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SOUNDPET NEWSLETTER

ISSUE 1

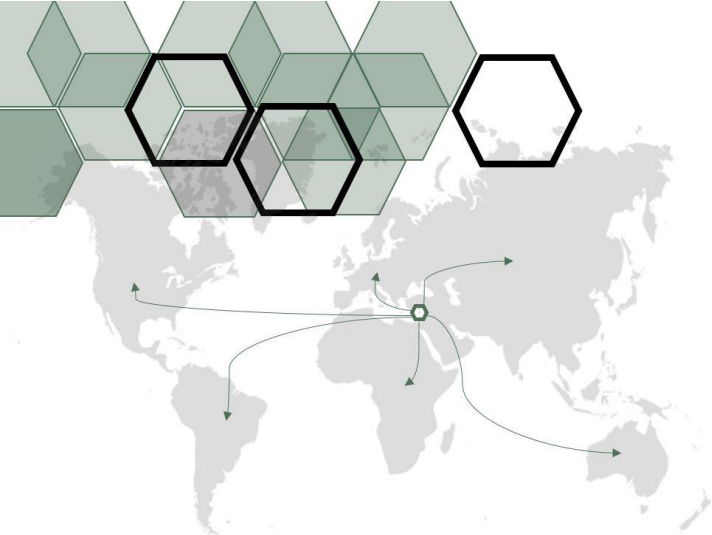
Providing with news on MRI guided Focused Ultrasound technology in the field of oncology, in the framework of the SOUNDPET project!

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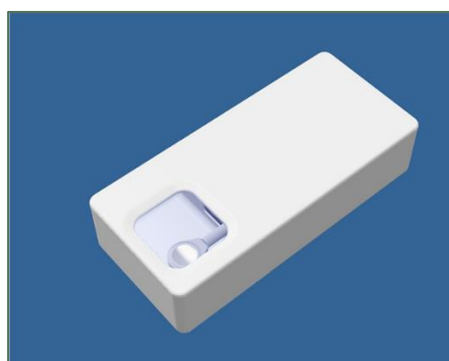
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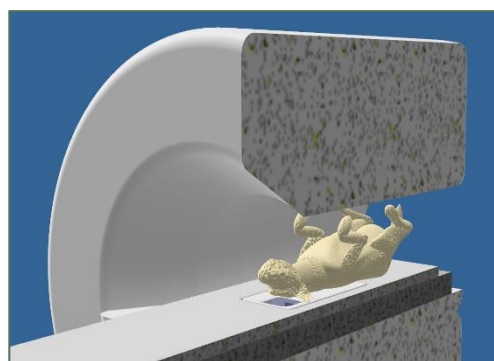


SUMMARY: THE SOUNDPET PROJECT

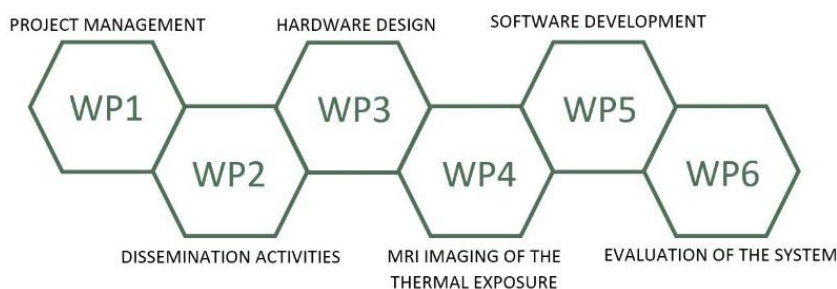
SOUNDPET (MRI-guided Focused Ultra**SOUND** system for cancer in **PETs** - dogs and cats) is a three-year project, co-funded by the European Union (through the Research & Innovation Foundation), started in July 2020 and its main goal is to develop an MRI-guided focused ultrasound (MRgFUS) robotic system for preclinical use of small and large animals. The final product will be applied in pets (dogs and cats) with naturally occurring mammary cancer. The goal is to produce a preclinical robotic system (final product) with 4 degrees of freedom (DOF) that can sonicate phantoms, excised tissue and animals using MRgFUS. The tissue heating can be accurately monitored using MR thermometry. The ultrasonic system will include a single element transducer (ranging from 20-60 mm in diameter) and will operate with a frequency ranging from 0.5 to 4 MHz. A software will be developed that will control this medical device. The system will be evaluated in phantoms, excised tissue and animals. The same mechanisms that result in cancer in humans are operative in pets and are operative in other animals as well. Man’s best friend is probably man’s best new biomedical friend. This system can be modified in the future for use in humans by scaling up the design of the robotic system. Based on the priorities of the smart specialization of Cyprus this proposal appeals to the area of Health (table II.1.6, priority B2- ‘Diagnosis, prevention, risk factors, therapy’). The proposed technology intends to serve the community of non-invasive surgery using therapeutic ultrasound and MRI guidance for veterinary applications. The long-term goal is to commercialize this technology (by the end of the project it will be in the state of final product). Since the device is applied in animals, there is no need to receive regulatory approvals (for example CE marking).



