NorMIT
Norwegian Centre for Minimally Invasive Image Guided Therapy and Medical Technologies

"By three methods we may learn wisdom: First, by reflection, which is noblest; Second, by imitation, which is easiest; and third by experience, which is the bitterest." Confucius

NEWSLETTER

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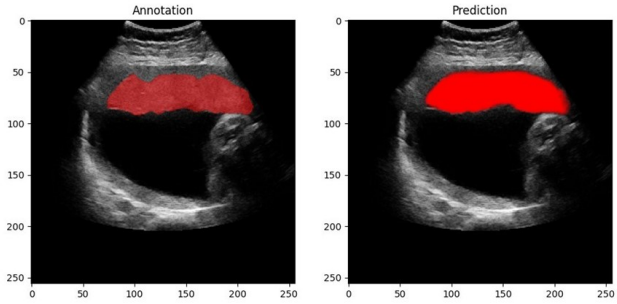
Depiction of placentas at Ahus in the RAMPUS project

In 2019, SINTEF Health initiated a collaboration with the women's clinic at Akershus University Hospital (Ahus). They have for many years studied the growth of the placenta, and they have, among other things, shown a connection between the volume of the placenta and the risk of complications. This can potentially be used to identify high-risk pregnancies that require additional follow-up.

To be able to measure this volume during pregnancy, you depend on good, three-dimensional (3D) images. Ultrasound probes for 3D imaging are beginning to become commonplace, but these cover a limited area, and it is often not possible to fit the entire placenta in one image. In the project Real-Time Accurate Measurement of Placental Volume by Ultrasound (RAMPUS), which is funded by the Research Council and SINTEF TTO, SINTEF and Ahus are collaborating to develop a method for measuring the volume of the placenta automatically by assembling two-dimensional (2D) images from a standard ultrasound probe. We will do this by equipping a probe with a position sensor, and then imaging a large number of placentas while measuring the position of each individual ultrasound image. Using modern machine learning methods, we can then teach a computer program how the 2D images can be put together into a 3D image based solely on what you see in the images. These 3D images can then be used to calculate the volume of the placenta. The method we develop will in the long run be able to be used on any ultrasound machine, and it will thus be able to help detect many high-risk pregnancies that we do not detect today.

In November last year, SINTEF's Torgrim Lie visited Ahus twice to collect ultrasound images from pregnant volunteers. It was a bit challenging to find an ultrasound scanner that was suitable and that we could also take with us away from Trondheim for several days in a row. At the last minute we got a solution with FORs scanner BK5000. This was initially not equipped with an abdominal probe, but the National Competence Service for Ultrasound and Image-Guided Treatment provided money, and the supplier then obtained a new probe with only two days delivery time. With some intensive work in the lab, we also equipped the probe with a position sensor, and then it was ready to leave. The freight was provided by Torgrim himself, and thus he also avoided the risk of infection on public transport.
The result of the two trips was almost 120,000 ultrasound images with position data collected from 43 pregnant women. In addition, MRI scans were taken of 15 women to have a gold standard to compare the volume measurements with. In retrospect, the doctors at Ahus have done a great job of annotating the placenta in almost 2600 ultrasound images and all 15 MRI volumes. The first attempts at machine learning on the collected data look promising, but we are now working to raise funds for further development of these.

Doctor Karianne Sagberg at Ahus takes ultrasound images from pregnant volunteers with FOR's ultrasound scanner BK5000



Ultrasound image with manual (left) and automatic (right) segmentation of the placenta.

SMIT 2021

Due to the ongoing Covid-19 pandemic in Norway and the rest of the world, the Organizing Committee has decided to move the 33rd Annual SMIT 2021 Conference to January 17 – 19, 2022.

