

TECHNOLOGY ANNOUNCEMENTS CATALOG 2019-2020

— ÖZYEĞİN —
— UNIVERSITY —



TECHNOLOGY
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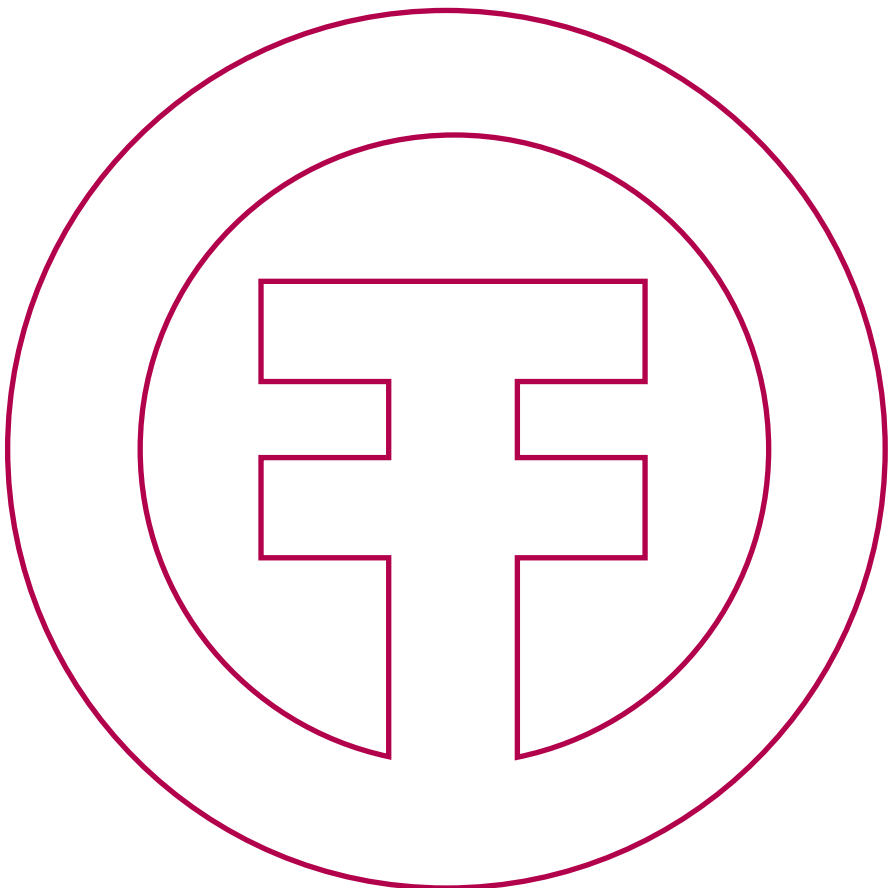
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2019-2020

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PREFACE

Director's Message

One of the most exciting sides of academic life, is to see your research outputs turn into an innovation and a patent. One of the most exciting sides of being a goal-oriented TTO, is to see your isolated academic patents turn into patent portfolios and become the subjects of commercialization. This year we are honored to share with you the 10 year patent collection and portfolio of Özyeğin University and we invite you become to be our partners in their commercialization successes.

Sincerely,
Dr. İsmail Arı
TTO and Entrepreneurship Director

ÖNSÖZ

Direktörün Mesajı

Akademik hayatın en heyecanlı taraflarından birisi, araştırma çıktıların bir buluşa ve patente dönüştüğünü görmektir. Hedef-odaklı bir TTO olmanın en heyecanlı taraflarından birisi ise, izole akademik patentlerinizin portföylere dönüştüğünü ve ticarileşmeye konu olduğunu görmektir. Bu yıl sizlerle Özyeğin Üniversitesi'nin 10 yıllık patent birikimini ve portföyünü paylaşmaktan gurur duyuyor ve ticarileşmeleri konusundaki başarılarına ortak olmaya davet ediyoruz.

Saygılarımla,
Dr. İsmail Arı
TTO ve Girişimcilik Merkezi Direktörü

OZU's Technology Areas for Licensing



**Lighting and Energy
Technologies**



**Mechanical & Thermal
Technologies**



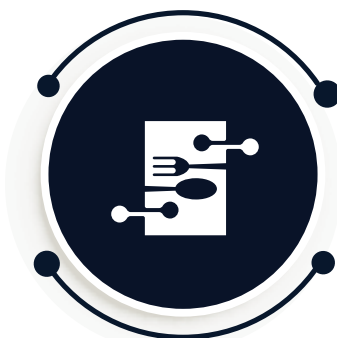
**Information &
Communication
Technologies**



**Health
Technologies**



**Construction
Materials**



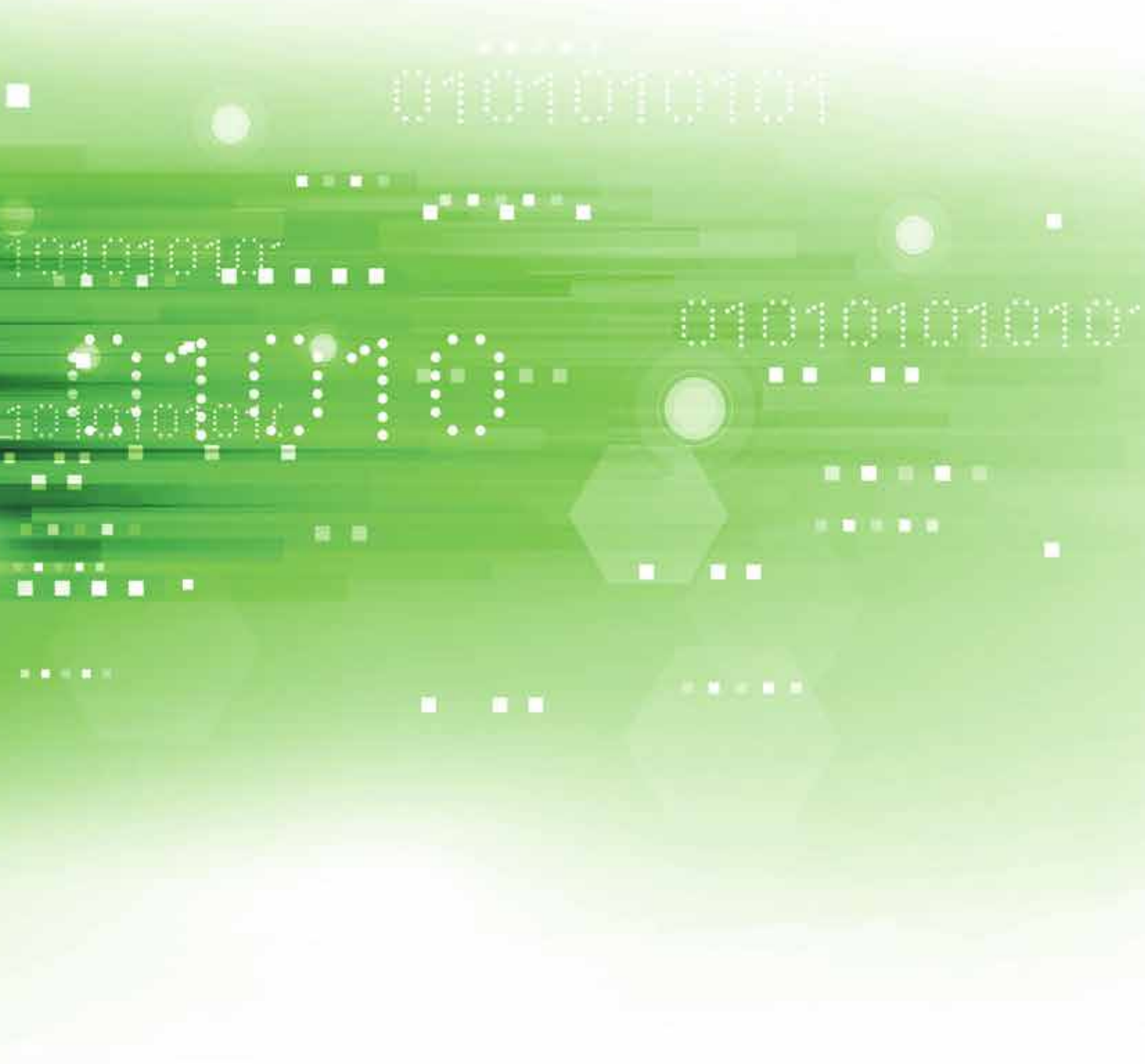
**Food
Technologies**

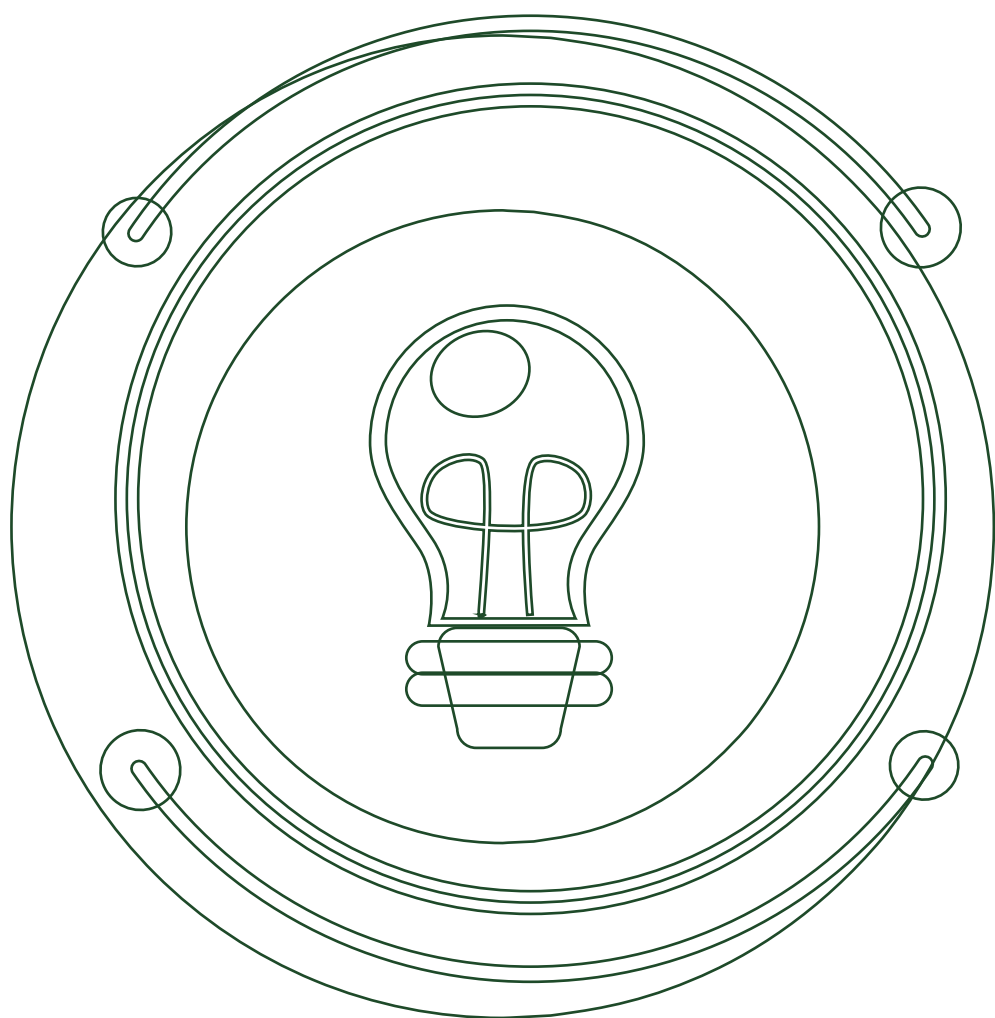


**Educational
Technologies**



LIGHTING AND ENERGY TECHNOLOGIES





Potential Application Area(s)

• Lighting

Patent Status

WO2017111752 (A1)

EP3345226 (A1)

US2018366620 (A1)

Inventor(s)

Prof. Mehmet Arik

Asst. Prof. Sedat Nizamoglu

Technology Readiness Level

TRL 3

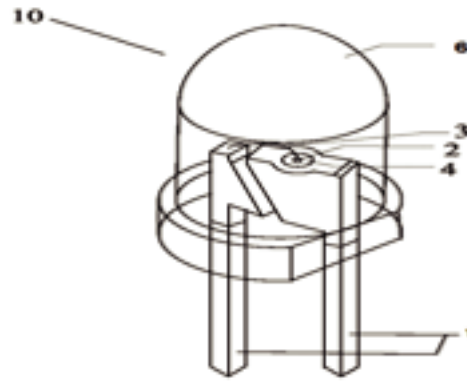
LIGHTING INTERLAYERS FOR OPTICAL PATHS OF LIGHT EMITTING OR ABSORBING SYSTEMS

Problem:

Various different coating constructs or lens based systems are used with a view to enhancing the luminous efficacy of LEDs. Said coating constructs are commonly epoxy materials. Epoxy and silicon materials available in optical paths of LEDs have a low thermal performance.

Technology:

Present technology provides lighting systems emitting or absorbing light, and containing at least one radiation layer which is located along the optical path of light with or without phosphor, and makes radiation by absorbing light and contains silk fibroin, and is capable of controlling the light distribution.



Advantages:

- Increasing illuminating capacity of LEDs
- Keeping the heating occurring in LED during illumination below the average heating values
- Obtaining a non-synthetic lighting interlayer that is recyclable in nature

Related Publications:

S. U. Yuruker, M. Arik, E. Tamdogan, R. Melikov, S. Nizamoglu, and I. Durak, "Thermal and optical performance of eco-friendly silk fibroin proteins as a cavity encapsulation over LED systems", ASME Interpack 2015, San Francisco, USA, July 2015.

Potential Application Area(s)

- LED based Lighting System

Patent Status

WO2017086893 (A1)
EP3335529 (A1)
US10506703 (B2)
TR201514689 (A2)

Inventor(s)

Prof. Mehmet Arik
Ferina Saati

Technology Readiness Level

TRL 3

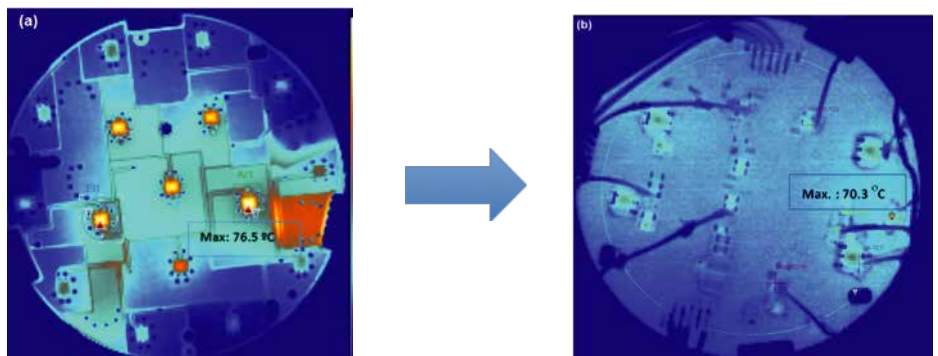
LIGHT ENGINE SYSTEM PREFERRED IN LED-BASED LIGHTING SYSTEMS

Problem:

In the background of technology various type of PCBs structures are used to allow the use of multifunctional LEDs (light emitting diodes) in automotive industry applications. These examples have a common basic property, characterized in that they are related to apparatuses having only LED structures on PCB and having heat sinks or similar cooling apparatuses on the other side. Extra cooling designs developed for limited spaces, providing specific solutions with regard to automotive applications are needed.