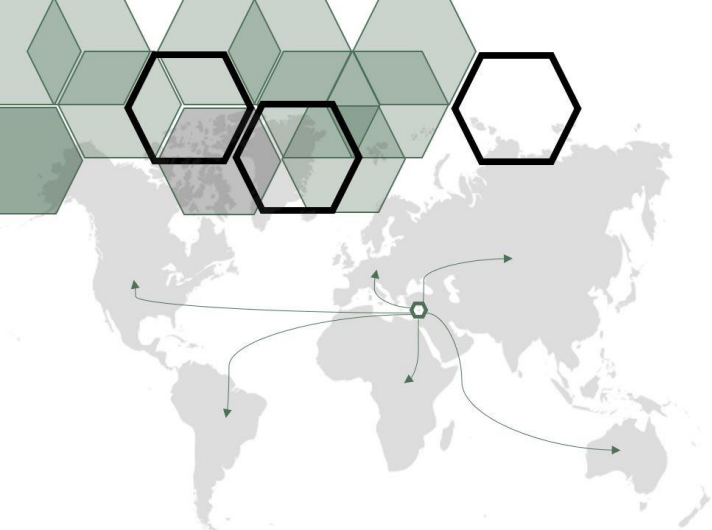
4 DOF robotic system for preclinical research.



The concept of the developed system as placed on the MRI table.



Work Packages (WP) of the SOUNDPET project.



PARTNERS

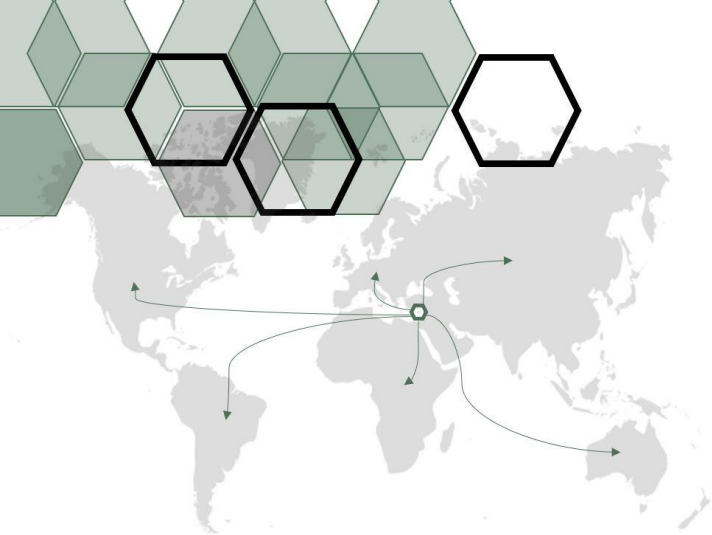


MEDSONIC: MEDSONIC LTD which is an SME was founded in 2005. The company was originally funded by the ministry of Commerce, industry and tourism, under the program of high technology incubators. MEDSONIC LTD was initially hosted by the HERMIS incubator of Cyprus. The company now operates in Limassol, Cyprus. MEDSONIC's goal is to become a major manufacturer and marketer of Focused Ultrasound (FUS) systems guided by MRI. The company has the necessary infrastructure, expertise and personnel for performing research in the area of therapeutic ultrasound. So far, the company has produced a prototype FUS system for animal use that can be guided using MRI. In order to achieve this, the company has produced an MR compatible positioning device that scans an MRI compatible FUS transducer. The system is controlled by user-friendly software. The company performed extensive animal experiments, and now the goal is to convert this prototype technology into a commercial product to be applied in humans. The company will apply for clinical trials through the Cyprus Medical Device Agency.

