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ПЕРЕВОД ТЕКСТОВ В ОБЛАСТИ ВЫСОКИХ ТЕХНОЛОГИЙ

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Данное пособие является дополнением к курсу «Перевод текстов в области высоких технологий», предназначено для студентов четвертого курса и содержит аутентичные материалы, дополняющие основной курс дисциплины. Пособие может быть использовано как для аудиторной, так и для самостоятельной работы студентов.

Предисловие

Настоящее учебно-методическое пособие предназначено для работы со студентами 4 курса ФГАОУ ВО «Казанский (Приволжский) федеральный университет», г. Казань, и представляет собой дополнение к основному курсу дисциплины «Перевод текстов в области высоких технологий». Тексты и задания подобраны с учетом требований Федерального государственного образовательного стандарта высшего образования и ориентировано на студентов, которые осваивают перевод в данной области в рамках программы Высшей школы.

Целью настоящего учебно-методического пособия является изучение необходимой для перевода в данной области лексики, включающей в себя специальный термины, сокращения и аббревиатуры, а также отработка стилистических, грамматических, лексических аспектов перевода, необходимых для осуществления адекватного перевода текстов в данной области. Пособие состоит из шести разделов, каждый из которых включает в себя задания и тексты, составленные и подобранные с учетом специфических особенностей каждой темы. Кроме того, в пособии представлен глоссарий на английском языке с основными терминами, необходимыми для осуществления адекватного перевода в данной области, и их объяснение, а также дополнительные аутентичные тексты для тренировки навыков перевода и получения более комплексной практики перевода в каждой конкретной теме.

В пособии осуществляется единый подход к изложению материала, основной особенностью которого является поэтапная подготовка к переводу. Соблюдение общего принципа организации материала способствует более эффективному усвоению всех включенных в пособие тем.

Практическая значимость учебно-методического пособия представляет собой упражнения, направленные на закрепление и отработку на практике лексико-грамматических и стилистических аспектов перевода.

Пособие может быть использовано как в рамках аудиторных занятий, так и в качестве материала для самостоятельной работы студентов. Кроме того, данное пособие может

стать дополнительным материалом для изучения на более общей дисциплине, посвященной переводу технических текстов в целом.

Оглавление

ТЕМА 1. ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ, ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ, РОБОТОТЕХНИКА

1. Расшифруйте и переведите следующие общепринятые сокращения:

1) AI, 2) RGB, 3) dpi, 4) RAM, 5) JPEG, 6) HTML, 7) TIFF, 8) MS, 9) ccw, 10) UPS, 11) FIFO, 12) MMS, 13) UGI, 14) FLOP, 15) API, 16) EDI, 17) CRM, 18) ANN.

2. Переведите многокомпонентные термины-словосочетания:

- Proofreading,
- Pop-up menu,
- Plug-in module,
- Printing defaults,
- Drag and drop text editing,
- Auto-Backup,
- Remote control switch,
- Business process reengineering,
- CD-ROM drive,
- Charge-coupled device,
- Off-the-shelf software,
- Remote control program,
- Removable hard disk drive,
- Volatile memory,
- Secondary storage device,
- Backpropagation.
- Pattern recognition.

3. Прочтите текст, обращая внимание на выделенную лексику, и ответьте на вопросы после текста.

Tweaking AI software to function like a human brain improves computer's learning ability

Source: Georgetown University Medical Center

Computer-based artificial intelligence can function more like human intelligence when programmed to use a much faster technique for learning new objects, say two neuroscientists who designed such a model that was designed to mirror human visual learning.

In the journal Frontiers in Computational Neuroscience, Maximilian Riesenhuber, PhD, professor of neuroscience, at Georgetown University Medical Center, and Joshua Rule, PhD, a postdoctoral scholar at UC Berkeley, explain how the new approach vastly improves the ability of AI software to quickly learn new visual concepts.

"Our model provides a biologically plausible way for artificial neural networks to learn new visual concepts from a small number of examples," says Riesenhuber. "We can get computers to learn much better from few examples by leveraging prior learning in a way that we think mirrors what the brain is doing."

Humans can quickly and accurately learn new visual concepts from sparse data – sometimes just a single example. Even three-to-four-month-old babies can easily learn to recognize zebras and distinguish them from cats, horses, and giraffes. But computers typically need to "see" many examples of the same object to know what it is, Riesenhuber explains.

The big change needed was in designing software to identify relationships between entire visual categories, instead of trying the more standard approach of identifying an object using only low-level and intermediate information, such as shape and color, Riesenhuber says.

"The computational power of the brain's hierarchy lies in the potential to simplify learning by leveraging previously learned representations from a databank, as it were, full of concepts about objects," he says.

Riesenhuber and Rule found that artificial neural networks, which represent objects in terms of previously learned concepts, learned new visual concepts significantly faster.

Rule explains, "Rather than learn high-level concepts in terms of low-level visual features, our approach explains them in terms of other high-level concepts. It is like saying that a platypus looks a bit like a duck, a beaver, and a sea otter."

The brain architecture underlying human visual concept learning builds on the neural networks involved in object recognition. The anterior temporal lobe of the brain is thought to contain "abstract" concept representations that go beyond shape. These complex neural hierarchies for visual recognition allow humans to learn new tasks and, crucially, leverage prior learning.

"By reusing these concepts, you can more easily learn new concepts, new meaning, such as the fact that a zebra is simply a horse of a different stripe," Riesenhuber says.

Despite advances in AI, the human visual system is still the gold standard in terms of ability to generalize from few examples, robustly deal with image variations, and comprehend scenes, the scientists say.

"Our findings not only suggest techniques that could help computers learn more quickly and efficiently, they can also lead to improved neuroscience experiments aimed at understanding how people learn so quickly, which is not yet well understood," Riesenhuber concludes.

This work was supported in part by Lawrence Livermore National Laboratory and by the National Science Foundation (1026934 and 1232530) Graduate Research Fellowship Grants.

- В чем заключается новшество новой модели искусственного интеллекта, созданной учеными М. Ризенхубером и Дж. Рулом?
- Какой ученой степени в России соответствует степень PhD?
- Что подразумевается под low-level information и high-level information? Приведите примеры того, что является информацией низкого и высокого уровней.
- В чем зрительная система человека все еще превосходит искусственный интеллект? Приведите 3 примера из текста.

4. Переведите текст.