Technology:

The technology relates to cooling units developed in LED applications in automotive industry and it also uses advanced printed circuit board technologies that minimizes the heat resistance and renders heat conductivity more efficient and productive compared to standard printed circuit boards.



Advantages:

- Eliminating local hotspots on the PCB
- Enabling dissipation of heat generated in PCBs over the board
- Creating a structure preventing the heating of PCB boards
- Extending useful operating life.

Related Publications:

F. S. Khosroshahi, M. Arik, C. S. Tufekci, "A computational and experimental study on a harsh environment LED system for vehicle exterior lighting applications", ITherm 2014, Orlando, June 2014.

Potential Application Area(s)

- Electronics Cooling
 - Lighting
 - LEDs
- HVAC systems
 - Chillers

Patent Status

US10629514 (B2)

WO2017099677 (A1)

Inventor(s)

Prof. Mehmet Arık

Muhammad Ikhlaz

Technology Readiness Level

TRL 3-4

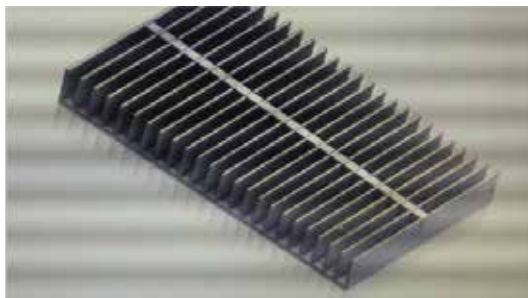
HEAT SINK COOLING WITH MOUNTED SYNTHETIC JET DEVICES SYSTEMS

Problem:

Heat sinks are the passive cooling components used for removing the heat released by the electronic devices. In the systems where active cooling is used, the actively cooled heat sink with fans decreases the reliability of the system and causes extra energy loss. Utilization of novel cooling systems with low power consumption and high lifetime is critical for sustainable thermal management applications.

Technology:

The lighting system of the present invention, heat sink, optical structure (LED chip and phosphor -like materials, and diffuser) and electronic circuit members are configured in an integrated manner. Therefore, the cooling fluid washes the surfaces effectively and receives the heat. Therefore, both the weight and size of the heat sink are decreased and it is enabled to cool down the LED chips and other electronic circuit members as the driver in a multi- purpose manner. This approach brings novel microfluidic devices for reducing the weight and increasing thermal performance.



Advantages:

- To cool down the LED chips and other electronic circuit members as the driver in a multi-purpose manner
- Reaching high performance cooling
- Reducing heat sink size and weight
- Cause drastic cost reduction
- Increasing lifetime

Related Publications:

<http://www.evateg.com/>

Potential Application Area(s)

- Lighting
- LEDs

Patent Status

TR2013/15075

Inventor(s)

Asst. Prof. Sedat Nizamoglu

Technology Readiness Level

TRL 6

FLUORESCENT PROTEIN INTEGRATED LIGHT EMITTING DIODES

Problem:

Bio-friendly, energy efficient and high-color quality solid-state lighting is required due to the current limitations of phosphor-based LED technology and the currently investigated nanocrystal-integrated LED technology.

Technology:

We propose a new class of color-conversion LEDs integrated with fluorescent proteins to overcome the disadvantages of currently used and investigated color conversion materials.

Advantages:

- Efficient and stable white light generation by strong absorption, high fluorescence quantum yields and high photostability
- The custom-designed emission spectrum by the narrow-emission linewidth of fluorescent proteins
- Biocompatible characteristics (green lighting)

Related Publications:

- S. Nizamoglu, M. C. Gather, and S. H. Yun, "All-biomaterial laser using vitamin and biopolymers," *Advanced Materials* 25, 5943-5947 (2013).

Potential Application Area(s)
• Lighting

Patent Status
TR 2014/08817

Inventor(s)
Asst. Prof. Özkan Bebek
Sabri Orçun Orhan

Technology Readiness Level
TRL 5

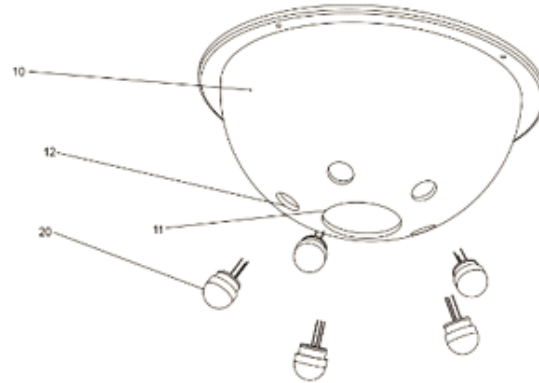
A LIGHTENING SYSTEM THAT ADJUSTS LIGHTING DURATION AND DENSITY

Problem:

Current technology provides automatic lighting systems that recognize one's movement. However, in these systems lighting sensors are programmed to remain open for a determined period of time, and it switches off itself even if the person is still present and needs light. Sometimes, sensors are programmed to remain for a long time to prevent this problem; however, it causes decrease in energy efficiency. There are different types of sensitive sensors such as single or multicolor infrared camera systems, laser scanning systems, or ultrasonic systems. Nevertheless, all of these systems have drawbacks as high costs, technical difficulties or sizableness.

Technology:

The invention is comprised of Passive Infra-Red (PIR) sensor, which is the most suitable system for automatic lighting. The PIR sensor array not only detects the movements, but also perceives the presence of a person.



Advantages:

- To provide energy efficiency
- Easy integration to the LED light bulbs due to the small size of the sensor
- Low-cost

Related Publications:

• O. Bebek, M. Kaya, and S. O. Orhan, "Developing next generation LED Lamps: Discriminating and identifying human movements", SSL-TR 2013: International Workshop on Solid State Lighting Technologies and Research: LEDs and OLEDs, August 20-21, 2014, pp. 45.

Potential Application Area(s)
• Lighting

Patent Status
WO2018034628 (A1)
EP3308072 (B1)
US10359186 (B2)
TR201804359 (T3)

Inventor(s)
Prof. Mehmet Arik
Muhammed Nasir Inan

Technology Readiness Level
TRL 7

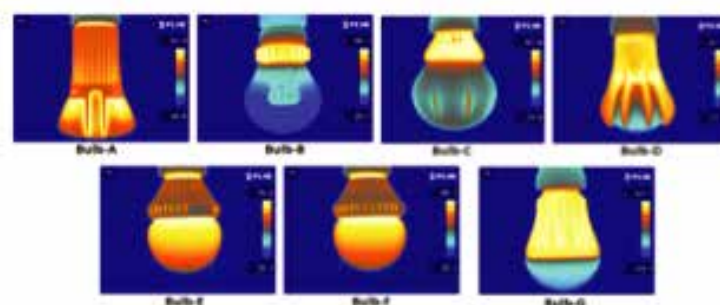
FLOW COOLED SOLID STATE LIGHTING WITH PREFERRED OPTICAL AND ADVANCED SENSING FEATURES

Problem:

Prior LED lamps and heat sinks have not had sufficient capacity that allow for high luminous flux and that perform the cooling required for LED lamps generating high heat.

Technology:

The present invention addresses some problems by providing a highly efficient lighting apparatus and controlled lighting system and method that enables air to efficiently flow and perform the cooling process, and in particular to perform the cooling process for the LEDs, phosphor, and the driver circuit. The lighting apparatus, system, and method can be combined with the preferred optical features and sensing, data collection and data sharing features.



Advantages:

- Highly efficient manner for increased lumen extraction and cooling efficiency while maintaining weight and size constraints of a bulb.
- Lighting apparatus of the present invention is thermally and optically optimized.
- Sound and/or motion sensors, humidity and temperature sensors can be integrated.

Related Publications:

Inan M. N., Arik M., "A multi-functional design approach and proposed figure of merits for solid state lighting systems", Journal of Solid State Lighting 20141:8 DOI: 10.1186/2196-1107-1-8© Inan and Arik; licensee Springer, 2014

Potential Application Area(s)
• Lighting

Patent Status
US9435530 (B2)

Inventor(s)
Prof. Mehmet Arık
Halis Saka
Cemal Özer Yiğit

Technology Readiness Level
TRL 3

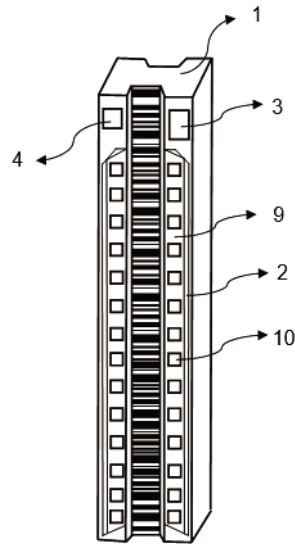
PREFERRED GEODETIC LEVELLING STAFFS AND METHOD OF USE THEREOF

Problem:

Levelling is an optical method that provides measurements of geodetic heights using a level that is configured to read a levelling staff for measuring and calculating elevation at selected positions. Deciding whether the levelling staff is in the vertical position depends solely on the opinion of the surveyor brings with it incorrect measurement data due to human error especially in low-light or no-light.

Technology:

The present invention relates to a levelling staff and a level for a geodetic levelling. More specifically, the present invention relates to lighted levelling staff which is used to determine the difference in height between points or heights of points above a datum surface.



Advantages:

- Perform accurate measurement while minimizing human error in low-light or no-light conditions
- Inexpensive
- Affordable
- Easy to produce

Related Publications:

<http://www.evateg.com/>

Potential Application Area(s)

• Lighting

Patent Status

US 20150233564 (A1)

Inventor(s)

Prof. Mehmet Arık

Enes Tamdoğan

Technology Readiness Level

TRL 3

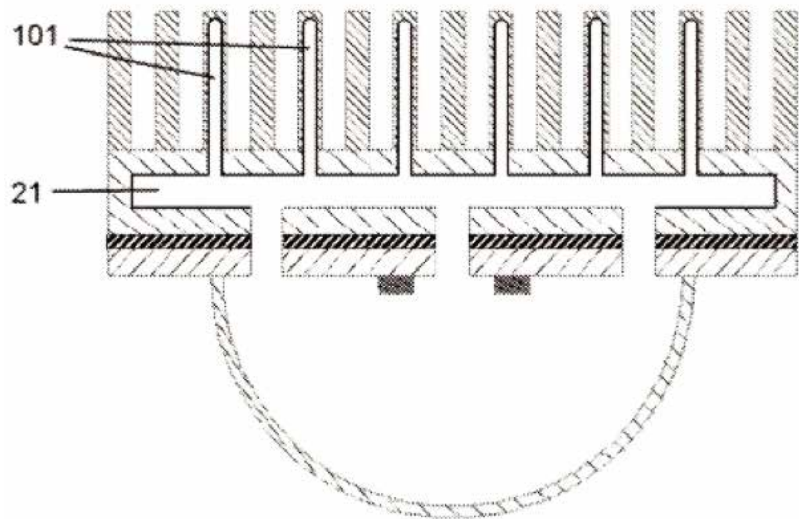
PREFERRED OPTOTHERMAL LED LIGHTING EMBODIMENT FOR HIGH LUMEN EXTRACTION AND EXTENDED LIFETIME

Problem:

Various cooling methods are used in different LED lamp types (especially in lamps having different power and light intensity). The general aim of all these cooling methods is to prevent the problems that are likely to occur due to the high heat formed during operation.

Technology:

The invention relates to an embodiment which cools down LED lamps efficiently, and to the integration of the cooling system with the LED lamp.



Advantages:

The invention;

- Cool downs LED lamps in an efficient manner,
- Increases the durability and the amount of light to be obtained from LED lamps,
- Reduces the weight thereof.
- Eliminates local temperature difference (local hotspots) in LED chips.

Related Publications:

<http://www.evateg.com/>

Potential Application Area(s)
• Lighting

Patent Status
PCT/TR2018/050889

Inventor(s)
Prof. Mehmet Arık
Enes Tamdoğan
Burak Özlük
Ahmet Mete Muslu

Technology Readiness Level
TRL 3

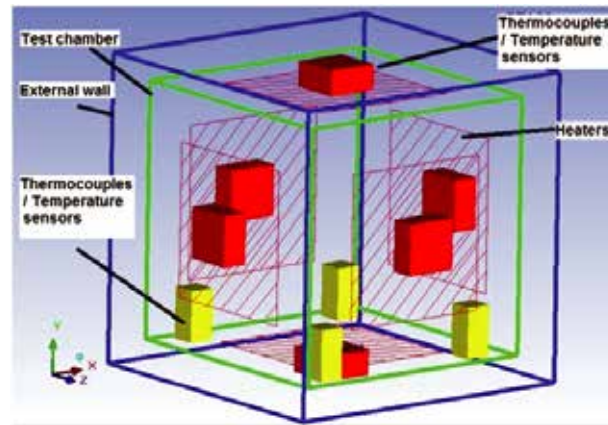
A PREFERRED SYSTEM FOR MEASURING JUNCTION TEMPERATURE OF PHOTONICS DEVICES

Problem:

As electronic packages are getting smaller day by day, generated heat fluxes are also becoming more intense and induce serious lifetime and performance issues on consumer devices. Light emitting diodes (Photonic devices) are also one of these photonics products and they are the future of lighting industry.

Technology:

The invention relates to an embodiment which cools down LED lamps efficiently, and to the integration of the cooling system with the LED lamp.



Advantages:

- The opportunity to customize a personalized plan for junction temperature measurement by choosing the desired settings for a particular photonics device.
- Most of the process will be facilitated with suggested default settings by the software and user may need to enter only the operating current of a particular photonics device and run the device without any extra action required by user during the measurement.
- More practical
- Time saving

Related Publications:

<http://www.evateg.com/>

Potential Application Area(s)

- Lighting

Patent Status

US9464802 (B2)

Inventor(s)

Prof. Mehmet Arık
Muhammed Nasır İnan

Technology Readiness Level

TRL 3

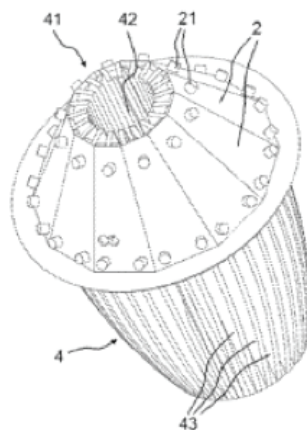
FLOW CONTROLLED EFFECTIVE LED BASED LIGHTING SYSTEM

Problem:

LED chips or LED packages used in LED lamps and generating light convert the majority of the energy used into heat. The temperature of chip, which increases together with the heat that cannot be removed decreases the amount and quality of the generated light, shortens the lives of chips and may cause failure of LED. A heat sink with the required cooling capacity maintains the chip temperature at a secured level and meanwhile needs to meet the optical, mechanical and aesthetic criteria of LED lamps.