Cyprus University of Technology (CUT): CUT is a public university which was founded in 2003. The first students were accepted in 2007. The Cyprus University of Technology is based at the city of Limassol, where all six faculties are located. CUT was recently ranked in the top 400-500 universities (Times Higher Education World University Rankings 2016). Among the universities ranked, it was the youngest university (12 years of operation). CUT's main faculty is the school of Engineering and technology which receives 70 % of the research funding. In this project CUT participates through the therapeutic ultrasound lab headed by Christakis Damianou which belongs to the Electrical engineering department. The therapeutic ultrasound lab has complete infrastructure of therapeutic ultrasound equipment. The therapeutic ultrasound lab occupies a 130 m² area. The laboratory is the only approved center for performing experiments in rabbits in Cyprus. CUT will undertake many research tasks for the proposed grant.

German Oncology Center: GOC is a newly-established Oncology Centre, founded by a world-renowned group of oncologists with significant prior experience at oncology centres and clinics in Germany and with core expertise in radiation oncology and innovative radiotherapy. The group has a strong record in both basic and clinical research, focusing on the translation of research results into innovative diagnostic and therapeutic services relating to all aspects of medical oncology. The Center has assembled a strong multidisciplinary care team that is well suited to adopt new methodologies and tools in precision oncology that will be the output of the proposed project. From reliable early detection investigations, to high-quality innovative radiotherapy, chemotherapy and hormone therapy, the GOC's aim is to fill an important gap in cancer-patient care in Cyprus. Moreover, the GOC has established important collaborations with both local hospitals and other hospitals in Europe, and it aspires to become an important referral center for cancer patients from all neighboring countries. Additionally, the Centre is committed to being regularly involved in research projects, conferences and other research activities that will ensure that its staff of medical professional remains constantly updated and involved with internationally innovative research. The Centre's staff roster boasts several experienced and acclaimed oncologists, each specializing in different types of cancer.





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German Oncology Center: Medical services are organized into five departments: 1) the Department of Radiation Oncology 2) the Department of Nuclear Medicine, 3) the Department of Diagnostic and Interventional Radiology, 4) the Department of Medical Oncology and 5) the Department of Medical Physics and Engineering. The GOC is equipped with state-of-the-art diagnostic and therapeutic means such as MRI, CT, PET, Cyclotron, as well as with its own clinical laboratory and pharmacy. It is situated in brand new facilities overlooking the city of Limassol, and it set to become an important contributor to the delivery of world class medical care in Cyprus.

Department of Electrical and Mechanical Services (DEMS): The DEMS has been established in 1975 under the Ministry of Transport, Communications and Works. The DEMS has five main operational activities: 1) Design, execution and maintenance of governmental electromechanical installations, 2) planning and management of complex technological projects (including biomedical projects), 3) purchase and maintenance of biomedical equipment, electronic equipment, electrical equipment, mechanical equipment and vehicles, planning, promotion and implementation of energy efficiency measures and energy management of the governmental buildings, and 5) Competent Authority for implementing the EU legislation for the electromagnetic compatibility of equipment (EMC directive), the low voltage directive (LVD) and the safety of many types mechanical equipment and for implementing non-harmonizing legislation. The DEMS actively participates in research programs. In 2015 the DEMS has completed the project ENERGEIN in co-operation with the Department of Public Works and the Energy Service in the context of the Cross-border Cooperation Programme “Greece-Cyprus 2007-2013”. Currently the DEMS participates in the project iHeERO with the Cyprus University of Technology in the context of the CEF Transport Competitive Program, the Internal market budget JA2015-EMCLVD for LED Floodlights and the Joint Market Surveillance Action 2015 (JA2015) for Consumer Products of the Consumer Programme for 2014-2020.

