacecraft outside the Earth's orbit Deep Space Atomic Clock (DSAC) is used. It allows spacecraft to autonomously determine its exact position and navigate in deep space.
When traveling on long distance DSAC is unapplicable due to its low range. In this case pulsar as neutron star is used. The pulsar provides the possibility of spatial positioning of the spacecraft due to time difference passage of precise and equal radio pulse between the rocket and the MCC.
Navigation systems are critical for launching rockets and satellites, but GPS has limitations within low Earth's orbit. IPIN and Proximity-1 protocols for interplanetary communication and the Deep Space Atomic Clock are used for autonomous navigation within the solar system. Thus, in long flights, pulsars should be considered as the most effective modern means of navigation.

Intensification of production by pumping carbon dioxide into the reservoir in space

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In the future, humanity plans to explore new planets and extract fossil fuels from them, but it is very difficult to say in advance what problems specialists may face. One of them can be a low level of production.
Carbon dioxide (CO2) is an effective displacing agent due to its high solubility in oil under reservoir conditions. This agent helps to expand the oil and reduce its viscosity even with immiscible displacement.
When CO2 is dissolved in water, carbonic acid H2CO3 is formed, which dissolves some types of cement.
When CO2 is dissolved in oil, the viscosity of the oil decreases, the density increases, and the volume increases significantly: the oil seems to swell.
But it should also be taken into account that carbon dioxide causes corrosion of metals. For this, it is necessary to take certain measures - make a special coating to prevent corrosion of pipes. You can cover them with a layer of special paint or cover them with glass.
Technologies for capturing carbon dioxide (CO2) from the atmosphere provide a great opportunity for the oil and gas industry in the context of decarbonization of production.
Carbon dioxide will be collected through special traps near the manufactures that emit it the most. After that, carbon dioxide passes through separators, it is liquefied and pumped into tanks, in which it is transported to the necessary planets by spaceships.
In this way , we can both help in solving a huge problem of our planet, and increase production from new wells in space.

APPLICATION OF CORNER REFLECTORS FOR SATELLITE SAR MONITORING

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APPLICATION OF CORNER REFLECTORS FOR SATELLITE SAR MONITORING
Viktoriia Rykhlivska

SAR satellites get the image of Earth`s surface, emitting electromagnetic waves and analyzing the removed signal. Every received value contains two basic properties: amplitude and phase. The method of InSAR satellites in measuring of change of phase of signal or obstacles in course of time. This method will help in the potential detection of anomalies of deformations on considerable areas, that could be skipped through discreteness of GNSS network. For the improvement of results of this technology it is necessary to apply terrestrial corner reflectors. Trihedral radiolocation corner reflector as a permanent point for the accurate measuring of deformation a method of InSAR.
Recommended to use corner reflectors on areas with a plant cover and in the absence of artificial building. The successfully projected constructions of angular reflectors have the opportunity to return on 360 degrees. For the correct orientation of corner reflector it is necessary to define the azimuth of orbit and height of satellite that will be acquire. The input data for the calculation are coordinates of installation of reflector, date of observation, name of satellite.
Thus, for the improvement of monitoring results by the InSAR method, it is necessary to set the terrestrial corner reflectors, and to comply with the basic requirements for their construction.

Ph.D. Denys Kuhtar

Architecture and space structures design as a tool to facilitate space exploration.

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Space is a field of new opportunities for us, however, for its exploration and development, we need well-adjusted living and working areas for its exploration and settlement. This field requires a thorough understanding of the unique challenges of designing and building in the extreme environment of space, including microgravity, radiation, and limited resources. Space architecture involves developing designs for spacecraft, habitats, and other structures that can sustain human life and support scientific research.
One of the important things is modular architecture which typically involves designing and manufacturing individual modules. These modules may be designed to serve specific functions, such as providing living quarters, laboratory space, or storage areas. The modules can be connected together using docking mechanisms or other types of connectors, which allow for easy assembly and disassembly. One of the key benefits of modular architecture in space is its flexibility. If a module is damaged or malfunctions, it can be easily replaced or repaired without affecting the rest of the structure. Additionally, new modules can be added to the structure over time as needed, allowing the space habitat to be expanded or modified to meet changing needs.
Overall, modular architecture is a promising approach to space habitat design that can help to reduce costs and increase efficiency in space exploration and settlement. It's cost-effective and efficient.