Technology:

The present invention is related to a lighting system that cools the LED lamps and the lamps in which said system is applied. Within the scope of this patent application, A-line lamps are presented as an example for the application of said concept.



Advantages:

- Low weight
- The luminous efficacy,
- Light quality,
- System reability
- Life span

Related Publications:

<http://www.evateg.com/>

Potential Application Area(s)

- Solar Energy

Patent Status

WO2020068011 (A1)

Inventor(s)

Tufan Akba

Technology Readiness Level

TRL 3

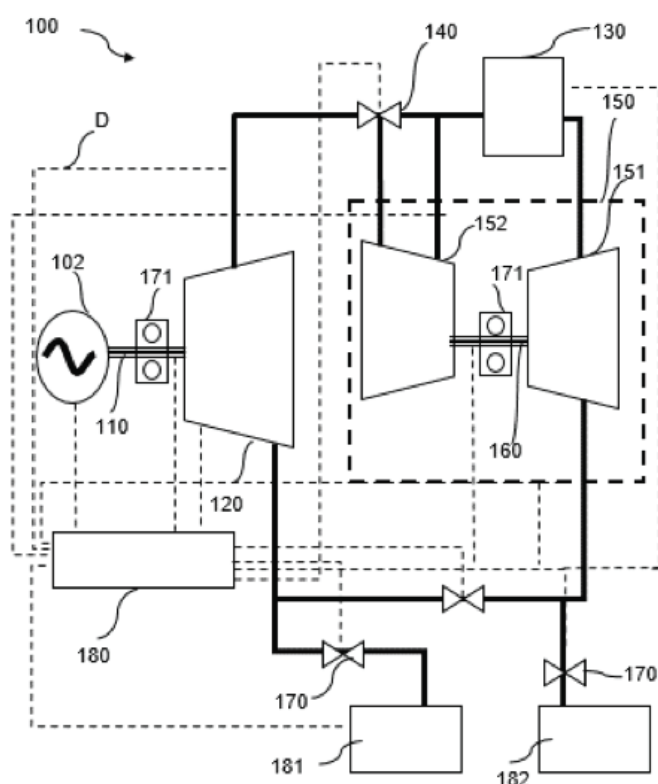
A SOLAR POWER GENERATING SYSTEM AND THE METHOD OF GENERATING ELECTRICITY AND PROVIDING HEAT IN SUCH A SYSTEM

Problem:

Requirement of micro-scale cost-effective solar heat and electricity generation

Technology:

The present invention relates generally to a power generating system, and more particularly to a system and a method for producing electrical power from solar energy.



Advantages:

- Longer working life
- Cost effective

Related Publications:

N.A.

Potential Application Area(s)

• Thermal Connectors

Patent Status

WO2020005175 (A1)

Inventor(s)

Prof. Mehmet Arık

Enes Tamdoğan

Ahmet Mete Muslu

Şevket Yürüker

Technology Readiness Level

TRL 3

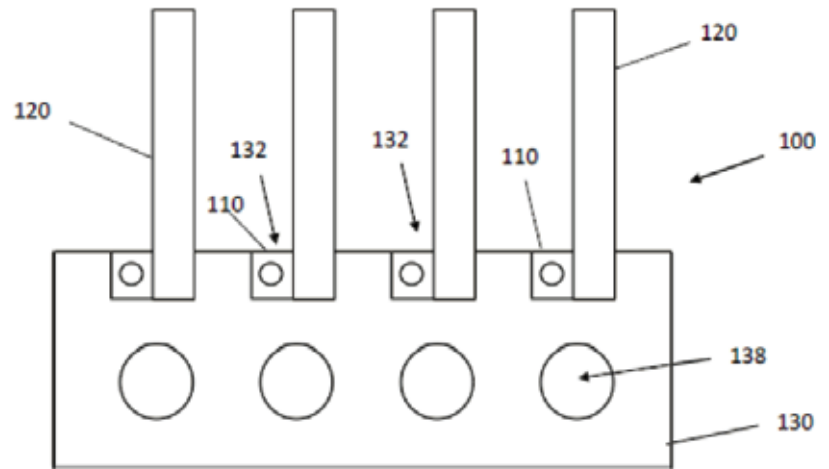
PREFERRED THERMAL CONNECTOR FOR ELECTRONIC SYSTEMS

Problem:

The present invention addresses possible problems such as insufficient clamping force, low thermal conductance, hardly accessible clamping adjustment, etc., by providing a thermal connector including: two wedges with opposed inclined surfaces; a tightening screw accessible at one wedge for keeping the assembly together; a tightening hole wherein the tightening screw threaded section goes into; and an optional stabilization hole wherein the thermal connector needs to be stabilized before activating one wedge and expanding.

Technology:

The present invention relates generally to thermal connectors, and more particularly to thermal connectors for coupling printed circuit boards (PCBs) to a cooling structure or a heat sink.

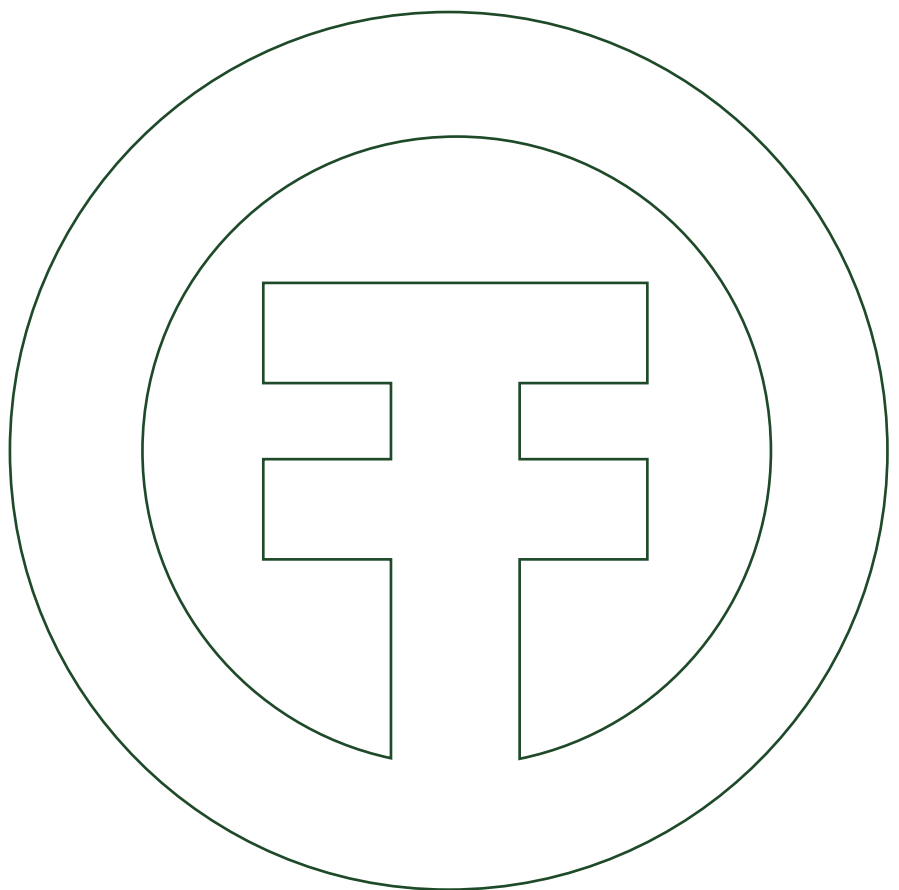


Advantages:

Embodiments of the present invention provide both accessible adjustment of required clamping force and minimized thermal resistances.

Related Publications:

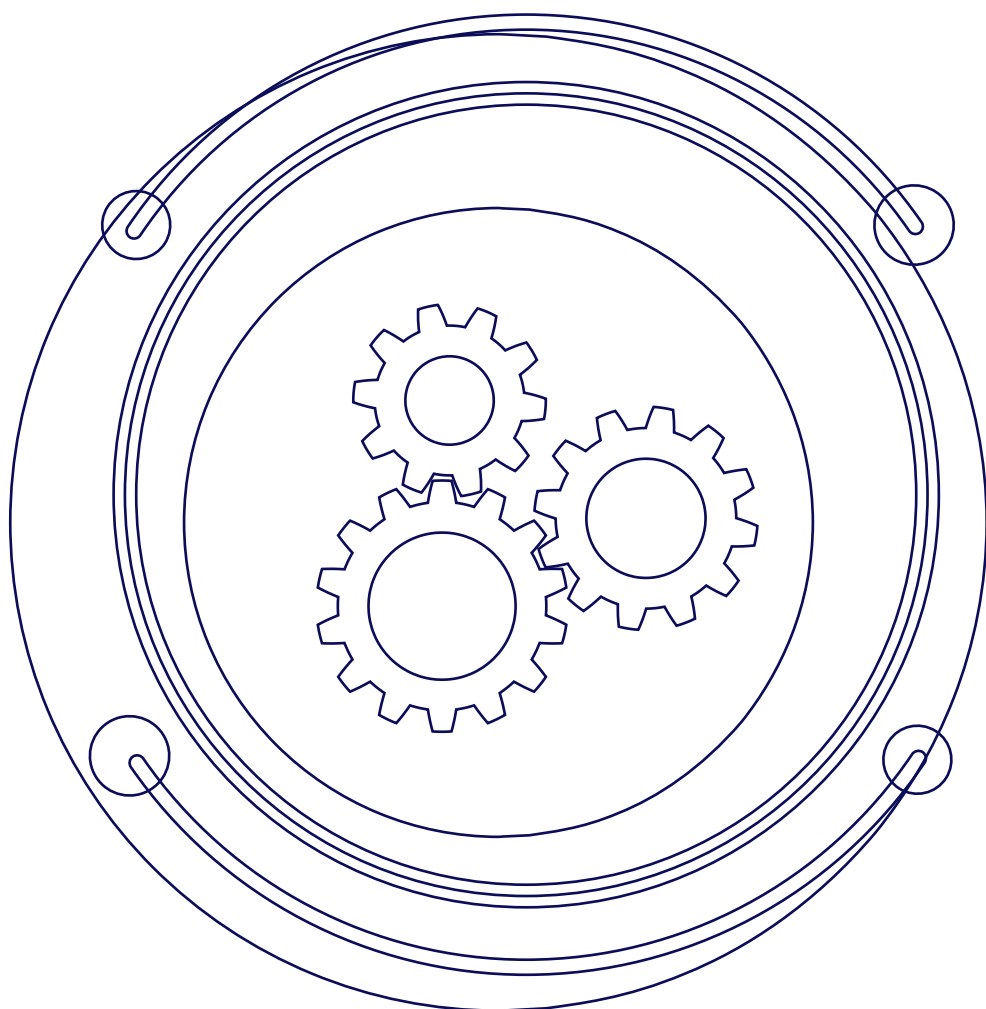
<http://www.evateg.com/>





MECHANICAL AND THERMAL TECHNOLOGIES





Potential Application Area(s)

• Assembly of
Motor Mechanics

Patent Status

WO2017196269 (A1)

EP3350908 (A1)

TR201805615 (T3)

Inventor(s)

Prof. Caner Aküner

Uğur Demir

Technology Readiness Level

TRL 3

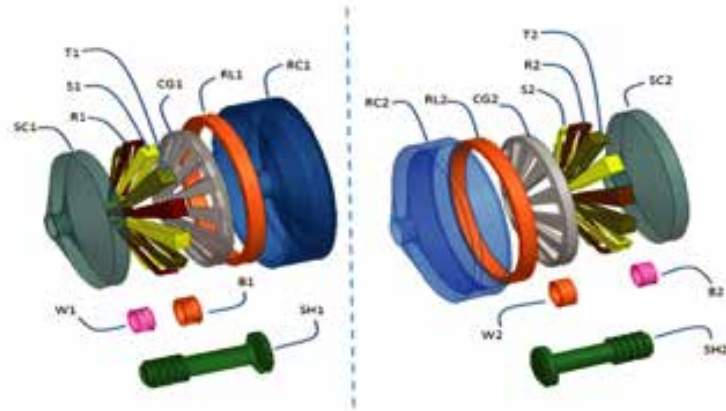
RADIAXIAL FLUX MOTOR WITH A CONICAL STATOR AND ROTOR ASSEMBLY

Problem:

Prior motors, in particular induction motors, have had several disadvantages. Prior motors use a significant amount of air space and can be large and heavy when assembled, making shipping of an electric motor costly. In order to get enough shaft torque, motor length should be increased mostly.

Technology:

The present invention provides for advantageous conical geometry of a stator and a rotor, thereby providing both radial flux and axial flux ("radiaxial" flux) simultaneously. In order to get enough shaft torque, the purpose of invention is regarding to reduce increasing motor length by design of conic geometry. In this way, conic geometry provides both decreasing motor length and getting high shaft torque because using radial and axial flux simultaneously.



Advantages:

- Invention maximizes and/or optimizes the radial space available in order to advantageously use the increased radial dimension of a conical design to increase the moment arm to increase available torque at the drive shaft of the motor.
- The present invention provides for increased efficiency, torque-speed, and improved space utilization for a motor.

Related Publications:

N/A

Potential Application Area(s)

- Heat Transfer
- Fluid Flow
- Particle Agglomeration
- Nanofluids

Patent Status

WO2017069712 (A1)
TR2015/17535
US2019049071 (A1)
JP2019503855 (A)
EP3365627 (B1)

Inventor(s)

Prof. Ali Koşar
Prof. Kürşad Şendur
Prof. M. Pınar Mengüç

Technology Readiness Level

TRL 3

FLOW SYSTEM FOR AVOIDING PARTICLE AGGLOMERATION

Problem:

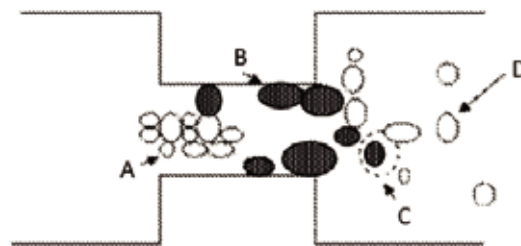
Nanofluids are considered to be the next-generation heat transfer media as they offer exciting new possibilities to enhance heat transfer performance compared to conventional fluids. Such fluids such as water, ethylene glycol and oils have limited thermal properties in comparison to new generation nanofluids.

Technology:

The present invention proposes a flow system for avoiding particle agglomeration in nanofluids, comprising a flow restrictive element which in use provides sudden expansion mechanism where cavitation takes place in the fluid upon exiting the flow restrictive element.

The proposed system and related method offers interesting practical applications in thermal management, refrigeration, drug delivery, and heat sink design of the nanofluids while maintaining their stability. This system and method do not involve any use of extensive surfactants or surface modifiers, which might alter thermophysical properties of nanofluids, adversely influencing their performance and biocompatibility, and limit their effectiveness.

Integration of flow restrictive elements and heaters could be accomplished by standard microfabrication tools and techniques and standards fittings. The new method and system use the forces of nature such as sudden expansion and additional heat transfer via plasmonic near-field radiation transfer, into effect.