TEAM MEMBERS

Christakis Damianou (CUT-Project Coordinator) received a B.Sc., M.Sc., and Ph.D. from the University of Arizona in Electrical engineering in 1988, 1990 and 1993 respectively. His research interests include MRI guided therapeutic ultrasound and MRI compatible robotics. Between 1988 and 1993, during his master and doctoral studies he worked as a research assistant in the department of radiation oncology at the University of Arizona. Between 1993 and 1994 he worked as postdoctoral fellow in the department of radiology at Harvard University in Massachusetts. Between 1994 and 1995 he worked as a research scientist in the department of biophysics at Indiana University. He is currently professor at Cyprus University of Technology (CUT) at the Electrical engineering, computer engineering and Informatics department. So far Dr. Damianou was involved in 34 research programs, having the coordination of 11 of them. The acronyms of the main programs that he participated are: ULTRASOUND I, ULTRASOUND II, SONOTHERM, ODISEAME, NETTLE, TROY, N2L, SONOMRI, BRAINSONIC, SONOSTROKE, PROFUS and ULTRASTROKE. He received so far 2 infrastructure grants from the research promotion foundation. Based on his research activities 130 publications were published and 3 book chapters. He is the inventor of the patent: ‘MRI positioning system for ultrasound brain surgery’ (WO/2007/082495). Another patent was issued by European patent office (‘Multi-purpose robotic system for MRI guided focused ultrasound treatment’). In 2015 Dr. Damianou created at CUT a master program in Biomedical engineer. Currently 6 Ph.D. students are working under the supervision of Dr. Damianou. So far 4 Ph.D. students have graduated under his supervision.

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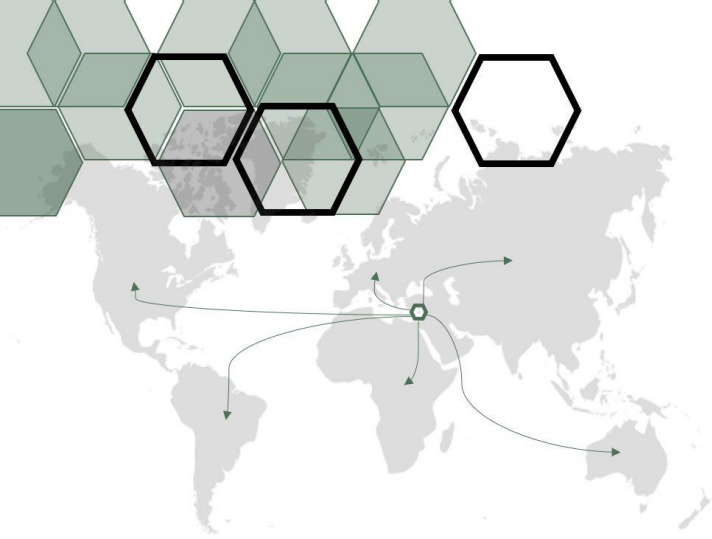
Ευρωπαϊκή Ένωση
Ευρωπαϊκό Ταμείο
Περιφερειακής Ανάπτυξης