WEB PLATFORM FOR SHARING THE SPACE-RELATED STARTUP IDEAS

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Introduction Space Technologies are a global development priority in the world nowadays. Galaxy has different ways of development which help humanity. For example, there are a lot of ways to create a technology that allows society to accumulate energy outside the Earth. The main approach is to find out the hidden and mysterious things much further than planet Earth. The contemporary, vibrant platform for startups allows investors to get modern ideas from young students. By the way, the platform allows users to be always up to date about recent space news.
The most effective technique to construct a Startup Platform is to create a RESTful application. RESTful applications are designed to be highly scalable, which can be handled large amounts of traffic and requests. The flexibility of using such architecture allows cross-platforming access. Also, the advantage is that applications designed in this way have fast and efficient performance results, with minimal overhead and latency. M
Based on the analysis, it is established that there is a growing trend of increasing interest in space technologies in Ukraine. Moreover, students have a lot of desire to explore something new about space and develop knowledge about this industry. The introduction of the Startups Platform will increase the number of projects with public access and allow investors to put their thoughts about a specific idea.

Geology in space and development of space electrical devices

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Since people began to explore space, the question of finding methods of geological and geophysical research of space in order to find minerals has arisen. I believe that the following theses described below will help us in this.
The study of the magnetic field of the planets will help to determine where, with the greatest probability, there may be some valuable deposits.
The creation of satellite modules for drilling wells and continuous extraction and processing of rock could start an industry in space and large processing stations will develop this industry
The design and development of chips that collect information relevant to the task and transmit it to sensors for various adaptations will greatly facilitate the use of various electrical devices in space. The collection of information on chips can also be used in the fast transmission of information from space to Earth online.
The development of chips that transmit information about the electromagnetic field to the sensors of adjustable devices greatly facilitates their use both on Earth and in space. Such devices can be used both on Earth and in space, when the electromagnetic field changes, the device can easily adapt through the signals it provides chip.
In summary, space exploration and space exploration have the potential to greatly improve our future lives there, and the development of new technologies, such as chip-based electromagnetic field data transmission, can make this process more efficient and affordable.

Anticipatory Cooperation Principles for Deep Space Autonomous Intelligent Exploratory Robots

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This paper shows how the principles of anticipatory robotics can be applied to plan cooperation and coordination of deep space fully autonomous intelligent exploratory robots. While performing a common task robots are endowed with autonomous decision making capacity and the knowledge of other robot decision algorithms Cooperating robot formations are modelled as evolving anticipatory networks driven by a discrete event system with a virtual supervisor. The key feature of anticipatory coordination consists in the identification of future actions of other robots in case of insufficient communication based on the knowledge of their decisions algorithms. Robot computational homogeneity allows each of them to perform periodically the role of coordinator and send commands to other robots taking into account their anticipated position and activity. The above coordination principles have been already validated for the teams of mine inspection and harvesting robots. Based on our earlier experiments with anticipatory robot coordination, we analyzed the current and planned deep space missions and selected several most promising applications of anticipatory coordination. These include Mars rovers during the solar conjunction of the planet, the icy moons and Titan surface exploration rovers. As an illustrative example we will solve a multicriteria coordinating problem for a team of robots traversing an obstacle in an anticipatory network formation with reinforcement learning

How can we generate electricity in space

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I`d like to start by saying that the most popular method of generating electricity in space is using solar panels. This method has been used for many years. It is simple and well known by scientists, but it is not powerful enough, so you have to put a big amount of panels, or find another method.
Nowadays the most powerful source of electricity is nuclear power plants. The main danger of nuclear reactor is a possibility of radiation disaster. So here, on Earth, those power plants have big and heavy protection. In outer space we can build the power plant as isolated object which won`t be connected with living quarters and don’t take care about radiation. Problem of cooling reactor can be solved by using materials with high heat transfer or we can use shadow from different objects to hide our power plant from sunlight.
Solar energy is effective and well-known source of energy, but we have to include other sources to use space in bigger scales.