Advantages:

- Economical since no expensive chemicals are included
- More effective
- High Performance
- Biocompatible

Related Publications:

N.A.

Potential Application Area(s)

- Electromagnetic
- Construction
- Off Linear Physical Movements

Patent Status

PCT/TR2018/050681

Inventor(s)

Asst. Prof. Özkan Bebek

Asst. Prof. Özgür Ertunç

Muhammed Sarmad Qureshi

Mehmet Kuntuz Polat

Technology Readiness Level

TRL 3

AN ELECTROMAGNETIC ACTUATOR TO ACHIEVE SOFT LANDING AND THE CONTROL METHOD THEREOF

Problem:

Electromechanical actuators are replacing pneumatic and hydraulic actuators as they provide more reliable and accurate control, they are more efficient and less hazardous to the environment. Moreover, compactness along with rugged, simple in construction and lower cost makes them suitable to be used in many domestic and commercial applications, which require on and off linear physical movements. The motion is induced by the current supplied to a coil of wire, which then give rise to a magnetic force, then this force is used to control the motion of the electromechanical actuator being controlled.

Technology:

The present invention relates to an electromagnetic actuator and a method for controlling the movement of an armature of the electromagnetic actuator.

Advantages:

- No sensors are used.
- Our invented signal uses the formula.
- Uses Uni-Polar Solenoids.
- Uses voltage signal
- Open Loop System.

Related Publications:

- M. P. Kuntuz, M. S. Qureshi, and O. Bebek, "Sliding Mode Control of An Electromechanical Solenoid Actuator For Soft Landing," In proceedings of the 23rd International Conference on Methods and Models in Automation and Robotics (MMAR), August 27-30, 2018, Miedzyzdroje, Poland, doi: 10.1109/MMAR.2018.8486059
- M. S. Qureshi, M. P. Kuntuz, and O. Bebek, "Performance Evaluation Of Sliding-Mode Approaches For Tracking The Motion Of The Solenoid Actuators," In proceedings of International Conference on Progresses In Automotive Technologies (ICPAT), May 10-12, 2018, Istanbul, Turkey, pp. 4-14. ISBN: 978-605-9546-11-9



INFORMATION AND COMMUNICATION TECHNOLOGIES





Potential Application Area(s)

- Wireless Communication Networks
- Internet of Things

Patent Status

WO2017091177 (A1)
EP3335345 (A1)
TR2015/014750

Inventor(s)

Prof. Murat Uysal
İbrahim Altunbaş
Semiha Tedik
Güneş Karabulut

Technology Readiness Level

TRL 3

RANDOM NETWORK CODING IN ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS (OFDMA) NETWORKS USING CONTROL SIGNALING

Problem:

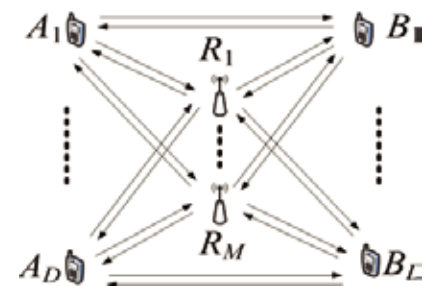
Rapidly increasing mobile traffic has become a serious concern for current wireless networks. It is predicted that there will be 50 billion connected devices by 2020. To enable communication among these devices with limited radio resources, major structural changes are expected to take place in next generation Internet. In conventional wireless networks, functionalities such as routing, error control coding and data storage are designed in accordance with the principle of network nodes performing transmission independently. Unconventional approaches in network design are required to deal with the ever-increasing demand for wireless applications and services.

Technology:

The present invention is a multi-carrier and multi-way random network coded cooperative communication system. Through the deployment of relay nodes, efficient resource utilization mechanisms are devised for scalable wireless networks with randomly changing topologies.

Advantages:

- Enabling cooperative communications
- Enhancing coverage area
- Reducing the total transmit power
- Improving outage performance



Related Publications:

- Heidarpour, G. Karabulut Kurt, and M. Uysal, "Finite-SNR Diversity-Multiplexing Tradeoff for Network Coded Cooperative OFDMA Systems" IEEE Transactions on Wireless Communications, vol.16, no.3, March 2017.
- S. Tedik Basaran, G. Karabulut Kurt, M. Uysal, and I. Altunbas, "A Tutorial on Cooperative Network Coding," in IEEE Communications Surveys and Tutorials, vol.18, no.4, 2016.

Potential Application Area(s)

- Commercial, Civilian and Military Platoon Communications

Patent Status

EP3257171 (B1)
PCT/TR2015/050266
US10204519 (B2)

Inventor(s)

Prof. Murat Uysal
Assoc. Prof. Serhat Erküçük
Ömer Narmanlıoğlu

Technology Readiness Level

TRL 3

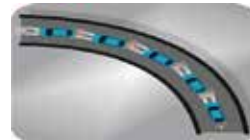
COMMUNICATION BETWEEN VEHICLES OF A PLATOON

Problem:

Platoon formation of vehicles is a critical foundation for autonomous or semi-autonomous vehicle control improving road safety, traffic flow, and environmental concerns towards the realization of intelligent transportation systems. Radio frequency (RF) wireless technologies are typically used to enable vehicle-to-vehicle communications. The main problem in using RF based communications in a vehicular platoon is that the communication between vehicles may be distorted by intentional RF jamming or could be intercepted by third parties, resulting in lack of reliability and security.

Technology:

The objective of the proposed invention is to provide a secure and reliable transmission between consecutive and non-consecutive vehicles in a platoon system through the use of visible light communication (VLC) technology. VLC is based on the idea of modulating light emitting diodes (LEDs) at very high speeds which are not noticeable to the human eye. Through this technology, vehicles fitted with LED-based front and back lights can communicate with each other in an inherently secure way. VLC is however mainly limited to communication between consecutive vehicles and does not provide an easy method of communication between any non-consecutive or multiple vehicles in a platoon. To address this problem, this invention proposes a reliable multi-hop VLC communication based on token-based data transmission, in addition to determining the position of each vehicle in the platoon without any prior information.



Advantages:

- Secure and reliable data communications within a vehicular platoon
- Determining vehicle positions without the need of an external system such as a GPS
- System based on low-cost and energy-efficient VLC technology

Related Publications:

<http://okatem.ozyegin.edu.tr/>

Potential Application Area(s)

- Communication Technology

Patent Status

US10020882 (B2)

Inventor(s)

Prof. Murat Uysal
Asst. Prof. R.Çağlar Kızılırmak
Asst. Prof. Tuncer Baykaş
Ömer Narmanlioğlu

Technology Readiness Level

TRL 3

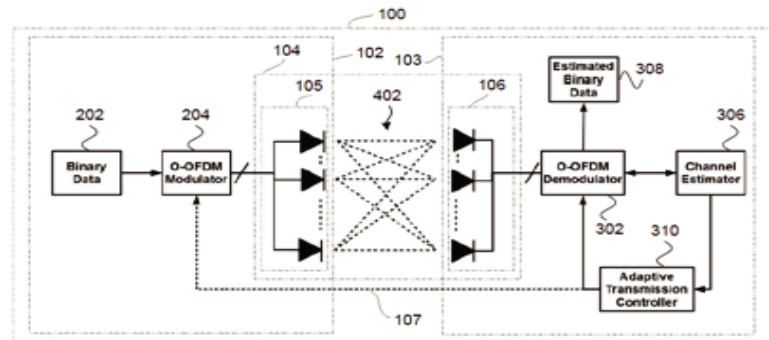
ADAPTIVE MULTIPLE INPUT MULTIPLE OUTPUT (MIMO) OPTICAL ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (O-OFDM) BASED VISIBLE LIGHT COMMUNICATION

Problem:

Visible light communication (VLC) is a short range optical wireless data transmission method that uses the illumination infrastructure as wireless access points. In indoor environments, the channel conditions and achievable signal-to-noise ratio is highly dependent on the user location. This requires the development of adaptive physical layer technologies tailored for VLC systems that automatically adjust transmission parameters according to channel conditions.

Technology:

This invention presents a new method and system for adaptive VLC where several transmission parameters such as modulation size/order, type and configuration of multi-input multi-output (MIMO) communication techniques are optimally adjusted according to channel conditions. This invention will significantly enhance VLC system performance in terms of link reliability and data rate.



Advantages:

- Adaptively choosing transmission parameters according to channel conditions
- Improved link reliability
- Increased data rate

Related Publications:

M. Uysal, F. Miramirkhani, O. Narmanlioglu, T. Baykas, and E. Panayirci, "IEEE 802.15.7r1 Reference Channel Models for Visible Light Communications", IEEE Communications Magazine, vol. 55, no. 1, p. 212-217, January 2017.

Potential Application Area(s)

- Intelligent Transportation Systems
- Speed Monitoring

Patent Status

US16/057,239

Inventor(s)

Prof. Murat Uysal
Hisham FadlAllah M. Abuella
Sabit Ekin

Technology Readiness Level

TRL 3

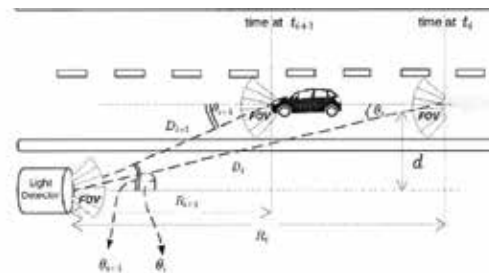
SYSTEM AND METHOD FOR SPEED ESTIMATION, DETECTION AND RANGING USING VISIBLE LIGHT IN VEHICLES

Problem:

Monitoring drivers' speed constitutes a critical issue for safety regulation agencies and automotive industry. Most of speed monitoring systems are based on measuring the speed of vehicles using a well-known RADAR or LIDAR systems that use RF signal or laser signals, respectively. However, these systems have limitations such as their requirement of narrow beam-width and line of sight, their deficient performance in curved roads.

Technology:

The subject of invention is a visible light based speed estimation method called as ViLDAR. By using the received light intensity of a vehicle's LED headlight, the vehicle speed can be accurately estimated for a wide range of incidence angle. Superior performance is obtained compared to the state-of-art detectors RADAR and LIDAR, both of which have relatively poor performance in fast incidence angle changing scenarios. In addition to the speed estimation, other potential application areas of ViLDAR include ranging detection and collision avoidance for autonomous vehicles.



Advantages:

Better speed estimation accuracy for a wide range of incidence angles
One-way signal model which is less susceptible to noise and path-loss

Related Publications:

- H. Abuella, S. Ekin, and M. Uysal, "ViLDAR: A Novel Speed Estimation System using Visible Light in Vehicles", IEEE Sarnoff Symposium, Newark, New Jersey, USA, September 2017.
- H. Abuella, S. Ekin, S. Ahmed, F. Miramirkhani, B. Kebapci, and M. Uysal, "Wireless Sensing using Vehicle Headlamps for Intelligent Transportation Systems: Proof of Concept", Annual Tran-SET Conference, San Antonio, Texas, USA, April 2019

Potential Application Area(s)

• Software Information Systems

Patent Status

US10110472B2

Inventor(s)

Asst. Prof. Selçuk Cevher

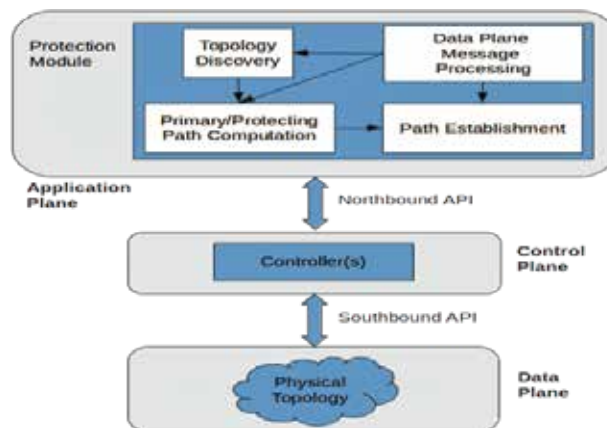
FAILURE PROTECTION FOR SOFTWARE DEFINED NETWORKS USING MULTI-TOPOLOGY ROUTING BASED FAST REROUTE

Problem:

The data traffic being transmitted in the forwarding plane of software defined networks (SDN) may be disrupted due to the unexpected link/switch failures or planned maintenance tasks. The fast recovery from the network failures in the forwarding plane plays a crucial role in supporting the real-time services in SDN.

Technology:

Within the scope of invention, a software defined networking (SDN) controller and methods based on multi topology routing for protecting against failure of a network element in a forwarding plane are provided.



Advantages:

- Performance and efficiencies.
- The recovery process from network failures in the forwarding plane can be controlled from a single point. This greatly simplifies the design and operation of the network.
- The network failures in the forwarding plane can be automatically recovered without the manual intervention of a network operator.
- Offering flexibility to perform failure recovery and traffic engineering tasks simultaneously.

Related Publications:

S. Cevher, "Multi Topology Routing Based Failure Protection for Software Defined Networks", IFIP Networking, Stockholm, Sweden, 2017 (Submitted)

Technology Readiness Level

TRL 4- 5

Potential Application Area(s)

• Cryptography

Patent Status

PCT/TR/2019/051081

TR 2018/21269

Inventor(s)

Asst. Prof. Kadir Durak

Burak Kebapçı

Technology Readiness Level

TRL 5- 6

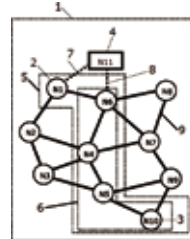
QUANTUM CRYPTOGRAPHY NETWORK

Problem:

Existing fiber based and free space optical links have limited range due to the transmission losses. Transmission losses inside an optical fiber limits the maximum achievable quantum key distribution range to hundred(s) of kilometers. Free space optical links have direct line-of-sight access problem due the shape of the Earth, which requires elevated nodes. Even with the elevated nodes there is a range limitation due to the losses within the atmosphere. Satellites are exploited in order to extend the QKD range. In this case the optical ground stations act as a trusted quantum nodes and still requires further improvement in order to provide the key to specific locations on Earth where there is no optical ground station.

Technology:

The invention relates generally to the quantum cryptographic systems and more specifically to the extension of distances to quantum key delivery in order to establish a quantum communication network.