ТЕМА 2. НАНОТЕХНОЛОГИИ

1. Расшифруйте и переведите следующие общепринятые сокращения, дайте определения данным терминам:

1) CPSC, 2) MOCVD, 3) NMR, 4) SAXS, 5) TEM, 6) UV, 7) MOF.

2. Переведите многокомпонентные термины-словосочетания:

- Alkali metals,
- Carbon nanotubes,
- Cell adhesion,
- Cell recognition,
- Dip-pen nanolithography,
- Enzyme,
- Ferrofluid,
- Forced intercalation (FIT) aptamer,
- Fullerene,
- Gene sequencing.
- Infrared (IR) spectroscopy,
- Lab-on-a-chip devices,
- Molecular beam epitaxy,
- Nanoparticles,
- Nanoporous materials,
- Nanoremediation.

3. Переведите следующие предложения:

1. An example of cell-cell recognition is when an immune cell recognizes glycoproteins or glycolipids on the cell surface of a bacterial cell as foreign and harmful.

2. The migration properties are partly dictated by cell adhesion and its endocytic regulation.

3. The vegetable contains the protein-digesting enzyme, erepsin.

4. Using the scientific technology of gene sequencing and careful breeding programs, *Lifestyle Pets* successfully developed cats with naturally occurring genetic divergences.

5. The multilayer stack has been grown by molecular beam epitaxy and e-beam evaporation.

6. Typical examples of nanoporous solids are zeolites, activated carbon, metal–organic frameworks, ceramics, silicates, aerogels, pillared materials, various polymers, and inorganic porous hybrid materials.

4. Переведите следующий текст:

Casting Light on Counterfeit Products Through Nano-optical Technology

Each year, an estimated two trillion dollars is lost globally due to counterfeit products ranging from jewelry to medicine. As current security labels and product authentication methods are rapidly becoming obsolete or easy to hack, there is a rising urgency for more secure anti- counterfeiting labels.

A research team fabricated a 3D printed nano optical security label that provides 33100 possible combinations for heightened security in optical anti-counterfeiting. Associate Professor Joel Yang and team from the Singapore University of Technology and Design (SUTD) collaborated with Professor Min Gu from University of Shanghai for Science and Technology (USST) and Associate Professor Cheng-Wei Qiu from National University of Singapore (NUS), along with their respective teams and published their research paper, 'Coloured vortex beams with incoherent white light illumination' in Nature Nanotechnology.

The research team achieved such a feat by exploiting higher dimensional structured light, i.e., coloured Orbital Angular Momentum (OAM) beams, through the fabrication of 3D printed spiral phase plates. Importantly, these plates were miniaturised down to a diameter smaller than that of a strand of human hair and further integrated with structural colour filters - spiky looking structures that allow specific colours of light through (refer to image).

"Orbital Angular Momentum or OAM light beam is increasingly being used in exciting research spaces such as optical communications, super-resolution imaging and quantum computing and we wanted to explore its capabilities in the anti-counterfeiting field as well. But OAM requires coherent light sources like lasers. We wanted to see if we could use incoherent light from the sun or a light bulb to generate OAM beams instead," explained Hongtao Wang, first author of the paper and SUTD-NUS joint PhD student.

In their study, they included colour, spatial position, and OAM of light (one degree of freedom of light) onto a small coloured vortex beam (CVB) generator (25 μm). With only 10-by-10 CVB unit array to demonstrate, the optical security label they designed could open pathways for the next generation of optical anti-counterfeiting.

"We see things clearly when we hold them up to the light. What our team has done is to learn how to use the natural light that surrounds us and extract tiny beams from it that carry information encoded in not just colour, but also by how much we 'twist' its wavefront. This optical version of the combination lock that utilises high-dimensional structured light

provides us with a powerful platform for advanced anti-counterfeiting and information security," explained principal investigator Assoc. Prof. Yang.

ТЕМА 3. АЛЬТЕРНАТИВНАЯ ЭНЕРГИЯ

1. Расшифруйте и переведите следующие общепринятые сокращения:

1) RES, 2) IPCC, 3) IRENA, 4) LED, 5) SDG, 6) UNFCCC, 7) COP, 8) ZEV, 9) PVC, 10) OTEC.

2. Переведите следующие термины-словосочетания:

- Photovoltaic cell,
- Biogenic emissions,
- Carbon stocks,
- Greenwashing,
- Landfill gas,
- Photovoltaic module,
- Reforestation,
- Vapor-dominated geothermal system.

3. Переведите следующие предложения:

1. Biogenic emissions are not subject to agency reduction targets at this time.
2. Photovoltaic cells are a product of modern solid - state physics.
3. The environmental movement has warned consumers against greenwashing, saying that when businesses use terms such as "environmentally friendly" and "green" they are often meaningless.
4. Wood is a renewable resource which should be developed further to assist carbon sequestration.
5. Vapour-dominated systems are the prime geothermal systems with only a handful found in nature.
6. The world's largest landfill gas plant sits atop the Puente Hills landfill—the largest in the U.S.—which accepts trash from Los Angeles County.
7. Reforestation proceeded rapidly after World War II, in which natural broad-leaved forests were replaced with coniferous plantations.

4. Переведите следующий текст:

Green hydrogen, recycling, and next-gen batteries: Checking in on 'Cleantech 2.0'

Alok Sindher, the infrastructure and special situations partner at the venture capital firm Fifth Wall, joined Episode 42 of the Factor This! podcast to break down what's on the way in 'Cleantech 2.0,' and who's positioned to cash in.

Green hydrogen, circular economies, and next-gen batteries are at the heart of "Cleantech 2.0." These innovations could take the clean economy to new heights when paired with fresh federal incentives for fighting climate change.

Alok Sindher, the infrastructure and special situations partner at the venture capital firm Fifth Wall, joined Episode 42 of the Factor This! podcast to break down what's on the way and who's positioned to cash in. Fifth Wall is one of the largest VCs driving cleantech innovation with $3.2 billion under management.

From consulting oil and gas giants like Shell and Pennzoil, to guiding M&A within the power and utility sector for JPMorgan, where he helped complete the largest utility transaction in U.S. history with Duke Energy's $65 billion acquisition of Progress Energy. He was the partner of renewable energy and infrastructure at the D.E. Shaw Group, now one of the largest global investors in renewable energy infrastructure.