Prototype of a conveyor system for the transport of lunar regolith

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Transport equipment designed to operate on the Moon will function under conditions of microgravity and the absence of an atmosphere, and will have to meet very high requirements regarding resistance to extremely low temperatures. Moreover, they should be resistant to highly abrasive lunar dust and should not contribute to its stirring from the surface. This article presents the concept, prototype, and laboratory tests of the tandem conveyor system for the transport of lunar regolith - TOLRECON (Tandem Of Lunar REgholit CONveyors). The prototype of this device was created as a result of research and development work of the student scientific group SpaceTeam AGH. The TOLRECON concept involves combining a rod scraper conveyor for horizontal transport of the regolith with a bucket elevator responsible for vertical transport. TOLRECON is equipped with a single synchronous drive system, which simultaneously drives the scraper conveyor and the drive sprocket of the bucket conveyor drive sprocket through a gearbox. The reciprocating motion of the rod gently moves portions of regolith with the help of scrapers, dosing them into buckets mounted on a single chain. As a result of laboratory tests of the device's design, the number of kinematic pairs sensitive to dust was minimized, the possibility of stirring up dust was limited through the optimization of the shape of scrapers and buckets, and the weight of the entire device was reduced.

WEB PLATFORM FOR SHARING THE SPACE-RELATED STARTUP IDEAS

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Global climate changes: factors of intensification and methods of their detection

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The climate on the planet is rapidly changing, and this fact is confirmed by many studies. The lack of consensus on the causes of global climate change makes it difficult to develop effective climate policies at the global, national and regional levels. An analysis of the increase in the number of natural disasters and extreme weather events around the world is presented.
The climate system is too complex to consider only the human influence as the main factor for the increase in global temperature. The geological history of our planet shows that the Earth has repeatedly experienced similar phases of global climate change, and the spectrum of influence of cosmic factors is quite wide.
Attention is drawn to the ecological state of the planet, which forms its immunity and resilience during global climate changes.
The important role of remote sensing of the earth in monitoring and detecting emergency situations, in particular from the point of view of environmental security in the conditions of military operations, is noted. Factors affecting the state of the environment caused by the activities of the energy sector, in particular oil and gas production, are considered.
The priority areas of research for the development of adaptation measures to the existing challenges caused by global climate changes and the catastrophic ecological state of the environment are considered.

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Office for Outer Space Affairs, Sustainability and Capacity-building

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Education and capacity-building are of central importance to mandates within the United Nations system, including that of the Office for Outer Space Affair of the Secretariat. The Office, for instance, runs an Access to Space For All Initiative, partnering with space agencies, research institutions and industry, to provide opportunities to access space through gradual learning steps and hands-on opportunities. Recognizing the need for developments in law and policy to keep pace with rapid scientific and technical advances, the Office also provides legal advisory services through its Space Law for New Space Actors project. As a whole, the Office holds workshops, symposia, webinars; conducts technical advisory missions; maintains online portals, hosts e-learning tools, and supports multilateral processes, covering a wide range of scientific, technical, legal and policy areas, with all these efforts falling under the umbrella of ensuring equitable access to the benefits of the exploration and use of outer space, supporting the achievement of the Sustainable Development Goals and making sure nobody is left behind.

While space sustainability is interdisciplinary in nature and is mainstreamed throughout the work of the Office, some targeted efforts on the topic include support to an ongoing related multilateral process and a project related to the implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities.