Advantages:

Invention provides solution to:

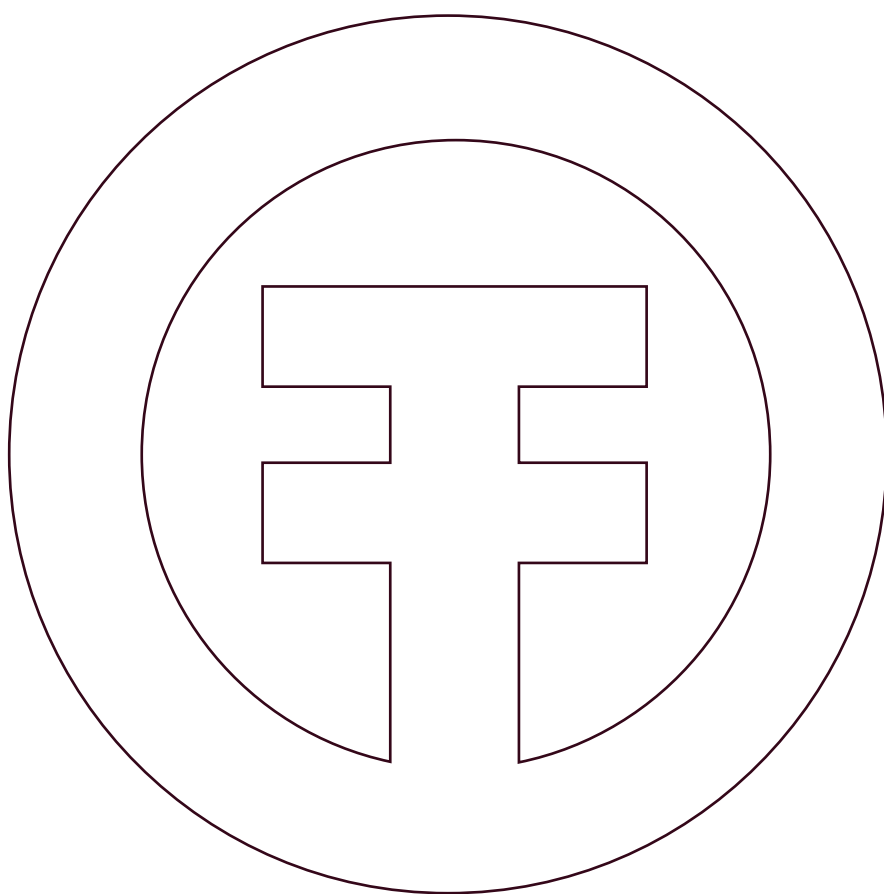
- Limited free space and fiber based optical link range
- Line-of-sight access for free-space optical links
- Secure transfer of quantum keys to distant targets that are out of link range.

The ease of implementation of the idea of courier drone makes this invention a suitable candidate for establishing a quantum cryptography network. The use of extra keys for secure transfer of a key to distant location benefit from the fact that if the pre-shared secret key is:

- i. Random
- ii. Safe (private)

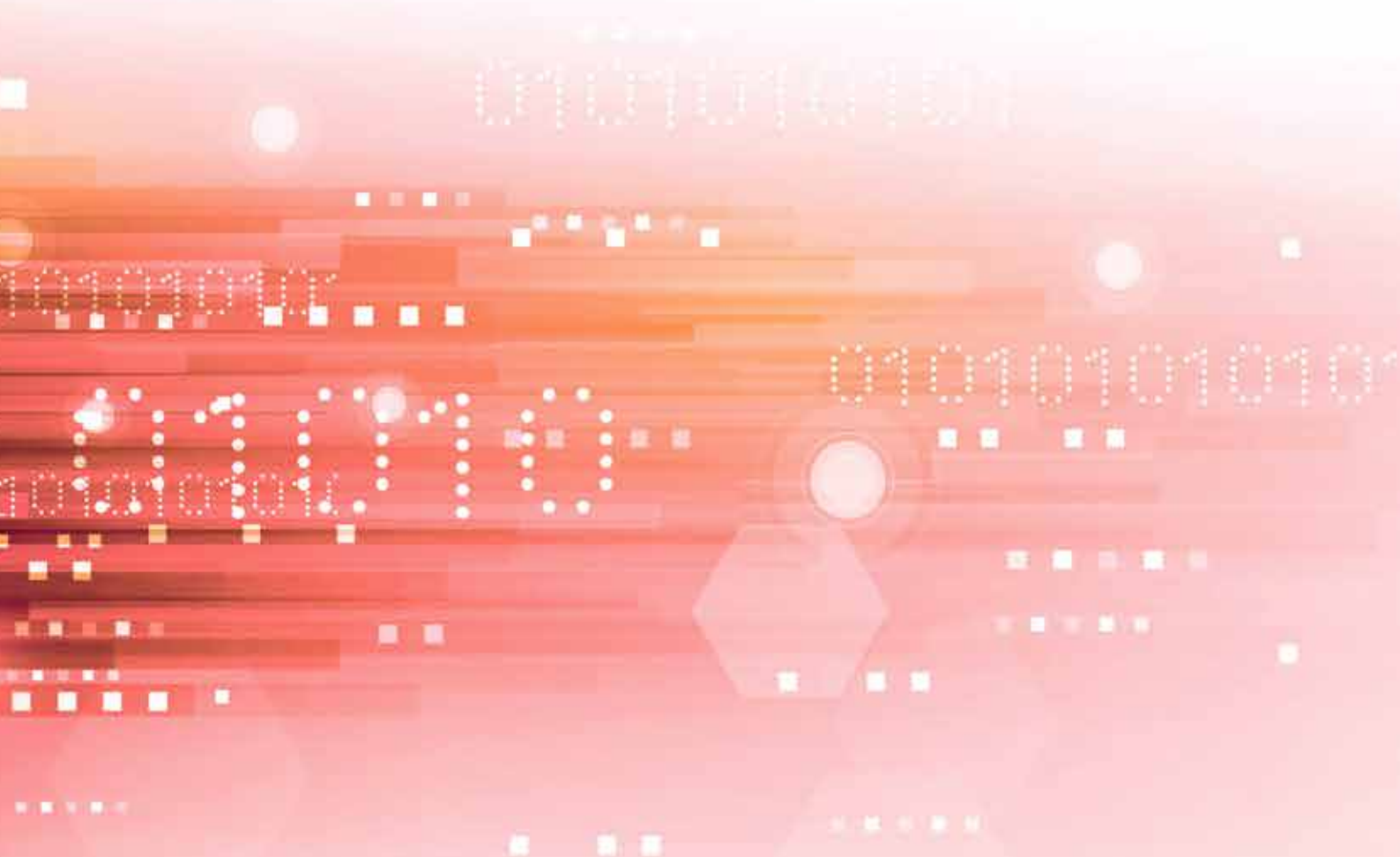
Related Publications:

<http://labs.ozyegin.edu.tr/qoptics/>





HEALTH TECHNOLOGIES





Potential Application Area(s)

•Hybrid Artificial Organs

Patent Status

TR2018/00340

Inventor(s)

Asst. Prof. Ahmet Tekin

Asst. Prof. Polat Sendur

Pegah Nomanfar

Mohamed O Abouzeid

Ahmet Mete Muslu

Technology Readiness Level

TRL 3

WEARABLE ARM SUPPORT

Problem:

Electromechanical support systems or robots in general are high-tech high cost equipment that may not be viable for many day to day applications. High-cost, system complexity and associated high failure rates make it hard for high-end robots to penetrate into our daily activities.

Technology:

This art encompasses a low-cost motorless multi-purpose robust wearable unit with wireless activated agile lock-unlock joint mechanisms. There are many human run basic operations that require high level of precision, low cost and minimal risk all at the same time. Surgery, welding, sculpting and many more hand operations may all benefit from a low cost semi-automatic wearable support arm that can improve stability, stamina and precision of the operation with a solenoid-based motorless lock mechanism. The shoulder-locked arm system is composed mostly of mechanical parts with the exception of Bluetooth activation module that triggers the locking relays when the user wishes to fix the arm in the desired position. The wearable mechanical arm has two joints, shoulder and elbow and the wrist of a wearer is free to perform the target operation. It should not have any impact on the freedom of movement until lock command is received. Once locked, the system should assure minimal movement or vibration. The mechanical support arm being fixated at the shoulder relieves the load on the operator and improves overall stability and stamina during the action.

Advantages:

- Low cost
- Minimal Risk
- Bluetooth activation



Related Publications:

Nomanfar, P., Tekin, A., Bogosyan, S., & Sendur, P. (2019, March). Design and Kinematics of 4-DoF Multi-Purpose Wearable Mechanical Arm (MUWA) Support for Enhanced Operation Stability. In 2019 IEEE International Conference on Mechatronics (ICM) (Vol. 1, pp. 167-174). IEEE.

Potential Application Area(s)

•Hybrid Artificial Organs

Patent Status

WO2020055342 (A1)

Inventor(s)

Asst. Prof. Özkan Bebek
Asst. Prof. Barkan Uğurlu
Mehmet Can Yıldırım

Technology Readiness Level

TRL 4

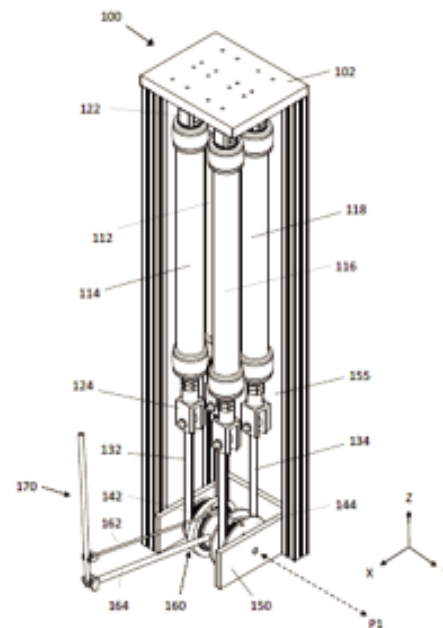
PNEUMATIC ARTIFICIAL MUSCLE

Problem:

The present invention provides systems and methods for the controlled actuation of robotic manipulators with cost effectiveness and efficiency.

Technology:

The present invention relates to robotic manipulators actuated by pneumatic artificial muscle (PAM) devices and methods of actuation, and in particular to pitch, roll, and yaw actuation of robotic manipulators.



Advantages:

- Actuators are at a remote location
- Compliant
- Under actuated design for 3DOF and 4DOF actuated arms
- Pneumatically actuated

Related Publications:

- Barkan Ugurlu, Paolo Forni, Corinne Doppmann, Emre Sariyildiz, and Jun Morimoto, Stable Control of Force, Position, and Stiffness for Robot Joints Powered via Pneumatic Muscles, IEEE Transactions on Industrial Informatics, Accepted. (SCI)

Potential Application Area(s)

• Hybrid Artificial Organs

Patent Status

WO2015060793 (A1)

TR2013/12431

DE21 2013 000 095.2

Inventor(s)

Assoc. Prof. Erkan Kaplanoglu

Technology Readiness Level

TRL 5-6

BIONIC AND HYBRID PROSTHETIC HAND EMBODIMENT

Problem:

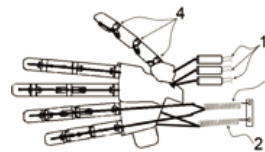
Currently, as a result of the researches conducted on the prosthesis users, it is found out that the factors relating to the performance of a prosthetic hand are the functionality, interaction with the surrounding, low weight, high speed of grabbing and power, being noise-free or minimum level of noise and visuality. The ideal prosthetic hands need to meet these criteria. In order to provide the "grabbing" function in the active prosthetic hand embodiments available in the state of the art, various kinds of direct current motor are used on the part that moves the fingers. The functionality and the grabbing power in the systems that are moved by means of direct current motor are high. However, the system works in a noisy way, and it poses a disadvantage compared to a normal human being hand in terms of natural view of a hand and its weight.

Technology:

The object of the present invention is to provide a high grabbing speed and power by using DC motor in the first three fingers as they are more actively used than the other two fingers (ring and little fingers). A further object of the present invention is to provide light and noise-free working by using Shape Memory Alloys(SMA) actuator in the ring and little fingers which move less compared to the first three fingers. The present invention relates to a bionic hybrid prosthetic hand embodiment comprising phalanges springs providing the fingers to return back following the grabbing; so as to provide a hybrid embodiment by using the shape memory alloy (SMA) and DC motors at the same time.

Advantages:

- To fulfill the daily-life activities and be used in a lighter and more effective manner
- Low weight
- Natural view
- Noise-free working
- Low energy-consumption which are necessary for a prosthetic hand performance by making use of SMA



Related Publications:

- E. Kaplanoglu, "Design of Shape Memory Alloy-Based and Tendon-Driven Actuated Fingers Towards a Hybrid Anthropomorphic Prosthetic Hand", Journal Article, "International Journal of Advanced Robotic Systems", ISSN 1729-8806, InTech, September 9, 2012.
- Y. Cotur, C. Gumus, E. Capa, T. Hasekioglu, E. Kaplanoglu, M. Ozkan, "EMG Classification of Index Finger Adaptive to Prosthetic Hand", IEEE Engineering In Medicine And Biology Society (IEEE Embs), 2014.

Potential Application Area(s)

- Ultrasound Imaging
- Medical Imaging

Patent Status

TR2014/03256
WO2015142306 (A1)

Inventor(s)

Asst. Prof. Göksenin Yaralıoğlu

Technology Readiness Level

TRL 5

METHOD AND SYSTEM FOR A PORTABLE ULTRASONIC IMAGING SYSTEM

Problem:

Ultrasonography is an ultrasound based medical imaging technique widely used in medicine. Ultrasound machines cost \$100K-\$250K because of sophisticated multichannel electronics. Additionally, those are sizable and therefore disable to be carried easily by medical practitioners. There is an absolute need for low cost and portable ultrasound imaging systems.

Technology:

The proposed technique uses motion sensors that are embedded with the probe to track the position of the ultrasound signals. This eliminates the use of a transducer array and beam forming electronics and enables very low cost imaging systems. Potentially, this device can make ultrasound imaging routine part of the clinical exam. It could also be used in emergency rooms and ambulances due to its small feature especially to detect internal bleeding.



Advantages:

- Low cost
- Small form factor (handy use)
- Wireless interface

Related Publications:

N/A

Potential Application Area(s)

•Ultrasound Imaging

Patent Status

WO2016080931 (A1)

EP3221064 (B1)

DE602015017178

NL 500234548

Inventor(s)

Asst. Prof. Dr. Göksenin Yaralıoğlu

Technology Readiness Level

TRL 3

VERTICAL GAP ACTUATOR FOR ULTRASONIC TRANSDUCERS AND FABRICATION OF THE SAME

Problem:

In order to address the limitations of piezoelectric transducers, capacitive micro machined ultrasonic transducers (CMUTs) have been introduced. Since the first introduction of CMUTs, extensive research has been performed on fabrication, modeling and applications. Main challenges of CMUTs can be traced to lack of high sound pressure generation, low receive sensitivity and highly nonlinear behavior of the parallel plate actuation. There was a need for a new actuation method for the CMUT transducers that will separate the dependence of the output pressure and receive sensitivity on the gap.