Each of Sindher's career stops influenced his work today as a partner at Fifth Wall, a venture capital firm that has raised $2.9 billion for cleantech startups.

Sindher, a partner at the firm, is eyeing what he calls the next generation of clean energy infrastructure. The projects in the Cleantech 2.0 pipeline stand to build off the emergence of now-mature technologies like solar and (some) energy storage technologies.

Green hydrogen, circular economics, and next-gen battery chemistries have Sindher's attention now. But getting these technologies to commercialization requires a new approach to financing.

"Traditional versions of (VC funds) were designed for a software ecosystem. Where the climate space differs is that most of these companies are going to be in the physical world," Sindher said on the Factor This! podcast. "These technologies will require factories, they'll turn into power plants."

Today, access to capital is a breeze for mature technologies like solar and wind. But the financial sector is inherently risk-averse, creating a gap in available funding for hardware cleantech companies.

Fifth Wall launched a climate infrastructure platform, led by Sindher, to provide capital to cleantech companies that have moved beyond lab and pilot scale, and are now pursuing small-scale commercial projects and first-of-their-kind factories.

That effort has led to investments in electrolyzer startup Electric Hydrogen, electric vehicle charging network Loop, and SOLARCYCLE, a solar module recycler.

"You need a different kind of capital stack to more efficiently capitalize these companies and hopefully avoid some of these mistakes made in 'Cleantech 1.0,'" Sindher said.

When Sindher visited SOLARCYLE's first commercial-scale facility in Odessa, Texas, he was skeptical of the company claiming to be able to recycle 95% of a solar module's critical materials.

Back in 2018, Sindher was working for D.E. Shaw, and one of the company's solar farms had suffered critical damage during a hail storm. Hundreds of thousands panels were damaged.

"One of the biggest problems was, what are we going to do with all the damaged panels?"

D.E. Shaw wanted to deal with the situation in an environmentally conscious way. But the options left much to be desired.

"My reaction was, this isn't recycling," Sindher said. "They called it recycling, but it wasn't. It was mostly crushing into a landfill."

But Sindher's visit to the SOLARCYCLE plant quickly relieved his skepticism.

The company had a single recycling line that was doing exactly what the company set out to do. Their process went beyond crushing glass or extracting aluminum. It was also pulling out critical materials like silver and copper.

"I saw it with my own eyes," Sindher said. "I saw a facility that was recycling panels in a much more efficient way. True recycling."

With a green light from Sindher, Fifth Wall went on to lead SOLARCYCLE's $30 million Series A round, recognizing an opportunity to immediately expand operations at the Odessa facility.

And while the market for SOLARCYCLE's services remains small since the vast majority of solar projects were installed in the past five years, Sindher said he believes there's additional opportunity around repowering.

Solar modules are getting more efficient, and incentives from the Inflation Reduction Act could lead developers and asset owners to upgrade their panels.

"I can see in the next few years project developers thinking, 'Hey, look, I can put a much more efficient panel from a few years ago.'" And the beauty, Sindher said, is that that site has existing interconnection.

ТЕМА 4. НАВИГАЦИОННЫЕ СИСТЕМЫ

1. Расшифруйте следующие общепринятые сокращения:

1) GPS, 2) GLONASS, 3) DME, 4) GNSS, 5) GNSSU, 6) NAVSTAR, 7) MSAS, 8) WGS, 9) TCAS, 10) EGNOS, 11) GDOP, 12) EST, 13) WGS-84.

2. Переведите следующие термины-словосочетания:

- acquisition time,
- almanac data,
- cold start,
- dual-frequency receiver,
- fast-Multiplexing receiver,
- time dilution of precision,
- user interface,
- waypoint.

3. Переведите следующие предложения:

1. The flight left Toronto at 22:55 EST.
2. The total acquisition time was 4 min 25 sec.
3. The cold start is when the GPS device dumps all the information, attempts to locate satellites and then calculates a GPS lock. This takes the longest because there is no known information.
4. Waypoints are locations or landmarks worth recording and storing in your GPS.
5. Dilution of precision factor is responsible for the obtained accuracy

4. Переведите следующий текст:

How satellite navigation works

Navigation beacons must be as visible as possible. So 20th century radio navigation towers guiding aircraft stood hundreds of metres tall, while the lighthouses warning mariners of treacherous waters reach dozens of metres in height or cling to high ground. In essence navigation satellites are the same, except they are built on the ultimate high ground of space, making them visible from anywhere on Earth.

Turning time into distance

The signal emitted from each satellite is a microwave radio wave containing the time it was transmitted and the satellite's current orbital position.

As signals travel at the speed of light then (if your time-keeping is accurate enough) by calculating the time difference between the satellite signal and your receiver, you can derive the precise distance the signal has travelled from the satellite to reach your receiver.

Ultra-precise satellite navigation relies on the same basic principle as counting the seconds after a lightning flash before the accompanying thunder is heard, in order to estimate a storm's remoteness: a time value is converted into a reckoning of distance.

Finding your place

Combine inputs from multiple satellite signals simultaneously – like viewing multiple lighthouses at once –and your location is pinpointed.

Locking on to more signals yields greater accuracy but a four is the absolute minimum required. Three are used to 'trilateralise' (the three-dimensional equivalent of triangulation) the user's longitude, latitude and altitude and a fourth to determine the time offset between the (precise) satellite clock and the (less precise) clock embedded within the receiver.

Space and ground segments

Design trade-offs have led to a medium-Earth orbit as the optimal altitude for navigation satellite constellations, commencing with the US GPS and Russian Glonass. There are solid practical reasons for this: medium-Earth orbits are relatively stable and the satellites move across the sky relatively slowly. Lower orbits would require more satellites to maintain the same coverage while higher orbits would reduce coverage extent.

In addition an extensive ground infrastructure distributed worldwide is required to uplink the navigation signals, keep the different clocks of the constellation synchronised and correct any onboard timing or positioning deviation.

User receivers

Satellite navigation receivers also do a great deal of work, containing 'ephemerides' or electronic almanacs recording the expected locations of the constellation, to reduce the time taken to acquire signal locks from minutes to a matter of seconds.

The satellite navigation signals are very faint, equivalent to car headlights shone from one end of Europe to another. The signals are based around pseudo-random number codes that identify each satellite in a constellation. The receiver has records of each of these complex codes, so a full-power replica can be generated within the receiver from the faint signal received and used for the calculations deriving the final navigational data displayed to the user.