The 33rd SMIT Conference will have a special focus on topics like Hybrid Operating rooms, Artificial Intelligence, Innovation in Healthcare, Minimally Invasive Therapy and Intervention, Value-based Healthcare, Robotic Surgery and Automation, Surgical Navigation and Visualization and Health Technology for Third world countries
The Conference will be executed as a physical conference coupled with an online conference that allows for both in-person and remote delegates to attend. This dual-solution makes SMIT2021 more resilient to potential changes in official health advice and government-imposed restrictions, as well as being a more inclusive conference for attendees that cannot attend in person due to other reasons.
For more information, visit https://smit2021.com

The Innovation Center Computer Assisted Surgery (ICCAS) – an interdisciplinary research institute at the Medical Faculty of Leipzig University (Germany), is looking forward to participating at the upcoming 33rd Annual SMIT Conference in Oslo. ICCAS started 15 years ago and quickly became a national innovation driver in the development of computer-assisted, integrative technologies and intelligent assistance systems: from diagnosis to therapy. The institute's research results have been accomplished due to the very close cooperation between computer scientists, engineers and active clinicians.

ICCAS has had a longstanding tradition in participating at the annual international SMIT conferences. The cooperation has been intensified since Prof. mult. Dr. Andreas Melzer – Chairman of the board and General Secretary of the Society for Medical Innovation and Technology (SMIT), joined ICCAS. Since then, the institute has doubled staff and funding income and presented a mobile version of its „Intelligent Operating Room“ to the German Chancellor, Angela Merkel and her Cabinet. Topics such as Image Guided Surgery, Interventions and Imaging Robotics, Artificial Intelligence (AI) in the operating room of the future, Hyperspectral and Multispectral imaging have been presented at an international level. The key added values of ICCAS' research are safer therapies, new non-invasive treatment methods and more efficient workflows through biomedical data management.

The ICCAS team is looking forward to expanding and intensifying our network of co-operations with Norway. We are eagerly anticipating meeting you in person in Oslo in January 2022 for the SMIT conference! Learn more about our organization and ongoing projects and subscribe to our quarterly newsletter!

HiPerNav (High Performance soft-tissue Navigation)Update

Laparoscopic liver resection performed with parenchyma sparing technique is one of the most challenging surgeries that is performed laparoscopically. Resection of each separate tumour with a safety margin around it place a higher demand when it comes to precision, avoiding bigger vessels surrounding them. Especially in cases where the tumour is placed in a challenging area close to several important vessels, a precise navigation system would be valuable.

HiPerNav (High Performance soft-tissue Navigation) is a project that received funding from the European Union´s Horizon 2020 Research and Innovation programme under Marie Sklodowska-Curie grant agreement No. 722068.

The overall scientific and clinical goal of HiPerNav was to develop a **navigation platform for management of liver cancer and metastases treatment** to improve the eligibility and prognosis for liver surgical procedures and ablation treatment. This platform should enable an integral management of surgical workflow in: (1) preoperative surgical planning; (2) intra-operative resection navigation and ablation monitoring; (3) postoperative quality control.

The **sub-goals** of HiPerNav were all challenges in current systems for soft-tissue navigation which the HiPerNav project aimed to solve. In particular, current navigation systems lack the functionality of continuously updating the anatomical map and effectively co-locate this map with the surgical reality. In soft-tissue navigation where the surgical field and actual organ is moving and deforming, this is absolutely necessary in order to secure an accuracy needed to trust the system.

The HiPerNav project funded 16 young researchers to perform 16 separate PhD-projects specifically picked to reduce these challenges and was supervised by key personnel from the partners in the European consortium.

The PhD students together with work package leaders and supervisors in the HiPerNav project were successfully able to develop new algorithms and gain new knowledge especially in the areas of:

- automatic segmentation using deep learning techniques combined with high-performance computing for faster liver model update from intra-operative image sources
- co-registration techniques, both between different image modalities and between the virtual liver model and the patient itself combining the use of both ultrasound, stereoscopic video and biomechanical models
- workflows for liver navigation with different scenarios when it comes to the use of intra-operative image sources
- workflow analysis for planning and simulating the effects of new workflows in laparoscopic liver resection