Technology:

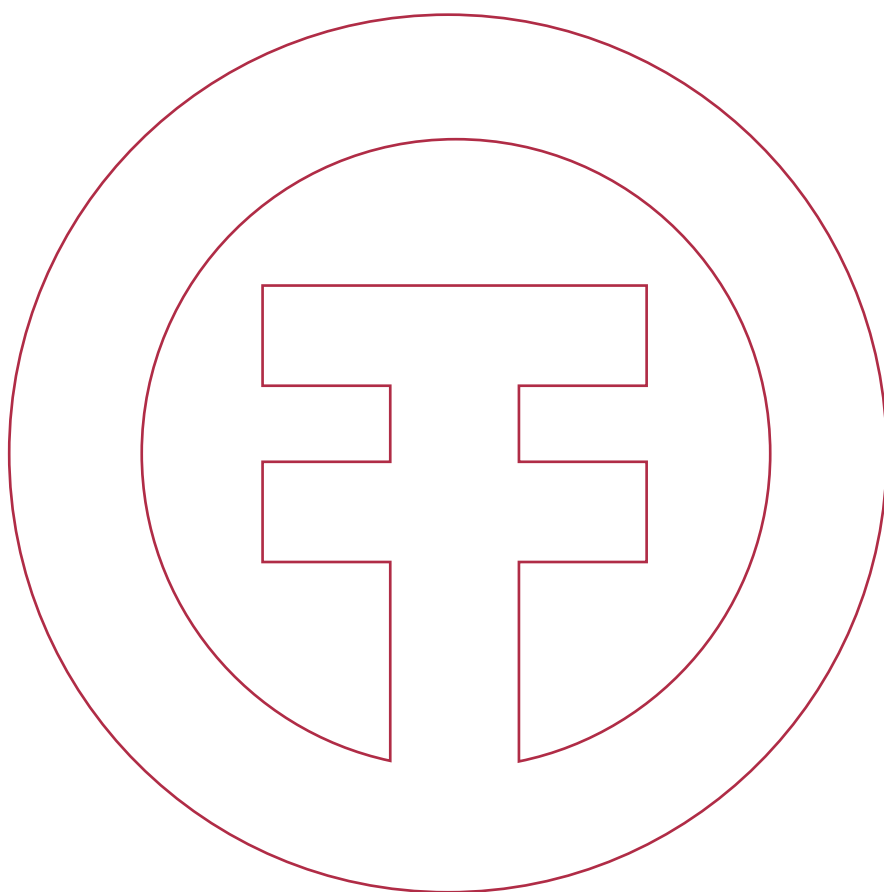
The main objective of this invention is to develop novel cell geometry for CMUT transducers where the sensitivity and the maximum output pressure do not have conflicting requirements over the gap. This is achieved by defining the gap between a piston type section of the membrane and the sidewalls. In this geometry, the motion of the membrane does not affect the height of the gap where the actuation forces are built. Also there are large cavities under the membrane in the horizontal direction such that these cavities do not interfere with the membrane motion even for large membrane displacement amplitudes. This enables membrane to move without any hard limits.

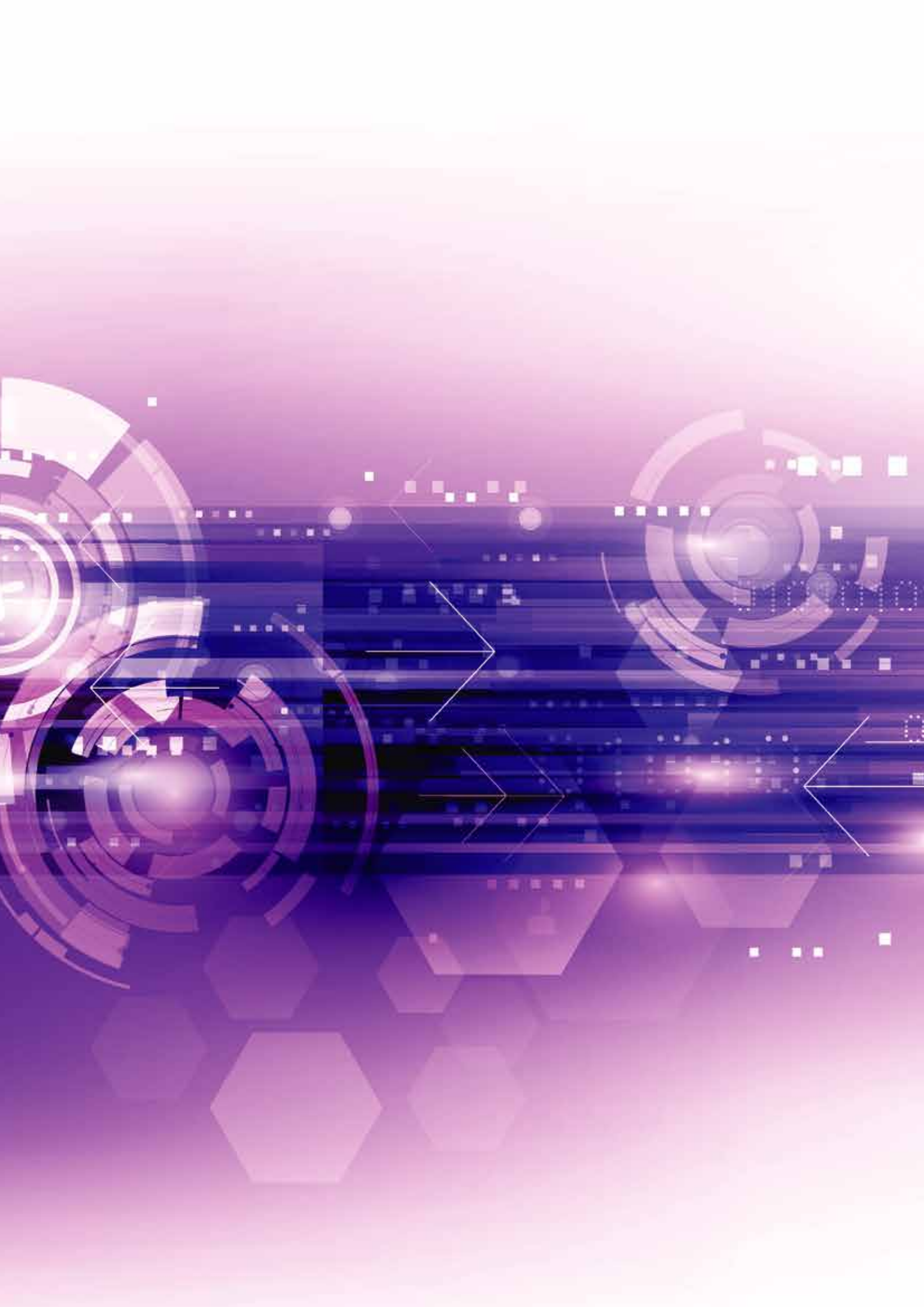
Advantages:

- To solve the low output pressure problem of CMUTs
- Increase in the receive sensitivity
- Cost reduction

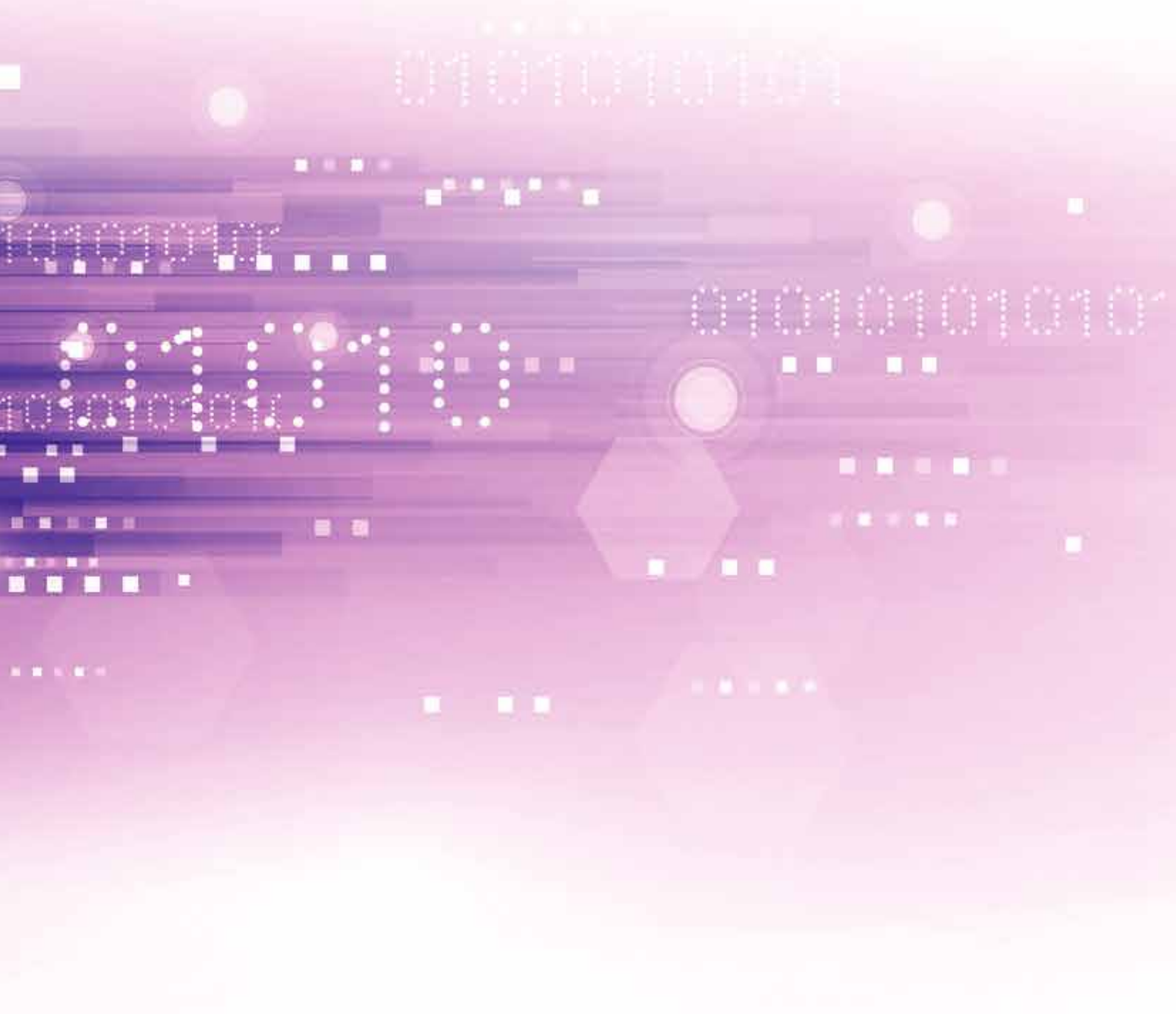
Related Publications:

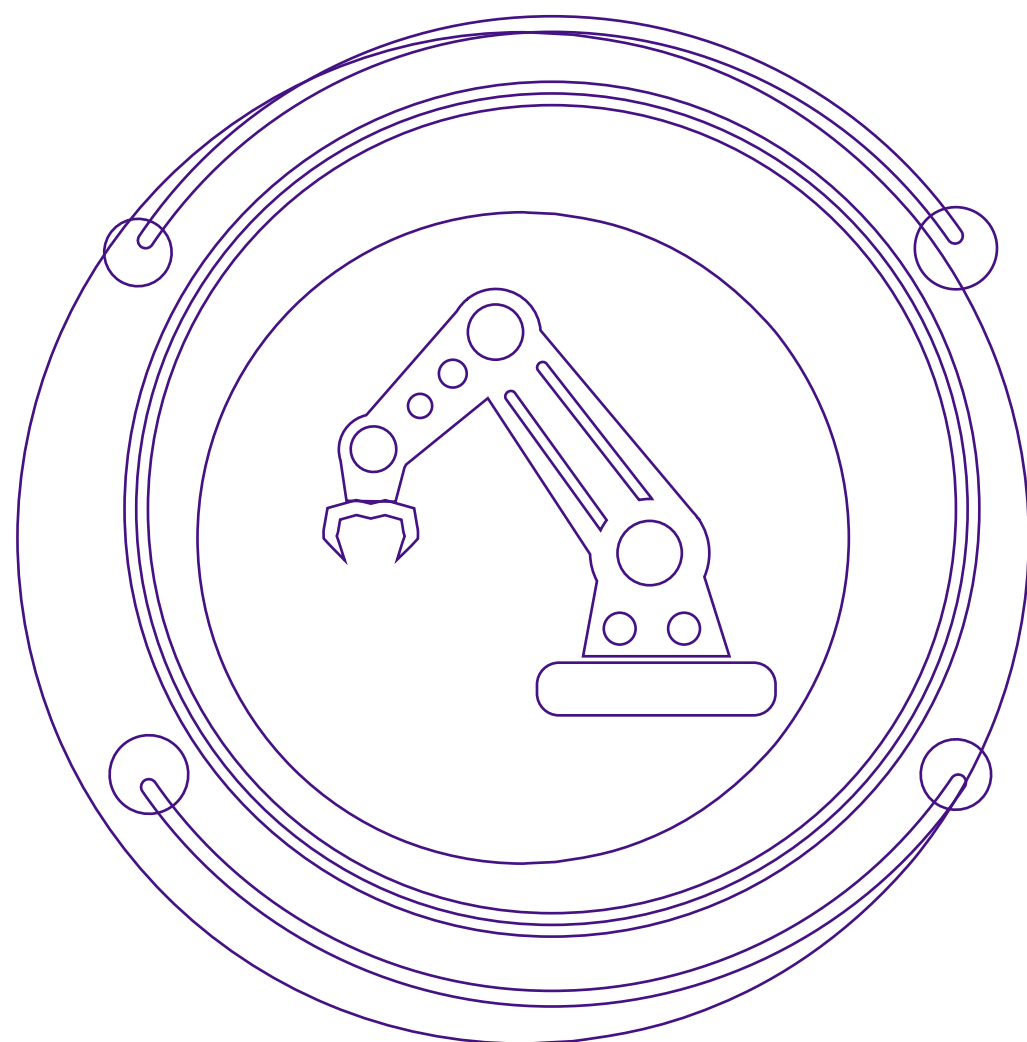
N/A





CONSTRUCTION MATERIALS





Potential Application Area(s)

- Cement Based Binders
- Grout Injections for Crack Repair

Patent Status

WO2017119859 (A1)
CN108290789 (A)
TR2016/00205

Inventor(s)

Asst. Prof. Zeynep Başaran Bundur
Ali Amiri

Technology Readiness Level

TRL 5

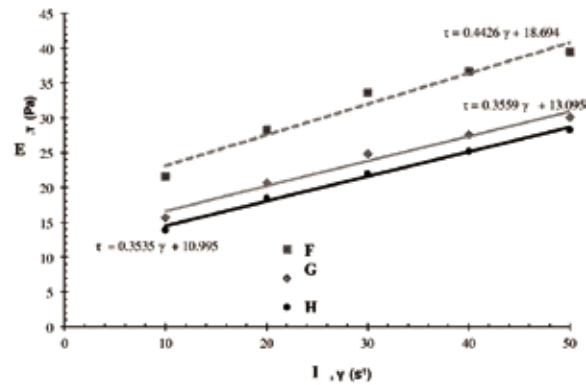
CEMENT-BASED COMPOSITIONS WITH IMPROVED RHEOLOGICAL PROPERTIES AND METHODS FOR PRODUCTION THEREOF

Problem:

Existing biomaterials in the field of construction are achieved Complex designs in structures mostly require highly flowable mixes which requires stabilizers (a.k.a viscosity modifying agents, VMA) to improve coherence and segregation resistance. However, compatibility of these stabilizers with other chemical additives and their production processes are being questioned.

Technology:

Bacterial cells were directly added to the mix water to improve the rheological performance a higher degree of thixotropy, greater low shear rate viscosity and resistance to segregation compared to control grouts.