Interference can be a problem: the ionosphere, the uppermost electrically-charged layers of Earth's atmosphere can cause signal delay equivalent to several metres in the worst case. Signals reflecting off local surroundings, known as 'multipath' can cause spurious signal locks and decrease the overall accuracy.

Larger dual-frequency receivers can remove most ‘iono-interference’ while smaller receivers of the type fitted into phones or car dashboards rely only on single frequency signals, but employ software models to remove up to half the error.

ТЕМА 5. БИОИНЖЕНЕРИЯ

1. Расшифруйте и переведите следующие общепринятые сокращения:

1) CRISPR, 2) CAS-9, 3) DNA, 4) RNA, 5) ECM, 6) fMRI, 7) GAGs, 8) MRI, 9) NIRS, 10) SPECT.

2. Переведите следующие термины-словосочетания:

- Biocompatibility,
- Bioinformatics,
- Extracellular Vesicles,
- half-life,
- In vitro,
- Microparticle,
- Minimally Invasive Surgery,
- Perfusable,
- X-rays.

3. Переведите следующие предложения:

1. The material is highly biocompatible and has properties suitable for use in orthopedic implants.
2. The time taken to reduce the concentration of a substance in the body to 50% is known as its biological half-life.
3. Conditions and results of in vitro experiments cannot be assumed to mimic in vivo situations.
4. He is a pioneer of minimally invasive surgery and has been conducting a review of London healthcare.
5. Following viral or parasitic infection, cells release extracellular vesicles with distinct molecular repertoires in easily accessible bodily fluids such as plasma.

4. Переведите следующий текст:

CRISPR-Cas9 – Genetic Scissors at Work

Isabella Limbert, SciTech Reporter

MARCH 22, 2023

In 2020, the Nobel Prize in Chemistry was awarded to Jennifer A. Doudna and Emmanuel Charpentier for their development and understanding of the gene-editing tool, CRISPR-Cas9.

Charpentier has been quoted as saying this system is “mind-blowing.”

Protection at the molecular level

The CRISPR-Cas9 complex, while new to our own understanding, is not new to archaea or bacteria. The system we know has been present in these organisms for centuries, allowing them to create their own network of molecular defense.

Utilizing this bacterial line of defense, the possibilities are endless for humans.

How exactly does CRISPR-Cas9 work? In simple terms, CRISPR-Cas9 can be thought of as a pair of genetic scissors.

CRISPR is a series of short palindromic repeats, while Cas9 is the endonuclease that is guided by designed RNA specific to the experiment. CRISPR and Cas9 must work together as a system to allow for the process of gene editing.

By making a specific cut at either a targeted gene or region of DNA, this system then allows natural DNA processes to take over and repair the region, excising the area of issue and replacing it with either the correct sequence of DNA or another gene.

Here is the step-by-step process:

1. Recognition – Guide RNA must be designed to target the region of interest, guiding the Cas9 "scissors" to the target
2. Cleavage – Cas9 makes double stranded breaks, as DNA is a double-stranded molecule, to excise the region of interest
3. Repair – Homology-directed repair and other host-cell machinery repair the excised region, either inserting another gene as directed by Cas9 or inputting the correct version of the sequence once there

Yes — this is a complicated process with plenty of scientific jargon that can make it confusing to those not familiar with the technique.

In summary, CRISPR-Cas9 can remove "bad" DNA and allow it to repair itself, opening up a world of possibilities for gene-editing in the future.

Designer babies: Seriously?

The movie "Gattaca" may not be that far out of reach…

Scientists hypothesize that with the power of CRISPR, certain diseases and disorders could be eradicated from a child before they're even born. Some issues with this, of course, lie with the potential implications and damage that this gene-editing could cause. Is it worth the risk?

While parents may dream of getting to choose whether their child has blue eyes or red hair, this tool should be used for more pressing issues such as Tay-Sachs or phenylketonuria.

Most notably, scientist He Jiankui was under much scrutiny when he announced to the world that twin girls with edited genomes were to be born. Not only did this go against

many within the scientific community, but he also risked human life and safety laws to practice this technique.

Human research is hard enough to get clearance for, as clinical trials must go through countless rounds of approval in order to use human subjects as opposed to other comparative species such as rats or monkeys. While scientists are unable to see the future impacts this research will have on the gene-edited children, they are consciously aware of the changes this could send spiraling in the scientific community.

Personalized treatment with targeted-gene therapy

With the ease of the CRISPR-Cas9 system, site-specific gene editing is within reach.

Traditional gene editing techniques rely heavily on viral vectors as delivery vehicles, which is the inactive form of a virus used as a means to deliver specific DNA sequences into cells and their genomes. Some issues with viral vectors are that they often are too large to integrate, can be inactivated by the cell's own mechanisms and the requirement for cell division to spread the information throughout the body stalls the efficacy of this method.

This is where CRISPR-Cas9 comes in. While avoiding the need for unreliable viral vectors, this system uses molecular tools to directly make changes to the DNA sequence (genome) itself.

This technology has a future that is bright, from patient-specific tumor treatments to clinical trials for sickle-cell anemia.

What other clinical trials are expected to be progressing as CRISPR is pending FDA approval?

- Genetic blindness
- Diabetes
- Infectious diseases such as chronic UTIs and HIV/AIDS
- Inflammatory diseases

The ideas above are not the only areas of science that CRISPR is limited to. The list will continue to expand as the mechanism of action is better understood.

ТЕМА 6. СОЗДАНИЕ КОСМИЧЕСКИХ АППАРАТОВ

1. Расшифруйте и переведите следующие общепринятые сокращения:

1) fNIRS, 2) EEG-fNIRS, 3) ACARS, 4) ADS-B, 5) AIRAC, 6) EUROCAE, 7) FBW, 8) EASA, 9) TACAN.

2. Переведите следующие термины-словосочетания:

- mental fatigue,
- airlock,
- cockpit,
- cabin pressurization,
- drop test,
- ductility,
- floatstick,
- Keel effect,
- Kessler syndrome,
- lithobraking.