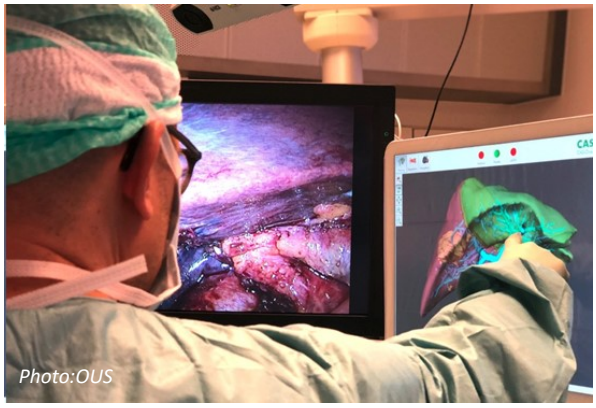

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Photo:OUS

The pictures aims to show positions of tumor for localized tumor resection and blood vessel visualization. This aims to shorten the learning curve for inexperienced clinicians as well as reduce risk of accidental resection or insufficient resection margins.

Through more than 35 publications we believe that the HiPerNav project significantly has contributed to the international research front and resulted in new knowledge that can contribute to make soft-tissue navigation safer by being more accurate and user friendly.

The HiPerNav project were coordinated by Oslo University Hospital in tight collaboration with SINTEF and NTNU.

HiPerNav
High performance soft tissue navigation

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New clinic will help Oslo University Hospital set a new course for innovation and technology

By moving some of our leading environments for change and implementation in a newly established clinic, Oslo University Hospital hopes to gather strength, but perhaps also show some muscle?

Bjørn Atle Bjørnbeth, CEO of Oslo University Hospital, decided on January 26th this year to bring together technology and innovation environments in OUS in one clinic. The clinic will work for technological framework conditions that are necessary to develop and establish the patient treatment of the future.

«As Norway's largest hospital, it is expected that Oslo University Hospital is a leader in the field of technology. There is therefore a need for a unified and visible technology unit in OUS. Such a collection of technology and innovation environments will give greater power in the development of future patient care, provide a clearer management focus and facilitate a good relationship and coordination with Health South-East and Hospital Partner», says Bjørnbeth who has been clear that it is important and correct to focus on a collection of environments that work with change and implementation.

In 2021, we have a budget of just over NOK 26 billion to operate and develop OUS. It is a lot of money. At the same time, there are major tasks to be solved. We need to work on how we solve these tasks so that we can use a somewhat larger part of the budget for investments in new equipment and technology, he adds.

Brand new clinic manager eager to get started

Jan Olav Høgetveit is the man who will lead the initiative and make us better equipped to deliver tomorrow's health services. Photo: OUS

The clinic saw the light of day on the first of May 2021 and just a few weeks before Jan Olav Høgetveit accepted the position as clinic manager in the newly established clinic

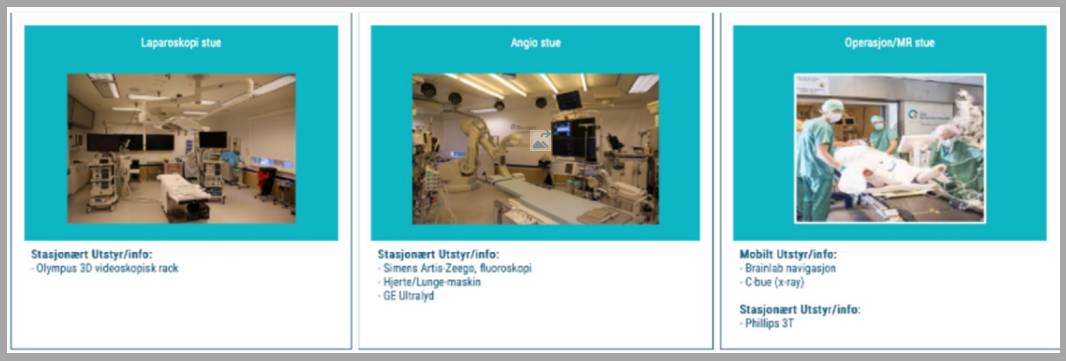
Jan Olav Høgetveit comes from the position as head of the Medical-Technological business area in the Oslo hospital service. He is a trained engineer and has a master's and Doctor Scient. in physics (electronics) from the University of Oslo and has a Master of Management from BI. Høgetveit has a long career in Oslo University Hospital in several roles and knows the organization well.