Advantages:

- Incorporation of cells increased the viscosity leading to higher resistance to segregation and bleeding of cement-based materials.
- Compatible with superplasticizers and other rheology modifying agents.
- Applicable for various mixing procedures particularly for 3D-printing.

Related Publications:

- Mahzad Azima, Zeynep Başaran Bundur "Use of Sporasarcina pasteurii cells as rheology modifying admixtures in cement-based materials" Construction and Building Materials.v.225 (2019), pp. 1086-1097.
- Mahzad Azima, Zeynep Başaran Bundur "A bio-based rheology modifying agent inspired from nature" Submitted to Anadolu University Journal of Science and Technology A- Applied Sciences and Engineering (In press)

Potential Application Area(s)

- Cement based binders
- Bricks

Patent Status

US 16/006,837

2018/09558

Inventor(s)

Asst. Prof. Sevil Yazıcı

Technology Readiness Level

TRL 3

DESIGN AND MANUFACTURING METHOD FOR A BUILDING SYSTEM IN REGARDS STRUCTURAL AND ENVIRONMENTAL FACTORS

Problem:

The exploration of human colonization options located in extra-terrestrial environments is imperative. Exploration beyond Earth provides alternatives to diminishing resources and ever-increasing disasters occurring on our planet. For decades, modularity has been considered a fundamental design approach for successful space exploration, as it is efficient, economical, transportable and demountable. In today's field of architecture, which is embracing CD processes, the opportunity to re-interpret the concept of modularity exists. Digital fabrication techniques are becoming more sophisticated and are enabling the seamless production of highly differentiated parts. Although much research remains to be undertaken, these systems offer tremendous potential as we seek to construct in extra-terrestrial environments. Therefore, in response to the In-Situ Materials Challenge on Mars described by the NASA, T-Brick Shell scheme is developed.

Technology:

This invention relates to a method for design and the manufacture of a building system, more particularly, to a modular system for system of interlockable bricks and similar structures from said bricks.

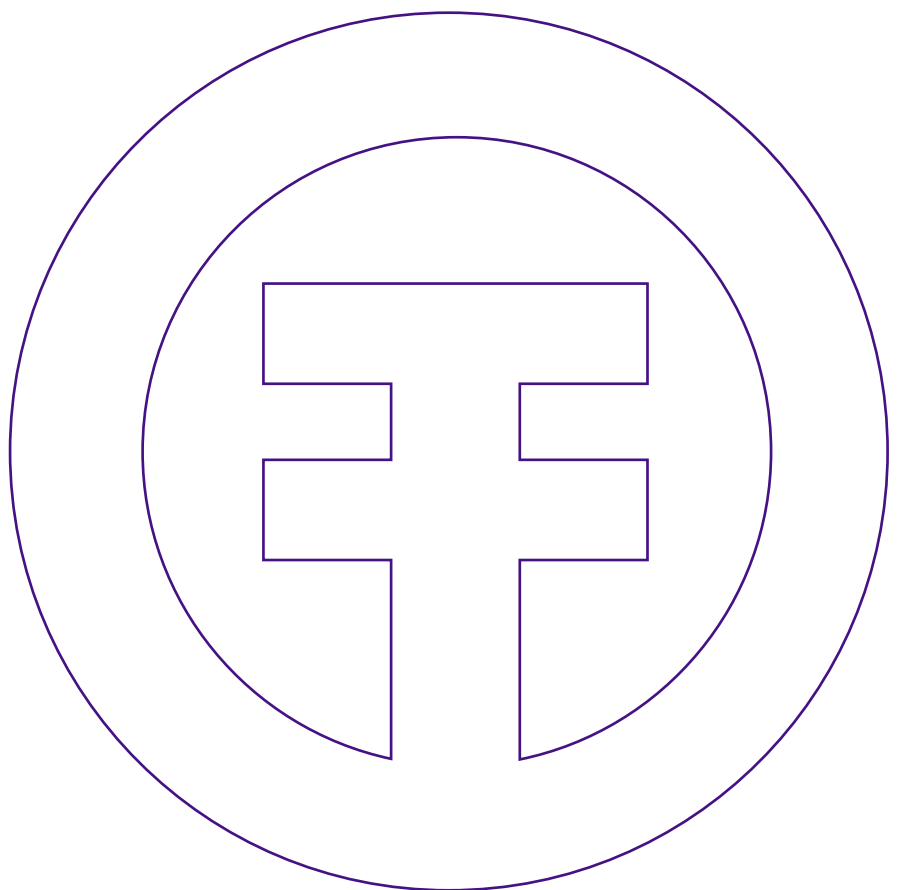


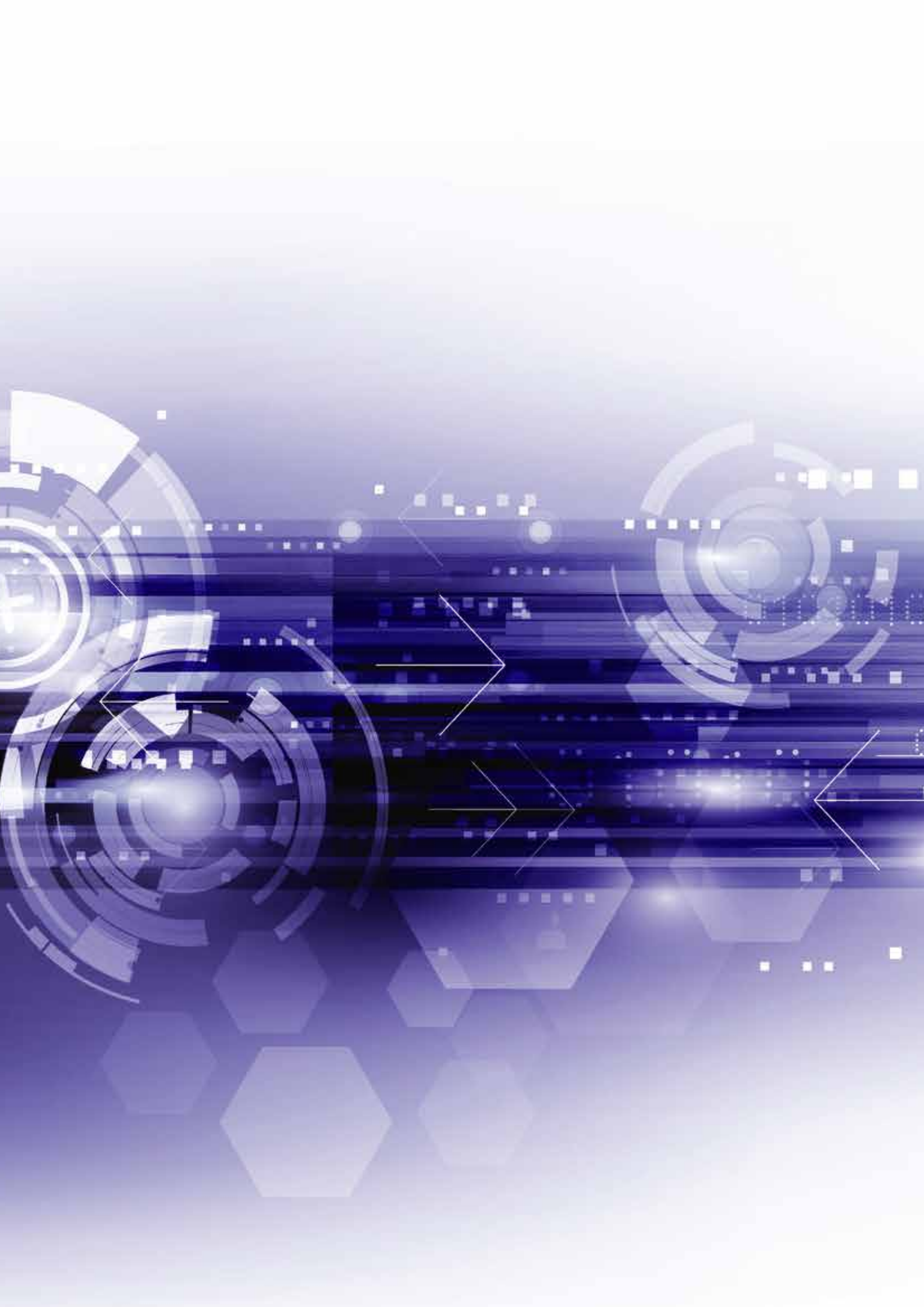
Advantages:

- With the proposed methodology, it is possible to translate current research on Earth to generate liveable systems at extra-terrestrial environments.
- T-Brick Shell reflects flexibility in design with a new understanding of modularity.
- T-Brick Shell responds to the environmental conditions, harness alien resources and meet performance criteria of an environment beyond Earth, such as Mars.
- The proposed system is able to generate highly flexible outputs that can be adapted into various design scenarios with the ability to accommodate various spatial and programmatic requirements.
- The methodology developed has the potential to be used on both Earth and extra-terrestrial environments.

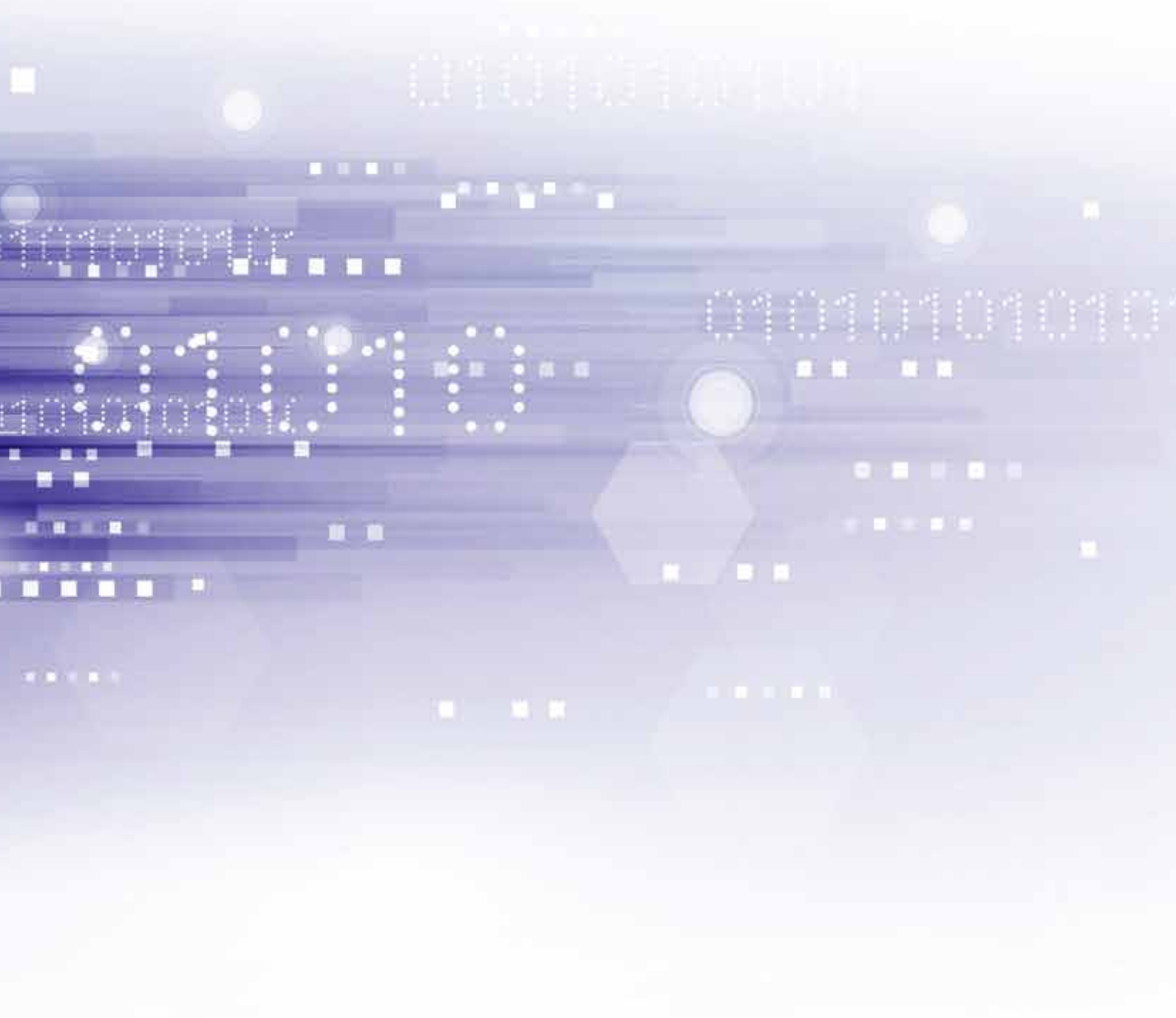
Related Publications:

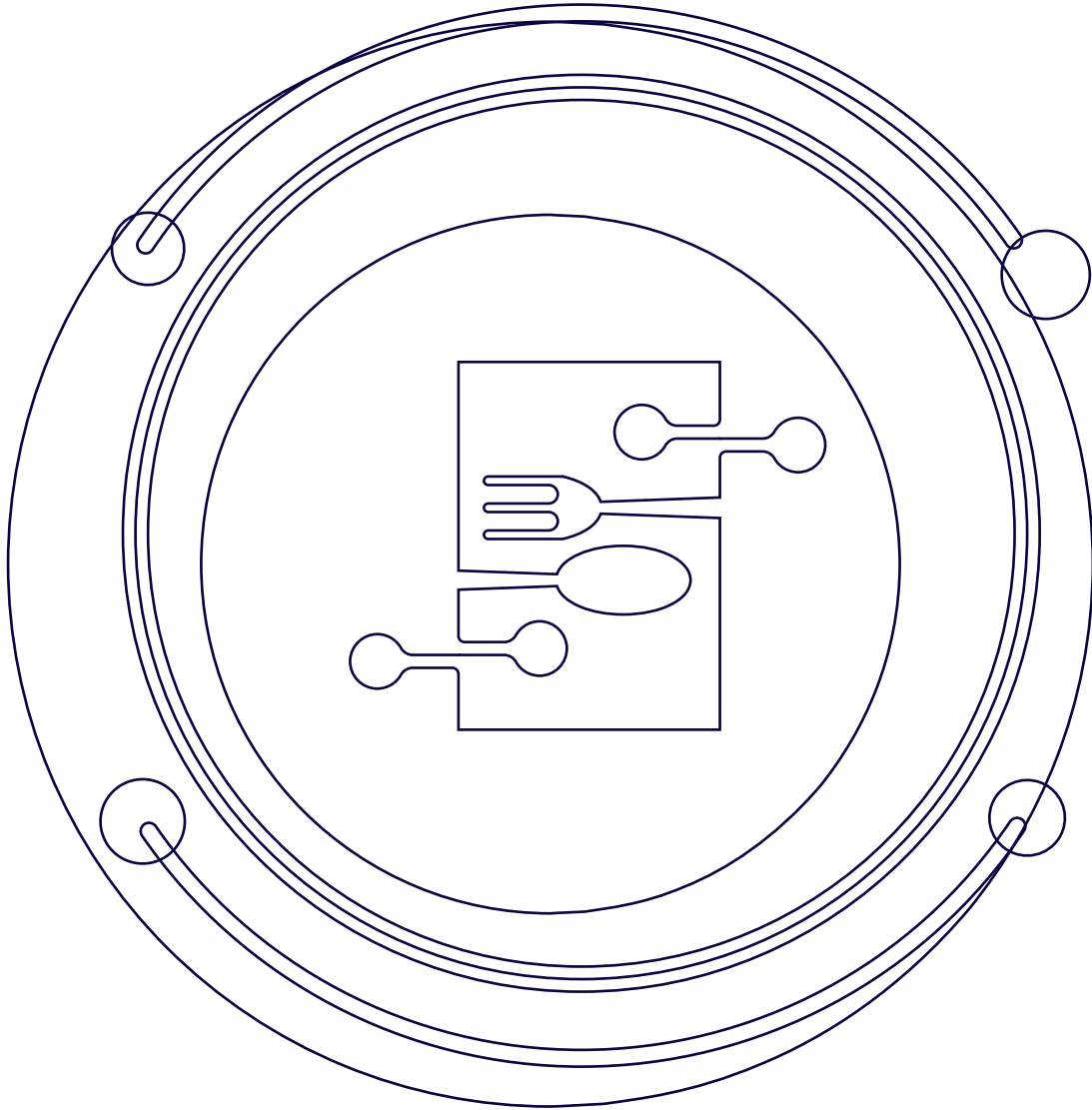
Yazici, S. 2017, Building in Extraterrestrial Environments: T-Brick Shell, Journal of Architectural Engineering, American Society of Civil Engineers, 24(1): 04017037





FOOD TECHNOLOGIES





Potential Application Area(s)

- **Functional Food**

Patent Status

TR 2018/07564

Inventor(s)

Assoc. Prof. Asli Zuluğ

Technology Readiness Level

TRL 8

TROTTER SOUP CHIPS: PACHA

Problem:

- There are no natural options in Collagen market
- The amount of money a person spends for collagen in a month is high
- The time it takes to reach it is long
- People don't know when and how much to take collagen

Technology:

The present invention relates to a process for producing high protein and collagen chips as a functional food. The process obtains compress nutritional value with small amount of end product with long shelf life and tastier and easy to achieve form of protein and natural collagen at the same time.