Closed ecological systems and the challenges they present in space exploration

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A closed ecological system is a self-sustaining ecosystem in which all the elements necessary for
life are present and can be recycled indefinitely. Such systems have been proposed for use in space
travel and colonization, as they would allow astronauts and colonists to produce their own food,
water, and oxygen, and recycle their waste.
However, the implementation of closed ecological systems in space presents several challenges.
One of the main challenges is the limited space available for such systems, as they must be small
and lightweight enough to be transported into space. This means that the ecosystem must be
carefully balanced and optimized to ensure maximum efficiency.
Another challenge is the need for a reliable source of energy to power the closed ecological system.
At the moment, I am working on breeding a new type of cherry. During my work and participation
in this project, I became curious about the possibility of growing cherries or, in general, stone fruit
crops in space.
In conclusion, closed ecological systems present exciting opportunities for space exploration and
colonization, but also significant challenges. Overcoming these challenges will require
collaboration between scientists, engineers, and space agencies from around the world. We must
work together to develop and test new technologies that can support sustainable life in space, and to explore new ways of utilizing closed ecological systems to meet the needs of future space missions.

Modern map without space technologies. Is that possible?

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Cartography pre-dates space tech. For example, Mercator's 1569 map used astronomy and math. Is it normal to use such methods now? Not really, let's analyze the main tools for creating modern maps. Satellite imagery offers detailed info and wide coverage of Earth's surface. GPS systems are crucial for creating accurate maps as they allow precise determination of object location, regardless of changes. Ground-based augmentation systems and advanced algorithms are methods for enhancing it. Lidars and radars are space tech that measures Earth's surface. Methods to improve that systems include improving signal processing algorithms, increasing measurement accuracy and sensitivity to different surfaces, enhancing efficiency, reducing energy consumption and production costs. GIS is essential to collect, store, process, analyze and use geographic info. Advanced GIS tech improves geolocation accuracy by providing precise data on geographical objects. Accurate sources of info for comparison with GPS data can reduce errors. Modern maps rely on improved geolocation. One approach is creating a large location determination system compatible with other tech.This would improve location determination based on signals from Wi-Fi access points or Bluetooth devices in the area. Specialized AI can learn on its own, access location sources, and create algorithms to combine them.A stable version that transmits data in a special format should be developed and integrated into GIS for further use.

The effect of cosmic radiation on human (I)

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Space radiation is different from the kinds of radiation we experience here on Earth. Astronauts are exposed to ionizing radiation with effective doses in the range from 50 to 2,000 mSv. Research on the effects of radiation is necessary to ensure the safety and health of people during long-term space missions and beyond. Together with the Vasyl Stefanyk Precarpathian National University, we plan to work on understanding molecular, cellular and tissue risks. There are risks of carcinogenesis, acute and late disorders of the central nervous system, chronic and degenerative tissue risks and acute radiation risks. Mechanisms of damage that include DNA damage processes, oxidative damage, cell loss through apoptosis or necrosis, extracellular matrix changes, inflammatory changes in plasticity, and microlesions. Knowing this information will help to develop appropriate countermeasures and protect a person from the harmful effects of radiation. In order to understand the biological response of a person to radiation, it is advisable to use model organisms for research. Examples of model organisms include bacteria, yeast, worms, plants, fruit flies, and many others. The fruit flies, we use in research have a number of properties that make them effective for humans. Baker's yeast is also widely used as a model system to study the effects of radiation-induced cell repair. The main consequences of cosmic radiation include: damage to DNA, damage to the Central Nervous System and Cancer.

Thermoelectric generators as power sources for spacecrafts

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Thermoelectric generators (TEGs) are devices that convert heat into electrical energy. TEGs can operate independently of external energy sources and can generate electricity in remote or harsh environments. A significant advantage of TEG is the simplicity of its design, which determines its reliability and durability. They can operate autonomously for decades as well. This makes TEGs an attractive option for power sources in spacecraft.
This paper provides an overview of the technology behind TEGs, including their operating principles and efficiency, as well as their advantages and limitations as power sources for spacecrafts. The design and implementation of TEGs on spacecraft are also discussed, with examples of their practical use in deep space missions.
Finally, the paper highlights ongoing research and development efforts aimed at improving the performance and reliability of TEGs. In particular, promising thermoelectric materials for various temperature ranges have been analyzed. The methods of obtaining and the factors that influence the formation of their properties are described.
Based on the analysis of literature and the results of our own research, a method for improving efficiency by using segmented thermoelements has been analyzed. The addition of segments made of medium temperature materials based on PbTe and low temperature materials based on BiSbTe to SiGe-based thermoelectric elements is suggested. The increase in thermogenerator performance can be up to 30%.

