MED MEDIZINISCHE FAKULTÄT

Forschungsbericht 2023

Innovation Laboratory for Image Guided Therapy

INNOVATION LABORATORY FOR IMAGE GUIDED THERAPY

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1. LEITUNG

Dr. Axel Boese
Dr. Alfredo Illanes
Prof. Dr. Michael Friebe

2. FORSCHUNGSPROFIL

Upcoming challenges in healthcare delivery and regional/global unmet clinical needs require new concepts for related purpose-driven research and development to ensure a quick translation back to clinical use.
With the HealthTEC Innovation lab (INNOLAB:IGT) we have established an interdisciplinary development environment with close ties to several clinical users, international partners (Australia, India, Portugal, Italy, Spain, UK, Switzerland, Turkey, USA, Chile), and translation networks.
Our primary focus is on workflow-, and device- innovation for image-guided and minimally invasive therapies, as well as on novel health monitoring approaches.
We are able to IDENTIFY Unmet Clinical Needs, define problem statements and provide IDEAS/INVENTIONS, can validate the prototypes, and have shown to be able to work with partners on IMPLEMENTATION and TRANSLATION. With that approach, we have generated over 40 patents, identified more than 100 needs and created just as many prototypes in the last 5 years.
For that, we provide a fully equipped clinical development environment (diagnostic and minimally invasive therapy systems, robots, 3D printers, electronics / mechanical lab, comprehensive machine learning expertise) and empathetic and knowledgeable development staff.
Engineering students (biomedical, electrical, computer science, and mechanical) and clinical students learn to work in a focused and interdisciplinary innovation environment from identification all the way to a potential technology transfer with the clinical user and at the same time stimulate start-up activities in this area.
We also know the regulatory environment and the economic realities of bringing innovation to the clinical markets.

3. SERVICEANGEBOT

The INKA Innovation Lab supports innovators in the realization of their ideas.
We provide application-driven research close to medical needs. Our strengths are ideation, innovation, prototyping and testing of new solutions and products with medical professionals involved. With our interdisciplinary and international team, we operate a fully equipped clinical development environment including diagnostic and minimally invasive therapy systems, robots, 3D printers, phantoms / electronics / mechanical lab, engineering, machine learning and data processing expertise and empathetic and knowledgeable development staff. We can show expertise in regulatory affairs and the economic realities supporting you to bring innovation to the clinical markets. We look forward to working with you! Please check: www.inka-md.de or contact inka@ovgu.de

4. METHODIK

We work based on an adapted Stanford Biodesign approach to **Identify** clinical needs, **Ideate** solutions and **Implement** these solutions for transfer to the market.

5. FORSCHUNGSPROJEKTE

Projektleitung: Dr.-Ing. Axel Boese
Projektbearbeitung: Prof. Dr. Dr. h.c. Roland S. Croner, Dr. Cora Wex
Förderer: Land (Sachsen-Anhalt) - 01.07.2021 - 30.06.2024

InnoMedTec - "Nachhaltige Etablierung einer Arbeitsgruppe "Innovationen in der Medizintechnik" an der Medizinischen Fakultät Magdeburg zur Digitalisierung der Medizintechnik"

Ziel von InnoMedTec ist es, klinisch relevante regionale und global verwertbare Ergebnisse zu generieren, die durch strategische Erarbeitung von Vorarbeiten sowohl den Wissenschaftsstandort, sowie durch eine entsprechende digitale Produkt-/Marktorientierung und Transfer auch den Wirtschaftsstandort stärken. Weiterhin dienen die zu erwarteten Ergebnisse zur Etablierung und Optimierung der flächendeckenden medizinischen Versorgung in Sachsen-Anhalt durch den Einsatz digitaler Diagnose- und Präventionsmethoden.

Projektleitung: MSc. Holger Fritzsche, Prof. Dr. Michael Friebe
Kooperationen: Siemens Healthineers, Innovation Think Tank, Prof. Haider
Förderer: Industrie - 18.12.2020 - 31.12.2024

INNOVATION THINK TANK - Siemens Healthineers

We have been certified as a SIEMENS HEALTHINEERS INNOVATION THINK TANK offering healthcare innovation programs and being part of the global network of think tanks. Together with partners from HEALTHINEERS we are addressing workflow and dedicated innovation needs and supervise graduate and doctoral students.

6. VERÖFFENTLICHUNGEN

BEGUTACHTETE ZEITSCHRIFTENAUFSÄTZE

Böckmann, Julian; Klebingat, Stefan; Schwab, Roland; Behme, Daniel; Boese, Axel
Evaluation of flushing parameters for clear view vascular endoscopy
Current directions in biomedical engineering - Berlin : De Gruyter, Bd. 9 (2023), Heft 1, S. 511-514

Esmaeili, Nazila; Davaris, Nikolaos; Boese, Axel; Illanes, Alfredo; Navab, Nassir; Friebe, Michael; Arens, Christoph
Contact Endoscopy - Narrow Band Imaging (CE-NBI) data set for laryngeal lesion assessment
Scientific data - London : Nature Publ. Group, Bd. 10 (2023), Artikel 733, insges. 10 S.
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Esmaeili, Nazila; Fischerauer, Sophie; Sühn, Thomas; Boese, Axel; Bußhoff, Jana; Datta, Rabi; Illanes, Alfredo
Laparoscopic surgery augmentation through vibro-acoustic sensing of instrument-tissue interactions
Current directions in biomedical engineering - Berlin : De Gruyter, Bd. 9 (2023), Heft 1, S. 630-633