3. Переведите следующие предложения:

1) She continued to have severe stomach cramps, aches, fatigue, and depression.
2) The floatstick is withdrawn from the bottom of the wing until the magnets stick, indicating the level of the fuel.
3) Copper has a higher ductility than alternate metal conductors with the exception of gold and silver.
4) In aeronautics, the keel effect is the result of the sideforce-generating surfaces being above (or below) the center of mass in an aircraft.
5) Back in the entrance lobby there is also an air lock into the transmitter room
6) Preparations for lithobraking involve protecting the probe with sufficient cushioning to withstand an impact with the surface and come to rest undamaged.

4. Переведите следующий текст:

Assessing the development of mental fatigue during simulated flights with concurrent EEG-fNIRS measurement

Anneke Hamann & Nils Carstengerdes

Abstract

Mental fatigue (MF) can impair pilots' performance and reactions to unforeseen events and is therefore an important concept within aviation. The physiological measurement of MF, especially with EEG and, in recent years, fNIRS, has gained much attention. However, a systematic investigation and comparison of the measurements is seldomly done. We induced MF via time on task during a 90-min simulated flight task and collected concurrent EEG-

fNIRS, performance and self-report data from 31 participants. While their subjective MF increased linearly, the participants were able to keep their performance stable over the course of the experiment. EEG data showed an early increase and levelling in parietal alpha power and a slower, but steady increase in frontal theta power. No consistent trend could be observed in the fNIRS data. Thus, more research on fNIRS is needed to understand its possibilities and limits for MF assessment, and a combination with EEG is advisable to compare and validate results. Until then, EEG remains the better choice for continuous MF assessment in cockpit applications because of its high sensitivity to a transition from alert to fatigued, even before performance is impaired.

ДОПОЛНИТЕЛЬНЫЕ ТЕКСТЫ ДЛЯ ПЕРЕВОДА

Тема 1. ПО, ИИ и робототехника

Robot displays a glimmer of empathy to a partner robot

Date: January 11, 2021

Source: Columbia University School of Engineering and Applied Science

Like a long-time couple who can predict each other's every move, a Columbia Engineering robot has learned to predict its partner robot's future actions and goals based on just a few initial video frames.

When two primates are cooped up together for a long time, we quickly learn to predict the near-term actions of our roommates, co-workers or family members. Our ability to anticipate the actions of others makes it easier for us to successfully live and work together. In contrast, even the most intelligent and advanced robots have remained notoriously inept at this sort of social communication. This may be about to change.

The study, conducted at Columbia Engineering's Creative Machines Lab led by Mechanical Engineering Professor Hod Lipson, is part of a broader effort to endow robots with the ability to understand and anticipate the goals of other robots, purely from visual observations.

The researchers first built a robot and placed it in a playpen roughly 3x2 feet in size. They programmed the robot to seek and move towards any green circle it could see. But there was a catch: Sometimes the robot could see a green circle in its camera and move directly towards it. But other times, the green circle would be occluded by a tall red carboard box, in which case the robot would move towards a different green circle, or not at all.

After observing its partner puttering around for two hours, the observing robot began to anticipate its partner's goal and path. The observing robot was eventually able to predict its partner's goal and path 98 out of 100 times, across varying situations -- without being told explicitly about the partner's visibility handicap.

"Our initial results are very exciting," says Boyuan Chen, lead author of the study, which was conducted in collaboration with Carl Vondrick, assistant professor of computer science, and published today by Nature Scientific Reports. "Our findings begin to demonstrate how robots can see the world from another robot's perspective. The ability of the observer to put itself in its partner's shoes, so to speak, and understand, without being guided, whether its partner could or could not see the green circle from its vantage point, is perhaps a primitive form of empathy."

When they designed the experiment, the researchers expected that the Observer Robot would learn to make predictions about the Subject Robot's near-term actions. What the

researchers didn't expect, however, was how accurately the Observer Robot could foresee its colleague's future "moves" with only a few seconds of video as a cue.

The researchers acknowledge that the behaviors exhibited by the robot in this study are far simpler than the behaviors and goals of humans. They believe, however, that this may be the beginning of endowing robots with what cognitive scientists call "Theory of Mind" (ToM). At about age three, children begin to understand that others may have different goals, needs and perspectives than they do. This can lead to playful activities such as hide and seek, as well as more sophisticated manipulations like lying. More broadly, ToM is recognized as a key distinguishing hallmark of human and primate cognition, and a factor that is essential for complex and adaptive social interactions such as cooperation, competition, empathy, and deception.

In addition, humans are still better than robots at describing their predictions using verbal language. The researchers had the observing robot make its predictions in the form of images, rather than words, in order to avoid becoming entangled in the thorny challenges of human language. Yet, Lipson speculates, the ability of a robot to predict the future actions visually is not unique: "We humans also think visually sometimes. We frequently imagine the future in our mind's eyes, not in words."

Lipson acknowledges that there are many ethical questions. The technology will make robots more resilient and useful, but when robots can anticipate how humans think, they may also learn to manipulate those thoughts.

"We recognize that robots aren't going to remain passive instruction-following machines for long," Lipson says. "Like other forms of advanced AI, we hope that policymakers can help keep this kind of technology in check, so that we can all benefit."

Тема 2. Нанотехнологии

Delivering Large Drug Cargoes in a Super-Sized Nanocage

Consider how difficult it is to attempt to cram a gift into a box that is not big enough. Sometimes a larger box is all that is required

Building a Bigger Box

To deliver treatments to a specific location in the body, small artificial containers called nanocages can be employed. But certain drug molecules are like gifts that are too large for the standard-sized nanocage “box.”

Researchers from the University of Cambridge detailed how they created a super-sized nanocage that could possibly be used to transport larger drug cargo in a study that was published in Nature Synthesis. They created a larger box.

Simple Building Blocks

The ability to exercise rational control over the self-assembly of these types of cages can often be quite difficult. Therefore, the team chose to employ an easy building block procedure inspired by natural biological systems rather than standard self-assembly techniques.

The larger cage they constructed with the new technique has an enclosed volume of more than 92 nm3, making it the largest ligand-enclosed inner cavity volume ever created.

Although larger cages have been reported, they feature more open ligand frameworks, making them less effective because they have not been successful in binding cargoes. Potential "guest" molecules can escape via the widely separated bars if they are not covalently attached to the "host" framework.

The findings of this study are important because they demonstrate how we are able to create ever-larger complex, functional structures using simple building blocks.

Larger Cargoes

Super-sized nanocages could be employed in biotechnology and drug delivery, where they could be used to transport larger therapeutic biomolecules to particular body parts.