Carbon nanomaterials in Space: achievments and prospects.

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This presentation examines carbon nanomaterials and their applications in Space. Carbon is an element of life because it is present in organic substances. Also, it has different many and allotropic modifications that are formed as a consequence of different quantitive substance compositions and structures. Graphite, carbon nanotubes and graphene are the most distributed for use in Space. Due to its lightweight, flexibility and high melting point (3600°C), graphite is used for coating the surface of rockets. Carbon nanotubes can be filled with various nanomaterials and can be present in solar sails. Graphene-based coatings can improve efficiency in heat exchangers and fundamental cooling systems used in satellites.
The resistance of graphene sails could equip future spacecraft. Engineers explore the use of graphene-bonded sheets for use as thermal straps in spacecraft. Scientists aim to create a space elevator using carbon nanotubes.
At Precarpathian University, we obtain and study the properties of graphene oxide and reduced graphene oxide. The object of my research is the processes of structure formation during the synthesis of graphene oxide by the modified Hummers method. The subject of research is the establishment of the relationship between synthesis conditions and the reduction of graphene oxide and its structural, morphological and electrophysical properties. I am sure that materials that are obtained in Ukraine will be in Space as material for space vehicles.

ASTROBIOLOGICAL PROJECTS IN THE SPACE TECHNOLOGY CENTRE AGH

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Space Technology Centre is developing Life Sciences for Space Laboratory. Three astrobiological projects have been recently initiated.

The BIOSTRAT project is the construction of a lab-on-chip device adapted to the near-space environment in the stratosphere in which there is a possibility to carry out a number of research projects related to astrobiology in the future. Our particular interest is deep space and lunar environment, therefore another experiment is related to lunar phases. Three months long incubation of yeasts in bioreactors and analysis of their metabolic activity will be monitored to search for specific biomarkers applicable in space.

The second astrobiological project developed in the Centre is fully automated aquaponic system for food production in extreme conditions - INNOFOOD. The main innovation here is food production in absence of humans. The prototype will be tested in the laboratory conditions and then implemented in the Polish Arctic base in Hornsund for testing.

The third astrobiological project is related with development of materials and products based on bacterial cellulose originated from kombucha consortium. Particular interest are composites with nanomaterials which can work as sensors or power supply.

In order to run described above projects, we obtained several grants and sponsorships. Interdisciplinary character of the ongoing projects requires collaboration with experts from different disciplines from medical universities, space sector.

Case study of using underwater environment for astronaut candidates EVA training for in-space and surface operations

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Neutral buoyancy in water is used by space agencies around the word for EVA training, spacesuit evaluation, development of human-robotic partnership protocols and many other simulations. Analog Astronaut Training Center partner with International Institute for Astronautical Sciences USA in creation of underwater analog training course for astronaut candidates in EVA training for in-space and surface operations.

Course EVA-105 (Fundamentals of Underwater Analog) extends upon the introductory life support system curriculum presented in EVA-101 to include specific EVA space suit systems and test and validation procedures in an underwater analog environment. The course covers a historical analysis EVA space suit development programs, EVA space suit systems, laboratory test protocols, terminology and etiquette, EVA space suit test development, and design drivers of future EVA space suit systems. Students are responsible to develop and implement procedures for extravehicular activity operations.

Course EVA 106 (Engineering for Underwater Environment) is a follow-up course to EVA-105 (Fundamentals of underwater analogs). It continues with the topic of underwater environment, but specializes in development of tools, techniques, equipment and scientific experiments for this extreme space analog. This course orients in engineering, protocol development and testing of new procedures.

Both training courses are held at Neutral Buoyancy Laboratory with Survival Systems USA in Groton, CT, USA.