- Oslo University Hospital has a unique chance to achieve something fantastically good for patients and staff, and I want to contribute to that in the new clinic. I am very motivated and I am really looking forward to starting up in the role of clinic manager, Jan Olav Høgetveit had to say when he accepted the position.

NorMIT infrastructure

Trondheim

Oslo



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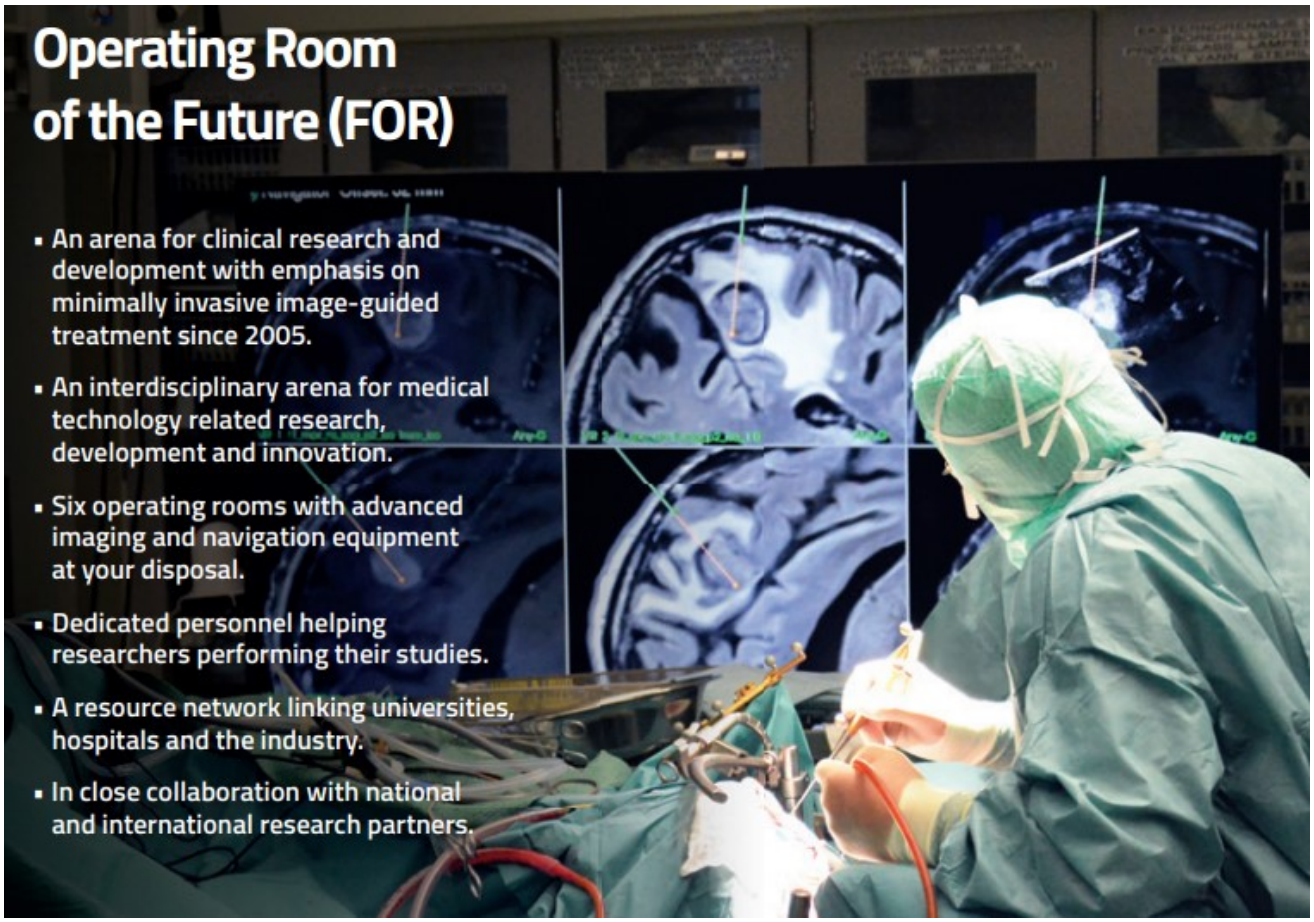

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