Advantages:

Pacha for;

- Individuals with bone or muscle problems
- Individuals actively engaged in sports
- Individuals in need of collagen regularly

Because PACHA is;

- More than half of its protein
- We use trotter as the source of high quality animal based complete protein for PACHA
- We introduce a local alternative for the collagen market which is totally dominated by imports

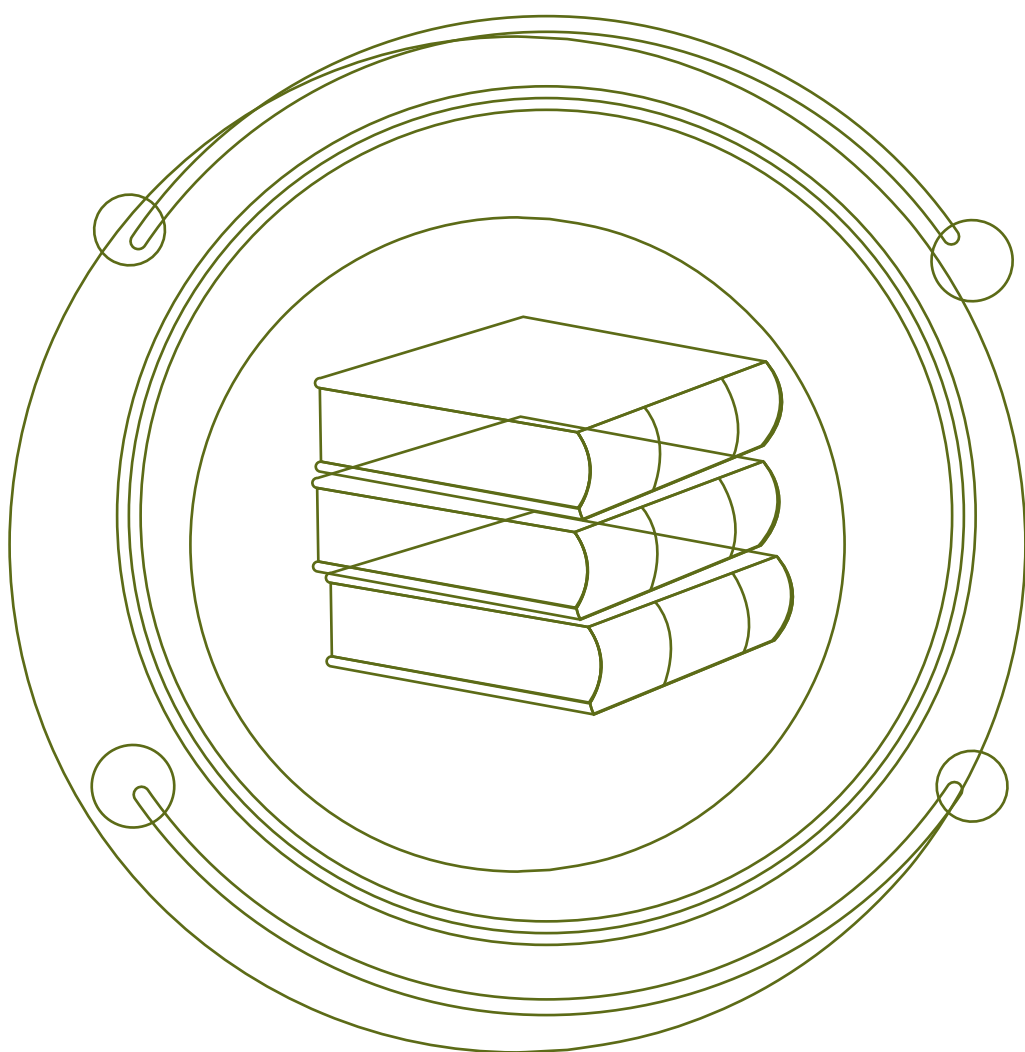
Related Publications:

<https://pachacips.com/>



EDUCATIONAL TECHNOLOGIES





Potential Application Area(s)

- Education
- Experiment System for High Schools
- Colleges and Universities

Patent Status

TR 2015 10700

Inventor(s)

Asst. Prof. Hüseyin Dağ

Technology Readiness Level

TRL 9

PARALLEL PLATE CAPACITOR WITH ADJUSTABLE CAPACITANCE

Problem:

In university education, main aim is to teach the technical details and the theory of a topic with examples, or tutorials to be shown. In the case of Capacitance topic of Physics courses, the experimental setups are expensive, might be dangerous for class usage and unnecessarily complex for the level of the students.

Technology:

"The Adjustable Capacitance Parallel Plate Capacitor" Experiment Setup is based on a well-known pedagogical example. Instead of using complex measuring devices, the system provides a variable capacitance which can be measured by simple multi-meters that are already available at laboratories. The systems geometry enables students to measure capacitance of a parallel plate capacitor with variable surface areas and plate to plate distances. Using these properties, students can measure the electric permittivity of air or any dielectric material.

Advantages:

- Easy to produce
- Contains no danger for class usage
- Provides capacitance up to 400 microfarads which is measurable with simple multimeters
- Enables measuring electric permittivity of air and other dielectrics
- Easy to establish

Related Publications:

N/A

Potential Application Area(s)

- Sports
- Martial Arts

Patent Status

TR 2018/02100

Inventor(s)

Fuat Ozan Dengiz

Technology Readiness Level

TRL 3

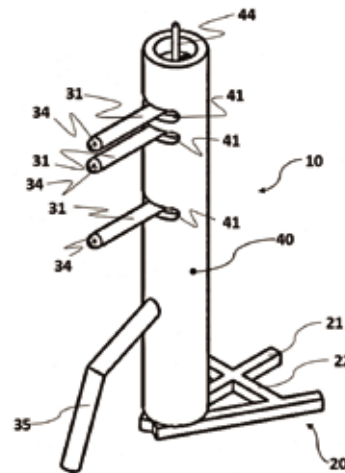
MARTIAL ARTS TRAINING GADGET

Problem:

Martial art students usually work on their own since it's almost impossible to find someone in your level and style that has the same practice schedule with you. There is a concept practice tool for Wing Chun trainees called Wooden Dummy which has the right dimensions and angles of an average enemy but the lack of movement and guidance makes it feel like a simple wooden punching bag.

Technology:

Wooden dummies don't move, the arm pieces of the gadget developed by this invention moves according to the combinations as determined. By manual choice, the arms can be controlled separately or together in any combination. Automatic choice has four moving and two standing still combinations. There is also a speed switch and reset button. The LED light on the edge of the arms shows where you should touch when you react to the movement in training. This guidance system makes the training easier for elementary trainees.

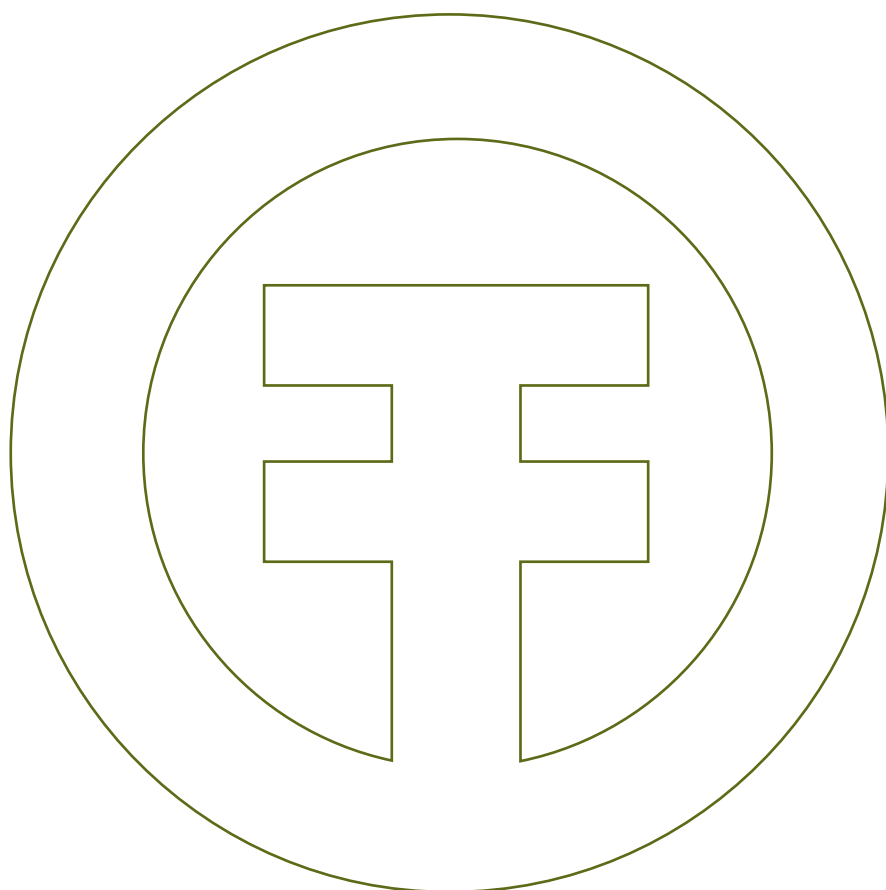


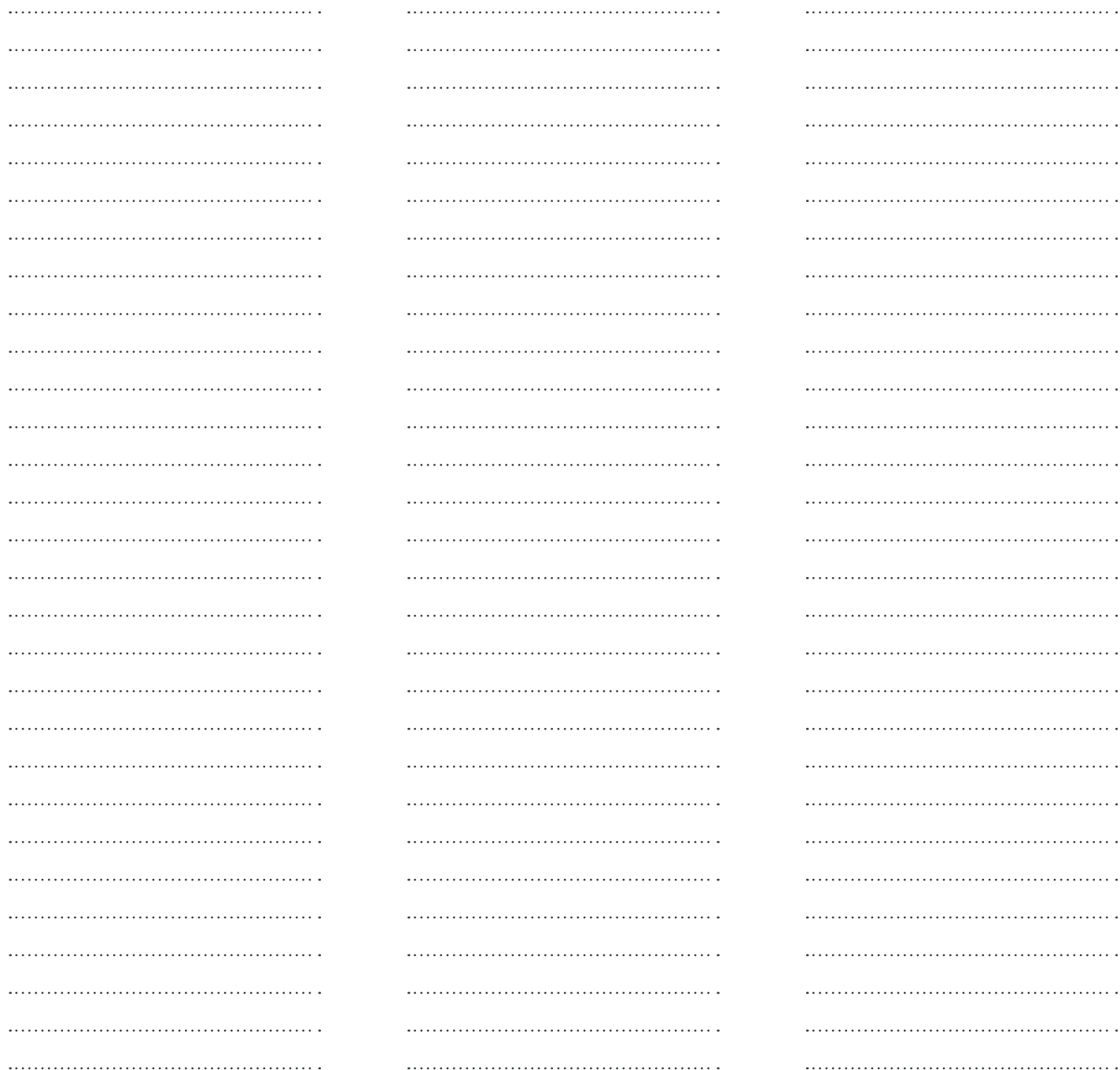
Advantages:

- Operable arms
- Being able to do different arm combinations.
- Speed switch and reset button.
- Easy to train for elementary trainees

Related Publications:

N/A





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