The researchers also point out that large biomolecules like hydrophobic membrane proteins or proteases could be able to attach to the huge internal cavities of the nanocages, which could prove advantageous for drug discovery and development.

Dr Wu added, "Overall, this research expands our understanding of how to create nanoscale structures and may have practical implications in a variety of fields."

Тема 3. Альтернативная энергия

Drilling surprise opens door to volcano-powered electricity

Can enormous heat deep in the earth be harnessed to provide energy for us on the surface? A promising report from a geothermal borehole project that accidentally struck magma – the same fiery, molten rock that spews from volcanoes – suggests it could.

The Icelandic Deep Drilling Project, IDDP, has been drilling shafts up to 5km deep in an attempt to harness the heat in the volcanic bedrock far below the surface of Iceland.

But in 2009 their borehole at Krafla, northeast Iceland, reached only 2,100m deep before unexpectedly striking a pocket of magma intruding into the Earth's upper crust from below, at searing temperatures of 900-1000°C.

This borehole, IDDP-1, was the first in a series of wells drilled by the IDDP in Iceland looking for usable geothermal resources. The special report in this month's Geothermics journal details the engineering feats and scientific results that came from the decision not to the plug the hole with concrete, as in a previous case in Hawaii in 2007, but instead attempt to harness the incredible geothermal heat.

Wilfred Elders, professor emeritus of geology at the University of California, Riverside, co-authored three of the research papers in the Geothermics special issue with Icelandic colleagues.

“Drilling into magma is a very rare occurrence, and this is only the second known instance anywhere in the world,” Elders said. The IDDP and Iceland’s National Power Company, which operates the Krafla geothermal power plant nearby, decided to make a substantial investment to investigate the hole further.

This meant cementing a steel casing into the well, leaving a perforated section at the bottom closest to the magma. Heat was allowed to slowly build in the borehole, and eventually superheated steam flowed up through the well for the next two years.

Elders said that the success of the drilling was “amazing, to say the least”, adding: “This could lead to a revolution in the energy efficiency of high-temperature geothermal projects in the future.”

The well funnelled superheated, high-pressure steam for months at temperatures of over 450°C – a world record. In comparison, geothermal resources in the UK rarely reach higher than around 60-80°C.

The magma-heated steam was measured to be capable of generating 36MW of electrical power. While relatively modest compared to a typical 660MW coal-fired power station, this is considerably more than the 1-3MW of an average wind turbine, and more than half of the Krafla plant’s current 60MW output.

Most importantly it demonstrated that it could be done. “Essentially, IDDP-1 is the world’s first magma-enhanced geothermal system, the first to supply heat directly from molten magma,” Elders said. The borehole was being set up to deliver steam directly into the Krafla power plant when a valve failed which required the borehole to be stoppered. Elders added that although the borehole had to plugged, the aim is to repair it or drill another well nearby.

Gillian Foulger, professor of geophysics at Durham University, worked at the Kravla site in the 1980s during a period of volcanic activity. “A well at this depth can’t have been expected to hit magma, but at the same time it can’t have been that surprising,” she said. “At one point when I was there we had magma gushing out of one of the boreholes,” she recalled.

Volcanic regions such as Iceland are not active most of the time, but can suddenly be activated by movement in the earth tens of kilometres below that fill chambers above with magma. “They can become very dynamic, raised in pressure, and even force magma to the surface. But if it’s not activated, then there’s no reason to expect a violent eruption, even if you drill into it,” she said.

“Having said that, with only one experimental account to go on, it wouldn’t be a good idea to drill like this in a volcanic region anywhere near a city,” she added.

The team, she said, deserved credit for using the opportunity to do research. “Most people faced with tapping into a magma chamber would pack their bags and leave,” she said. “But when life gives you lemons, you make lemonade.”

In Iceland, around 90% of homes are heated from geothermal sources. According to the International Geothermal Association, 10,700MW of geothermal electricity was generated worldwide in 2010. Typically, these enhanced or engineered geothermal systems are created by pumping cold water into hot, dry rocks at depths of between 4-5km. The heated water is pumped up again as hot water or steam from production wells. The trend in recent decades has been steady growth in geothermal power, with Iceland, the Philippines and El Salvador leading the way, producing between 25-30% of their power from geothermal sources. Considerable effort invested in elsewher including Europe, Australia, the US, and Japan, has typically had uneven results, and the cost is high.

With the deeper boreholes, the IDDP are looking for a further prize: supercritical water; at high temperature and under high pressure deep underground, the water enters a supercritical state, when it is neither gas nor liquid. In this state it carries far more energy and, harnessed correctly, this can increase the power output above ground tenfold, from 5MW to 50MW.

Elders said: “While the experiment at Krafla suffered various setbacks that pushed personnel and equipment to their limits, the process itself was very instructive. As well as the published scientific articles we’ve prepared comprehensive reports on the practical lessons learned.” The Icelandic National Power Company will put these towards improving their next drilling operations.

The IDDP is a collaboration of three energy companies, HS Energy Ltd, National Power Company and Reykjavik Energy, and the National Energy Authority of Iceland, with a consortium of international scientists led by Elders. The next IDDP-2 borehole will be sunk in southwest Iceland at Reykjanes later this year.

Тема 4. Навигационные технологии

Bluesky, SkyFi collaborate to broaden aerial imagery access

April 6, 2023 - By Jesse Khalil

Bluesky International and SkyFi have collaborated to provide access to Earth observation assets and multi-perspective imagery to users globally. Bluesky is providing its high-resolution aerial imagery, taken by aircraft-mounted cameras, to SkyFi to make available for businesses, forestry, water and land managers across the United Kingdom.

SkyFi aims to make Earth observation data more accessible to users through its growing network of satellites and aerial platforms. The company has created a data marketplace where users can purchase existing images or task a satellite to purchase a new image.

Bluesky provides a wide range of geospatial data products and services to users across the United Kingdom. GIS and CAD-ready imagery from Bluesky captures ground terrain, cityscape rooftops, fauna and more. The company's catalogue of aerial imagery is available in England, Scotland, Wales and the Republic of Ireland.

Тема 5. Генная инженерия

Targeting Oncogenic Fusions to Combat Pediatric Cancer Cells

April 7, 2023

Computational biologists at St. Jude categorized and identified the mechanism underlying oncogenic fusions in pediatric cancer cells. The researchers showed in mice that targeting oncogenic fusions that drive cancer with genome editing tools such as CRISPR has the potential to cure certain tumors.