White Elephant: past, present, future

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The scientific research observatory "White Elephant" is located on Mount Pip Ivan in the Carpathians, in the west of Ukraine. The past of the observatory is connected with scientific research in the field of meteorology, astronomy and geodesy. The modern observatory is used for scientific research in the field of astronomy and astrophysics, as well as for the development of science and education. The future of the observatory is connected with the further development of scientific research with the help of the latest technologies and tools. In addition to scientific research, the observatory also plans to develop the tourism potential of the mountainous region and offer tourists new types of services related to astronomy and the night sky. Cooperation between the observatory and the UNIVERSEH project can contribute to improving relations between scientific research institutions in Europe and ensuring the joint development of space technologies and scientific research in the field of astronomy.
So, the "White Elephant" is located on a peak that is popular among tourists. And as a result, it can create new opportunities in the form of expansion of sales markets and business development. In this way, the observatory can attract a significant number of visitors, which will lead to stable income and can become a platform for scientific research and space exploration, which can attract scientists and investors from all over the world.

Spaceborne SAR Interferometry or Time Machine for Geodetic Purposes

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The Synthetic Aperture Radar (SAR) is a powerful and well established microwave remote sensing technique which enables high resolution measurements of the Earth surface independent of weather conditions and sunlight illumination. These measurements are very accurate and can be used to identify areas of deformation from events like volcanic eruptions and earthquakes.
Sentinel missions receive radar and hyper-spectral images for analysis and monitoring of land, ocean and atmosphere. The program goal is to provide global, continuous, autonomous, high-quality and wide-ranging monitoring of the Earth.
InSAR remote sensing technology provides users with systematically updated data. This makes it possible to form time series of images and analyze spatio-temporal changes in them. Satellite radar interferometry data are widely used for monitoring dams on large navigable rivers, transport infrastructure, bridges, airports, etc.
The SAR data, make it possible to determine the ice velocity of glaciers and develop ice flow velocity maps. For this purpose, we used the offset tracking method, which calculates displacements of points between two acquisitions.
Remote radar sensing data are widely used in addition to the results of GNSS measurements on permanent networks. The use of radar data with Synthetic Aperture Radar (SAR) makes it possible to develop almost continuous maps of displacements of the earth surface with millimeter accuracy.

The Use of Pressurized Garments in Space Analog Studies

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The long history of analog studies has yielded much valuable information for planning lunar and Mars exploration. To date, however, few analog facilities use pressurized suits for EVA activities. I introduce the use of such garments for analog studies and provide examples of experiments, activities and data generation that they make possible.

Anticipated network of optimizers for energy applications

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To meet today's demand forecasting challenges, where the data generated is huge, modern data-driven techniques need to be applied. The demand for electricity and power is predictable and we are able to predict consumption patterns.The importance of the issue of demand forecasting and other related factors are shown, and some experience of using anticipatory networking techniques for demand forecasting is collected.
The anticipatory network is designed to simulate the process of choosing a compromise position in multi-criteria optimisation situations. The main objectives for solving real-world problems are to respond to changing demand and maintain flexibility, and to create a platform for data exchange between components. This will allow you to continuously balance electricity supply and demand.
There are objectives related to the development of the multi-criteria decision-making methodology. Enriching the methods for controlling elements with the possibility of selecting the best methods at the moment based on the information provided by the system, and creating a visualisation of the effects of the proposed management methods are the operation done for fulfill the methodology.
At the presentation, I want to show an example of using an anticipation network in the problem of supplying loads with energy when there is no power generation from a possible photovoltaic installation.

New Materials for Cosmic Rays Shielding

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This presentation discusses the latest advances in the development of new materials for shielding
against cosmic rays, which pose a significant challenge to the safety of spacecraft and their crews
during long-duration space missions. Cosmic rays are high-energy particles that originate from
outside our solar system and can cause damage to human tissue, electronics, and other vital
components of a spacecraft.
One promising solution to this problem is the use of composite materials made of metal or metal
oxide particles in a polymer matrix. These materials offer several advantages over traditional
shielding materials, including their low weight, flexibility, and ease of manufacturing. One of the
most exciting developments in this field is the use of 3D printing technology to create complex
geometries and structures that are tailored to specific radiation shielding requirements.
Recent studies have shown that composite materials with the optimal size ratios and concentrations
of tungsten, lead, and bismuth particles in the polymer matrix can significantly improve the mass
attenuation coefficient of the material, providing superior radiation shielding performance
compared to traditional materials. Furthermore, these new materials have the potential to
revolutionize radiation protection in space and may enable safer and more efficient space
exploration and commercial spaceflight.
To conclude, the space industry must prioritize research on developing effective materials for cosmic ray shielding.