Κυπριακή Δημοκρατία



Διαρθρωτικά Ταμεία
της Ευρωπαϊκής Ένωσης στην Κύπρο

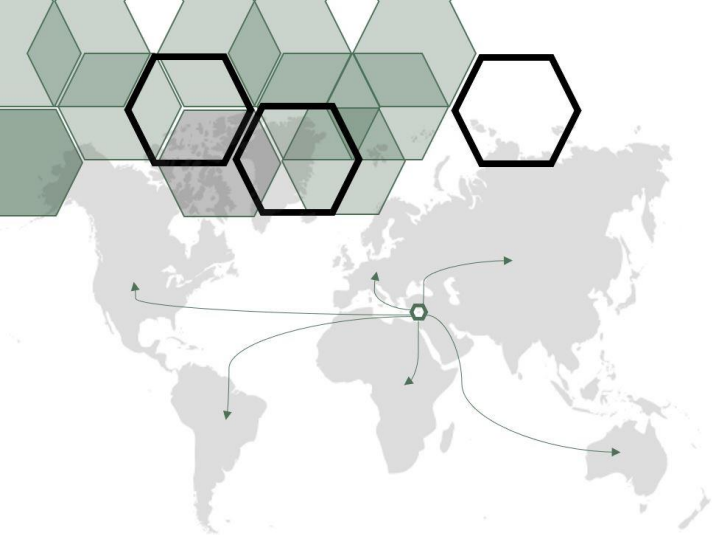


TEAM MEMBERS

Georgios Constantinides (CUT) has more than a decade of experience in the field of nanoscale materials characterization and composite/contact mechanics modelling. During his PhD and Post-Doctorate positions at the Massachusetts Institute of Technology (MIT) he has been trained on various nanomechanical tools and exposed to a variety of materials systems ranging from metals and ceramics to polymers, biomaterials and composites. He is currently an Assistant Professor in the Department of Mechanical Engineering and Materials Science and Engineering at CUT and a founding member of the Research Unit for Nanostructured Materials Systems (<http://www.cut.ac.cy/runms/>). In 2009 he established the Nano/Micro Mechanics of Materials Lab (<http://cutnanolab.weebly.com/>) which develops experimental and computational techniques for small scale mechanical testing and modelling. Apart from contributing his experience on material characterization he will also help on materials engineering and optimization. He is the author/co-author of 2 book chapters and >30 Journal publications (>1600 citations, h-index: 14, Scopus). He serves regularly as a reviewer on more than 25 Journals and has participated in various US, EU and national (CY) projects with total funding in excess of €5M.

Marinos Yiannakou (MEDSONIC) graduated from University of Cyprus in 2012 with the degree of Electrical Engineering. He received his Ph.D. at Cyprus University of Technology in 2017. His Ph.D. dissertation was related to an MRI guided FUS robotic system for brain surgery. He did his Ph.D. work under the supervision of C.Damianou. He worked as a teaching assistant under the guidance of Dr. C. Damianou, teaching medical imaging courses. He has published so far 12 peer-reviewed scientific papers, 16 conference papers, and one patent ('Multi-purpose robotic system for MRI guided focused ultrasound treatment'). His main interest is design of MRI compatible robots and transducer design. He has participated so far as a researcher in 3 research grants related to therapeutic ultrasound. He currently the CEO of MEDSONIC and main designer of MRgFUS robotic systems. His main research interest is focused ultrasound, MRI imaging, robotic design and design of ultrasonic phantoms.

Nikolaos Zamboglou (GOC) was born and raised in Limassol, Cyprus, and in 1967 he moved to Germany for his studies. He was awarded a degree in Physics from RWTH Aachen in 1974, and in 1977 he obtained his PhD in Physics at the University of Düsseldorf. He completed his degree in Medicine in 1984, and his PhD in Medicine in 1989, both at the University of Essen. From 1986 to 1992, Prof. Zamboglou held the post of Consultant of Radiation Oncology at the University of Düsseldorf. He subsequently assumed his appointment as Director and Professor of the Department of Radiation Oncology at Klinikum Offenbach, at the Academic Hospital of Wolfgang Goethe University, Frankfurt, where he remained until 2016. Prof. Zamboglou also is appointed as Adjunct Research Professor at the Technical University of Athens since 1993. He is elected as corresponding member of the Academy of Athens in 2010. Most notably, he was President of the German Society of Radiation Oncology between 2005 and 2007, and in 2012 was declared an Honorary Member of the Austrian Radiation Oncology Society. Finally, in 2015 he was honoured with the Alfred-Breit Award of the German Society of Radiation Oncology (the highest society award). Since 2016, Prof. Zamboglou has been acting as Medical Director of the German Oncology Centre.