Friebe, Michael; Illanes, Alfredo
Advancements in medical imaging and image-guided procedures - a potential—or rather likely—paradigm shift in diagnosis and therapy : understand disruption and take advantage of it!
Applied Sciences - Basel : MDPI, Bd. 13 (2023), Heft 16, Artikel 9218, insges. 6 S.
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Schaufler, Anna; Sanin, Ahmed Y.; Sandalcioglu, I. Erol; Hartmann, Karl; Croner, Roland; Perrakis, Aristotelis; Wartmann, Thomas; Boese, Axel; Kahlert, Ulf D.; Fischer, Igor
Concept of a fully-implantable system to monitor tumor recurrence
Scientific reports - [London]: Macmillan Publishers Limited, part of Springer Nature, Bd. 13 (2023), Artikel 16362, insges. 16 S.
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Serwatka, Witold; Heryan, Katarzyna; Sorysz, Joanna; Illanes, Alfredo; Boese, Axel; Krombach, Gabrielle A.; Friebe, Michael
Audio-based tissue classification - preliminary investigation for a needle procedure
Current directions in biomedical engineering - Berlin : De Gruyter, Bd. 9 (2023), Heft 1, S. 347-350

Spiller, Moritz; Esmaeili, Nazila; Sühn, Thomas; Boese, Axel; Friebe, Michael; Turial, Salmai; Illanes, Alfredo
Towards AI-driven minimally invasive needle interventions
Current directions in biomedical engineering - Berlin : De Gruyter, Bd. 9 (2023), Heft 1, S. 559-562

Sühn, Thomas; Esmaeili, Nazila; Mattepu, Sandeep Y.; Spiller, Moritz; Boese, Axel; Urrutia, Robin; Poblete, Victor; Hansen, Christian; Lohmann, Christoph H.; Illanes, Alfredo; Friebe, Michael
Vibro-acoustic sensing of instrument interactions as a potential source of texture-related information in robotic palpation
Sensors - Basel : MDPI, Bd. 23 (2023), Heft 6, Artikel 3141, insges. 21 S.
[Imp.fact.: 3.9]

Sühn, Thomas; Esmaeili, Nazila; Spiller, Moritz; Costa, Maximilian; Boese, Axel; Bertrand, Jessica; Pandey, Ajay; Lohmann, Christoph H.; Friebe, Michael; Illanes, Alfredo
Vibro-acoustic sensing of tissue-instrument-interactions allows a differentiation of biological tissue in computerised palpation
Computers in biology and medicine - Amsterdam [u.a.]: Elsevier Science, Bd. 164 (2023), Artikel 107272, insges. 13 S.
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Urrutia, Robin; Espejo, Diego; Evens, Natalia; Guerra, Montserrat; Sühn, Thomas; Boese, Axel; Hansen, Christian; Fuentealba, Patricio; Illanes, Alfredo; Poblete, Victor
Clustering methods for vibro-acoustic sensing features as a potential approach to tissue characterisation in robot-assisted interventions
Sensors - Basel : MDPI, Bd. 23 (2023), Heft 23, Artikel 9297, insges. 16 S.
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Yamashita, Keisuke; Wex, Cora Barbara Anette; Croner, Roland; Boese, Axel
Conveyor-based robot allows fast and safe instrument handling in the operating room
Current directions in biomedical engineering - Berlin : De Gruyter, Bd. 9 (2023), Heft 1, S. 234-237

BEGUTACHTETE BUCHBEITRÄGE

Singh, Yashbir; Farrelly, Colleen; Hathaway, Quincy A.; Carrubba, Aakriti R.; Deepa, Deepa; Friebe, Michael; Chaudhary, Ashok; Atalls, Shadi; Mansoor, Wathiq; Himeur, Yassine
The critical role of homotopy continuation in robotic-assisted surgery - future perspective
2023 Tenth International Conference on Social Networks Analysis, Management and Security (SNAMS) , 2023 - [Piscataway, NJ]: IEEE ; Salameh, Haythem Bany, S. 356-360

ABSTRACTS

Davaris, Nikolaos; Esmaeili, Nazila; Illanes, Alfredo; Boese, Axel; Friebe, Michael; Arens, Christoph
Gesetzter Vortrag aus der Univ. HNO-Klinik Gießen - Trainieren eines neuartigen Algorithmus der Künstlichen Intelligenz mithilfe der ersten Online-Datenbank laryngealer Stimmlippengefäße unter Kontaktendoskopie und Narrow Band Imaging
Laryngo-Rhino-Otologie - Stuttgart [u.a.]: Thieme, Bd. 102 (2023), Heft S 02, S. S4
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Davaris, Nikolaos; Esmaeili, Nazila; Illanes, Alfredo; Boese, Axel; Friebe, Michael; Arens, Christoph
Training of a novel artificial intelligence algorithm on the first online database of laryngeal vessels of the vocal folds using contact endoscopy and narrow band imaging
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The evaluation of vibroacoustic signals acquired with Surgical Audio Guidance technology for Veress needle placement in animal cadaver model
Innovative surgical sciences - Berlin : de Gruyter, Bd. 8 (2023), Heft Special Suppl 1, S. S265-S266, Artikel ID: 696
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Tissue-instrument-interaction based palpation as a complementary tool for cartilage assement
Innovative surgical sciences - Berlin : de Gruyter, Bd. 8 (2023), Heft Special Suppl 1, S. S228-S230, Artikel ID: 378
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Investigation of artifacts and mechanical properties of non-metallic MRI biopsy needles in interventional procedures - phantom and simulation studies
Magdeburg: Universitätsbibliothek, Dissertation Otto-von-Guericke-Universität Magdeburg, Fakultät für Elektrotechnik und Informationstechnik 2023, 1 Online-Ressource (iii, 142 Seiten, 14,1 MB) ;
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