The findings were published in Nature Communications in a paper titled, "Etiology of oncogenic fusions in 5,190 childhood cancers and its clinical and therapeutic implication."

"Oncogenic fusions formed through chromosomal rearrangements are hallmarks of childhood cancer that define cancer subtype, predict outcome, persist through treatment, and can be ideal therapeutic targets," wrote the researchers. "However, mechanistic understanding of the etiology of oncogenic fusions remains elusive. Here we report a comprehensive detection of 272 oncogenic fusion gene pairs by using tumor transcriptome sequencing data from 5,190 childhood cancer patients. We identify diverse factors, including translation frame, protein domain, splicing, and gene length, that shape the formation of oncogenic fusions. Our mathematical modeling reveals a strong link between differential selection pressure and clinical outcome in CBFB-MYH11."

"We've made something similar to the periodic table in chemistry for types of oncogenic fusions," said senior and co-corresponding author Xiaotu Ma, PhD, St. Jude department of computational biology. "By cataloging the underlying mechanisms, we've given other scientists the ability to study fusions in better detail."

"It is now well established that fusion oncoproteins drive many pediatric cancers," explained co-corresponding author Jeffery Klco, MD, PhD, St. Jude department of pathology. "The Ma lab has comprehensively characterized the full spectrum of oncogenic fusions in childhood cancer, providing the community which a rich resource that can be mined to develop more predictive clinical tests while also suggesting potential therapeutic strategies for some tumor types. This will be a hugely impactful study."

The new St. Jude tool lays a foundation for using genome editing to cure cancer. The mutations that cause fusion genes are only present in cancer cells. That means a highly specific genetic engineering tool, such as the CRISPR-Cas9 system, could selectively cut out the fusion gene in cancer cells, which removes their ability to make the hybrid protein.

“The fusion gene specific sequence only exists in cancer cells,” said first author Yanling Liu, PhD, St. Jude department of computational biology. “It wouldn’t target any normal cells. We used CRISPR-Cas9 to perturb the fusion specific alleles in two cancer cell lines and killed them.”

“We were able to demonstrate the therapeutic potential of genome editing using CRISPR-Cas9 and in vitro cancer cell line models,” said co-corresponding author Shondra Pruett-Miller, PhD, director, St. Jude Center for Advanced Genome Engineering. “We believe this is just the tip of the iceberg in terms of how we might be able to harness the power of genome editing to target these oncofusions.”

Even with the challenges facing its use in therapy, the computational tool already predicts some clinical outcomes. The St. Jude authors were able to explain why a small group of pediatric patients with relapsed acute myeloid leukemia (AML) had poor outcomes. The result demonstrated that the tool can be used for clinical predictions, which will help physicians choose more personalized and effective treatments for patients in the future.

Тема 6. Создание космических аппаратов

Progress in the development of small-celestial-body anchoring robots

Tingzhang Wang, Qiquan Quan, Dewei Tang & Zongquan Deng

Abstract

The exploration of small celestial bodies (SCBs) is important for understanding the evolution of the Solar System and the origin of life on Earth, as well as developing and utilizing resources. Regolith sampling and in situ analysis are effective exploration methods, and the robots used to anchor probes on SCBs are crucial for such in situ explorations. This Perspective reviews missions to explore SCBs and briefly analyses existing exploration methods. Small-celestial-body anchoring robots are systematically summarized, including the basic concepts, structure and composition and application characteristics. Next, the influence and challenges of extreme space environments and the effects of the unknown surface properties of SCBs on SCB anchoring robots are explored to help determine crucial issues in developing these robots. Finally, a comprehensive overview of the progress of SCB anchoring robots is presented, drawn from the macroscopic development of SCB exploration, maturation and utilization missions. Innovations in SCB anchoring robots will continue to assist in SCB exploration missions and we expect them to enable remarkable achievements.

ГЛОССАРИЙ

Algorithm is a formula given to a computer in order for it to complete a task (i.e. a set of rules for a computer.

Artificial general intelligence (AGI): also known as strong AI, AGI is a type of artificial intelligence that is considered human-like, and still in its preliminary stages (more of a hypothetical existence in present day).

Artificial intelligence is a subset of computer science that deals with computer systems performing tasks with similar, equal, or superior intelligence to that of a human (e.g. decision-making, object classification and detection, speech recognition and translation)

Artificial narrow intelligence (ANI) is also known as weak AI, ANI is a type of artificial intelligence that can only focus on one task or problem at a given time (e.g. playing a game against a human competitor). This is the current existing form of AI.

Artificial neural network (ANN) is a network modeled after the human brain by creating an artificial neural system via a pattern-recognizing computer algorithm that learns from, interprets, and classifies sensory data.

Augmented Reality (AR) has the ability to integrate virtual enhancements such as computer-generated elements in the form of graphics, text, audio, video, and other types of data words real-world objects. The use of these enhancements of the real-world elements is the biggest difference between augmented reality from virtual reality (VR).

Automation solutions are attempts to create more efficient, automated workflows, allowing for more intricate productivity and a more streamlined approach.

Backpropagation is shorthand for “backward propagation of errors,” is a method of training neural networks where the system’s initial output is compared to the desired output, then adjusted until the difference (between outputs) becomes minimal.

Bayesian networks is also known as Bayes network, Bayes model, belief network, and decision network, is a graph-based model representing a set of variables and their dependencies.

Big data are large amounts of structured and unstructured data that is too complex to be handled by standard data-processing software.

Bring Your Own Device (BYOD) refers to the practice of giving employees the option of using personal devices for work-related activities.

Chatbots is a chat robot that can converse with a human user through text or voice commands. Utilized by e-commerce, education, health, and business industries for ease of communication and to answer user questions.

Classification is an algorithm technique that allows machines to assign categories to data points.

Cloud Migration is a process during which databases, applications, services, and other business or IT processes are transferred to a cloud computing environment.

Clustering is an algorithm technique that allows machines to group similar data into larger data categories.

Cognitive computing is a computerized model that mimics human thought processes by data mining, NLP, and pattern recognition.

Computer vision is when a machine processes visual input from image files (JPEGs) or camera feeds.

Convolutional neural network (CNN) is a type of neural network specifically created for analyzing, classifying, and clustering visual imagery by using multilayer perceptrons.