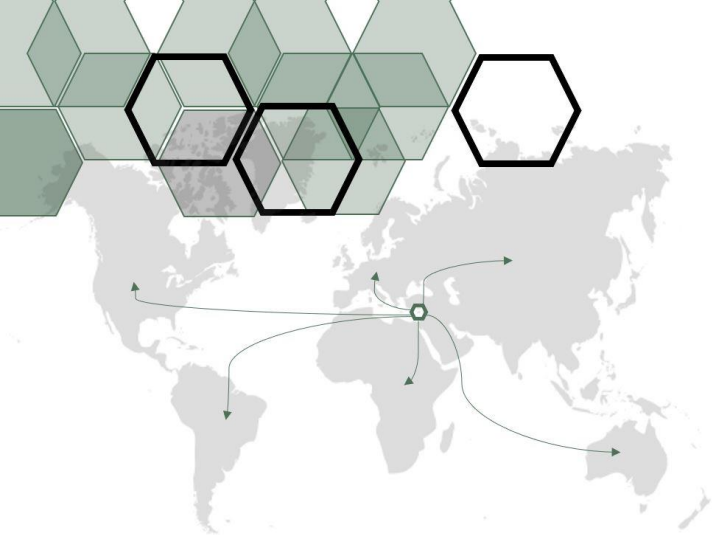
TEAM MEMBERS

Nikolaos Zamboglou (GOC) awards: 1991 Hans Langendorff Price of the Medical Society for Radiation Protection, Germany, 1998 Price of the German Society for Senology, 2001 Richard-Mertens Price for Innovative Research, 2002 Price of the German Society for Surgery, 2003 Price of the German Society for Medical Technology, 2009 Corresponding Member of the Academy of Athens, 2009 Honorary Member of the Medical Society of Limassol, Cyprus, 2010 “Strebel Medal for Brachytherapy” of the German, Austrian and Swiss Societies for Radiation Oncology, 2011 Honorary Member of the Austrian Society of Radiation Oncology, 2014 Alfred Breit Price of the German Society for Radiation Oncology, 2017 Honorary Doctorate awarded by Cyprus University of Technology.

Kleanthis Ioannides (GOC) has a medical degree from University of Vienna since 1996. He obtained specialization in radiology from university of Athens in 2002. He received specialization in Magnetic Resonance Imaging between 2002 and 2004 from the University of Athens. He is the director of interventional radiology department at GOC. He published several papers in the area of MRI. His main research interest is MRI imaging of the thermal effects of ultrasound.

Leonidas Georgiou (GOC) graduated from the University of Manchester (2010-2014), with a PhD in Pharmacokinetic Imaging, in a collaboration with AstraZeneca, to explore the potential of magnetic resonance imaging techniques in drug-drug interactions. In 2010, Dr Leonidas Georgiou graduated from the University of Manchester with MSc Physics and Computing in Medicine and Biology and a BSc (Hons) in Physics. His work experience includes work placement in AstraZeneca for in vitro test systems and quantification techniques (LC-MS/MS, fluorescence analysis) (2010-2014), software developer within the quantitative biomedical imaging laboratory team of the University of Manchester (2014-2015) and a research fellow in the Division of Biomedical Imaging in the University of Leeds (2015-2017), with a focus on MRI techniques for monitoring treatment effects. His research area is focused on exploiting non-invasive MRI techniques for quantitative insights into pathophysiology using novel approaches in the field, such as quantitative dynamic contrast-enhanced MRI and diffusion weighted imaging with authored articles in the field. Since then he has been employed by the German Oncology centre as a medical physicist with a wide area of responsibilities both in the Radiotherapy and Radiology department.





TEAM MEMBERS

Konstantinos Ferentinos (GOC) was born in Ioannina Greece, where he studied Medicine. He was awarded the degree in Medicine in 2007. He was resident in the Department of Radiation Oncology at the Klinikum Offenbach in Germany under the supervision of the renowned oncologist Prof. Zamboglou. His main areas of interest were the Interventional Radiotherapy and the novel radiation techniques. He was responsible for the Stereotactic Radiotherapy in his department. In 2012 he obtained the PhD in Medicine at the Goethe University Frankfurt. From 2013 to 2015 he worked as consultant at the Klinikum Offenbach and since 2016 as a senior consultant in the Department of Interventional Radiotherapy at the Iatriko Kentro Hospital in Athens. He is the head of the Department of Radiation Oncology at the German Oncology Center in Limassol.

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