Mitochondrial stress as a central phenotype under spaceflight environment

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Space agencies and the private sector prepare for upcoming missions to the Moon and Mars, but our understanding of the health risks of spaceflight remains incomplete. Plans to develop space tourism require a safe flight experience for an average passenger, but because of space radiation and microgravity, space remains a challenging environment that dysregulates cellular homeostasis. In animals, most of cellular energy is produced in the form of ATP via oxidative phosphorylation, through the mitochondrial electron transport system (ETS). But electrons escaping the ETS can form reactive oxygen species, which contribute to oxidative stress. Mitochondria energetics is a key mechanism underlying many ecological, physiological, and evolutionary processes. Mitochondrial stress is also considered one of the most fundamental features of spaceflight. Several in-flight and ground-based studies in astronauts and model organisms revealed mitochondrial changes at functional, genomic, and proteomic levels. This stress is, in part, associated with ionizing space radiation. Deer mice kept in enclosures that allowed for increased or limited levels of physical activity were exposed to 2 Gy of X-rays. The mitochondrial respiratory capacity in the liver and muscle decreased days after the exposure, and in muscle, it recovered after a month, but not in the liver. Also the mass of liver decreased after irradiation, and physical activity affected oxidative stress to lipids in the liver and muscle.

The effect of cosmic radiation on human

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DNA is a molecule that contains genetic information in most living organisms, including humans. It is made up of two chains of nucleotides that form a double helix. DNA stores information that encodes sequences of amino acids, which make up proteins necessary for the functioning of cells and organisms. It plays a crucial role in the synthesis of proteins by providing genetic information. Radiation can cause various types of damage to DNA, including single-strand breaks, double-strand breaks, base damage, cross-linking, and oxidative damage. The damage can lead to increased risk of cancer, genetic mutations, and cell death. High-energy ions can cause similar types of damage and have serious consequences for the health of organisms. DNA damage can result in genetic mutations, cell death, chromosomal abnormalities, aging, and cancer. There are several types of DNA repair mechanisms, including base excision repair, nucleotide excision repair, mismatch repair, homologous recombination, and non-homologous end joining. It is important to protect oneself from ionizing radiation through strategies such as minimizing exposure time, increasing distance from the source, using shielding and personal protective equipment, and monitoring radiation levels. By taking appropriate precautions, individuals can protect themselves from the harmful effects of ionizing radiation.

A Framework for Coordinated Withdrawal Of Service Robots From Field Operation

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Today, the usage area of robots has increased to a great extent with the increase in the need for efficiency. Robots often make mass production in unmanned environments alone or in groups. Sometimes, emergencies arise in these automated environments, causing major disasters. In such cases, the safe evacuation of robots is therefore of great importance. It is called Emergency Evacuation which is escaping from an area where there is an immediate threat, a continuing threat, or a threat to life and/or property. There are too many examples like an extreme demonstration due to a major fire, a flood, or a dreamy weather system. So, having a plan increases the maintainability and robustness of robotic systems. This study aimed to create a unique evacuation plan for robotic fields. However, with the high variety of robots and differences in environments, it is impossible to create an evacuation plan that would work for every system. Because robots are formed in divergent shapes and abilities. Plus, the places they are conducted have different natures in terms of exit and material. For that reason, a high-level framework is created in the scope of this paper. This framework would result in an 'Evacuation Plan' after it merges the specific environment of robots. Namely, this paper proposes framework bounds and defines the steps of an emergency evacuation instead of a generic plan.