Customer Intelligence is a term given to the collection and analysis of information regarding customers, allowing organizations to work out the most effective way to interact

with their clients and consumers. This can manifest in improved customer experience, better customer relationships, increased loyalty, and much more.

Data mining is the process of sorting through large sets of data in order to identify recurring patterns while establishing problem-solving relationships.

Data migration is a term that defines the process of moving data from one computer-based storage device or format to another storage system or computing environment.

Decision tree is a tree and branch-based model used to map decisions and their possible consequences, similar to a flow chart.

Deep learning is a machine learning technique that teaches computers how to learn by rote (i.e. machines mimic learning as a human mind would, by using classification techniques).

Digital banking is a relatively new term that refers to the process of moving traditional banking services, activities, financial and investment transactions, and other banking activities online or to mobile banking applications.

Digital ecosystem is several software platforms or cloud services that work in tandem across a network.

Digital Wealth Management defines new Fintech financial services, which include digital banking software, platforms, and tools. Digital Wealth Management software uses algorithms based on the user's data and risk preferences to help customers receive proper digital banking services, as well as financial experiences.

Edge computing is the term used to describe the practice of shortening the distance between computation and data storage, allowing for a swifter analysis of the data as well as saving on bandwidth and other costs.

Experience Architecture (often abbreviated to EA or XA) is the process of creating and articulating user experience from beginning to end. EA can be a combination of various

other approaches, all with the same outcome in mind; namely a streamlined journey for the user of any particular digital function.

Fraud detection is activities and attempts to prevent money or property from being obtained under false pretences, as well as the prevention of stolen finances being used.

Fraud intelligence has never been more important. This is the process of analyzing transactions to identify and single out unusual activities, nipping fraud in the bud before it has a chance to manifest and grow.

Generative adversarial networks (GAN) is a type of neural network that can generate seemingly authentic photographs on a superficial scale to human eyes. GAN-generated images take elements of photographic data and shape them into realistic-looking images of people, animals, and places.

Genetic algorithm is an algorithm based on principles of genetics that is used to efficiently and quickly find solutions to difficult problems.

Heuristic is a computer science technique designed for quick, optimal, solution-based problem solving.

Human-centred Artificial Intelligence is born out of the appreciation and understanding that how AI works is foreign to the majority of people, thus HC-AI focuses on creating an environment and service that bridges the gap between computer and consumer, between human and machine.

Hybrid Cloud is the name given to any IT infrastructure that connects at least one public cloud and one private, bridging the gap between the two in order to allow a single platform for a company's workload.

Image recognition is the process of identifying or detecting an object or feature of an object in an image or video.

Internet of Things (IoT) is enabling the biggest digital transformation the world has ever seen. Things or IoT defines a network of connected physical sensors, devices, big data, analytics, artificial intelligence (AI), wireless networks, computing power to the internet.

Industry 4.0 is the continued automation of industrial practices as well as the evolving ways in which data is used to give manufacturers a stronger analysis of every aspect of a business.

Limited memory is systems with short-term memory limited to a given timeframe.

Machine learning (ML) focuses on developing programs that access and use data on their own, leading machines to learn for themselves and improve from learned experiences.

Machine translation is an application of NLP used for language translation (human-to-human) in text- and speech-based conversations.

Natural language processing (NLP) helps computers process, interpret, and analyze human language and its characteristics by using natural language data.

Optical Character Recognition (OCR) is a conversion of images of text (typed, handwritten, or printed) either electronically or mechanically, into machine-encoded text.

Pattern recognition is an automated recognition of patterns found in data.

Perishable data is data that has lost its initial value and must be used soon to provide any benefit to companies.

Process automation focuses on diverting manual tasks to efficient automated equivalents. Many necessary tasks that an organization must complete are time-consuming and mundane, a set of circumstances that often lead to human error.

Process mapping allows a company to monitor an operation from beginning to end, much in the same way that flowcharts once did. Process mapping is an end-to-end process that provides clarity to a business when it comes to understanding the various steps taken through a specific operation or wider approach.

Quality management services (QMS) are processes that focus on meeting the desired requirements of customers. This can be achieved through extensive attention to quality policy and fully executed quality planning and assurance, not to mention constant monitoring and development from A to Z, meaning QMS covers almost all of an organisation's output.

Reactive machines can analyze, perceive, and make predictions about experiences, but do not store data; they react to situations and act based on the given moment.

Recurrent neural network (RNN) is a type of neural network that makes sense of and creates outputs based on sequential information and pattern recognition.

Reinforcement learning is a machine learning method where the reinforcement algorithm learns by interacting with its environment, and is then penalized or rewarded based off of decisions it makes.

Robotic process automation (RPA) uses software with artificial intelligence and machine learning capabilities to perform repetitive tasks once completed by humans.

Robotics focused on the design and manufacturing of robots that exhibit and/or replicate human intelligence and actions.

Smart city is an urban area that develops and functions primarily through the analysis of big data. In a smart city, the many public spaces are analysed to make the best use of resources and create a better living environment for its citizens, from public transport to law enforcement and everything in between.

Structured data are clearly defined data with easily searchable patterns.

Supervised learning is a type of machine learning where output datasets teach machines to generate desired outcomes or algorithms (akin to a teacher-student relationship).

Swarm behavior is from the perspective of the mathematical modeler, it is an emergent behavior arising from simple rules that are followed by individuals and does not involve any central coordination.

Thick data is qualitative data that provides actionable insights into the everyday emotional lives of consumers both real and potential.

Transfer learning is a system that uses previously-learned data and applies it to a new set of tasks.

Turing Test is a test created by computer scientist Alan Turing (1950) to see if machines could exhibit intelligence equal to or indistinguishable from that of a human.

Unstructured data are data without easily searchable patterns (e.g. audio, video, social media content).

Unsupervised learning is a type of machine learning where an algorithm is trained with information that is neither classified nor labeled, thus allowing the algorithm to act without guidance (or supervision).

User experience (UX) monitors how people interact with applications, websites, and more while working towards creating the most enjoyable and efficient online experience.

Virtual reality (VR) is a computer-simulated 3D experience that includes a blend of scenes from the physical world and cyber world equipped with surround sounds and video, which enables users to interact with them in a non-physical reality.

Weak AI is artificial narrow intelligence (ANI).

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