Earth Observation Based on Computer Vision

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Earth Observation (EO) is essential for monitoring our planet and understanding complex phenomena like climate change and natural disasters. However, analyzing the vast amounts of collected data presents significant challenges. My presentation explores the role of computer vision in addressing these challenges and unlocking its potential to benefit humanity.
EO involves acquiring, analyzing, and interpreting data from remote sensing platforms. Traditional methods are time-consuming and limited by human capacity. Computer vision, a subset of AI, offers powerful tools for automating EO data analysis. It leverages machine learning to extract valuable insights from images and sensor data, enabling object detection, change detection, and image classification.
Computer vision algorithms can track objects, detect land cover changes, monitor vegetation health, and analyze spatial-temporal trends. These capabilities enhance our understanding of environmental processes, support decision-making, and aid in disaster response efforts. Combining computer vision with IoT and cloud computing enables real-time monitoring and scalable data processing.
Ongoing advancements in deep learning, data fusion, and multi-modal analysis enable the integration of diverse data sources, including imagery, LiDAR, radar, and hyperspectral data. This integration enhances the richness and contextual understanding of EO data, leading to more accurate and comprehensive analyses.

The Polish polar stations as a testing platform for analogue simulations and space technology

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Manned space missions require special preparatory stages, including tests of human behaviour, safety protocols and equipment during analogue space simulations. Special habitats are created for this purpose. However, reconstructing appropriate environmental conditions is still a major challenge. On Earth, the closest thing to the Moon or Mars is the polar regions. The Arctic and Antarctic, with their cold and dry climate and specific atmospheric conditions, scarce vegetation and remoteness from human settlements, are ideal for analogue simulations and space technology testing.
Poland is a unique country with seasonal and year-round polar stations in the Arctic and Antarctic. Many years of experience in polar research and good polar facilities provide an ideal opportunity for cooperation between polar and space researchers and the use of the Polish polar infrastructure as a test platform for new developments.
The presentation will provide an overview of the Polish polar stations, their infrastructure and potential for the preparation of space missions in the future.

The effect of cosmic radiation on human

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DNA is a molecule that contains genetic information in most living organisms, including humans. It is made up of two chains of nucleotides that form a double helix. DNA stores information that encodes sequences of amino acids, which make up proteins necessary for the functioning of cells and organisms. It plays a crucial role in the synthesis of proteins by providing genetic information. Radiation can cause various types of damage to DNA, including single-strand breaks, double-strand breaks, base damage, cross-linking, and oxidative damage. The damage can lead to increased risk of cancer, genetic mutations, and cell death. High-energy ions can cause similar types of damage and have serious consequences for the health of organisms. DNA damage can result in genetic mutations, cell death, chromosomal abnormalities, aging, and cancer. There are several types of DNA repair mechanisms, including base excision repair, nucleotide excision repair, mismatch repair, homologous recombination, and non-homologous end joining. It is important to protect oneself from ionizing radiation through strategies such as minimizing exposure time, increasing distance from the source, using shielding and personal protective equipment, and monitoring radiation levels. By taking appropriate precautions, individuals can protect themselves from the harmful effects of ionizing radiation.

Monitoring of pit mine activity using integrated radar and optical remote sensing data

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The aim of the presentation is to present the "Intelligent detection and monitoring system for mine workings using satellite systems and GIS (MineSens)" project, which focuses on the development of an intelligent detection and monitoring system for mining activities, utilizing satellite data and GIS technologies. The primary research goal is to enhance algorithms for processing and analyzing satellite data, identifying areas where mineral extraction activities are taking place. Key expected outcomes of applying developed indicators have been defined within sentences, such as: the extraction of vegetation and water areas, improvement in identifying exposed soils compared to developed areas, and the segmentation of excavations based on the type of minerals being extracted. In light of potential conflicts between excavation classes and developed areas, it is suggested to eliminate developed areas from analyses using additional data, such as NMT/NMPT analysis or other data (OSM/BDOT), as well as VHRS images.
Furthermore, it is recommended to eliminate exposed soils (agricultural land) through the analysis of multi-temp img from a single growing season. It is cautioned that periodic appearance of exposed soil indicates cultivation, whereas permanent "bare soil" may signify excavations or permanently barren, industrial, or developed areas.
In conclusion, the highest classification accuracies were achieved using machine learning classifiers, such as SVM (90%) and Neural Net (71%).
