



Access & Acceleraton: WP5 Pilot Project – Stryker / SDU Master Theses

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Mads Clausen Institute, Photonics Engineering
University of Southern Denmark (SDU)



WP5 – Medical Industry – University Collaboration

- Establish a sustainable cross-border collaboration between Stryker Trauma GmbH, Schönkirchen, Germany, and SDU Sønderborg.
- Establish awareness of Stryker's R&D challenges in SDU's education programmes.



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SDU's master programme in mechatronics (cyberphysical systems) trains students in (e.g.)

- ... computational multiphysical modeling
- ... optimisation and image processing
- ... the basics of machine learning (artificial neural networks)



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Master Thesis I – Stryker ADAPT – Image Processing, Machine Learning

- X-Ray classification and segmentation using machine learning in Stryker's ADAPT project

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Master Thesis I – Stryker ADAPT – Image Processing, Machine Learning

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Master Thesis II – Stryker Gamma Nail Sterilisation – Computational Fluid Dynamics

- Simulation of Autoclave Processes for Medical Device Sterilization

The Stryker ADAPT Technology

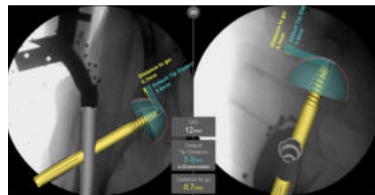
- ... assists with accurate implant and instrument positioning in orthopaedic surgery.
- ... is based on automated image analysis of intra-operative surgical X-ray images.



ADAPT Clip



ADAPT Tower



ADAPT Software

The Stryker ADAPT Technology

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The ADAPT Software

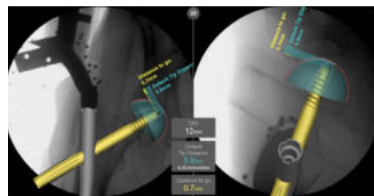
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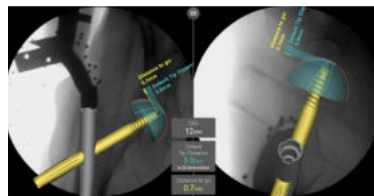
Challenge: Automatically detect (possibly fractured) bones and their major axes to suggest optimal device positioning.



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ADAPT Software

Master Thesis I

X-Ray classification and segmentation
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Deutschland - Danmark



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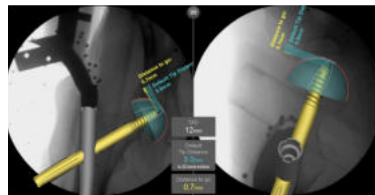
Central Thesis Goal: Progress on assisting the surgeon in finding the operational tool's optimal entry point into the bone.



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Achieved Milestones:

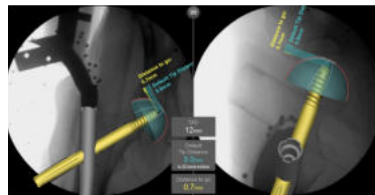
- Classify and segment X-Ray images in order to extract their relevant features.
- Apply machine learning methods to supplement traditional image processing methods.
- Develop concepts to find the bone's major axes to suggest optimal entry point.



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Candidate

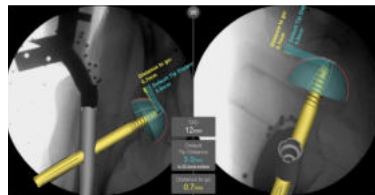
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Stryker Trauma Co-Supervisors:

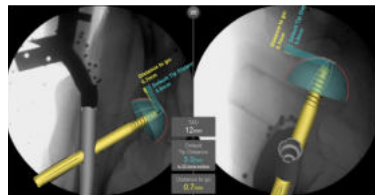
- Bernd Simon, Lars Metz, Dr. Andreas Petersick



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Device sterilisation

- ... prevents the spread infectious diseases in hospitals and biomedical faculties.
- ... inactivates microorganisms for a pre-determined time period.



Hospital Sterilizers (Autoclaves)



Surgical Instrument Tray

Device sterilisation

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The Autoclave

- ... is the most utilised element in the sterilisation of medical and dental equipment
- ... operates by enveloping the items to be sterilised with dry steam at a temperature of not less than 120°C.



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Challenge: Possible residual moisture promotes bacteria growth; the trays need to be designed to ensure sufficient drying capability.



Hospital Sterilizers (Autoclaves)



Surgical Instrument Tray

Central Thesis Goal: Provide an initial model for investigations utilising computational fluid dynamics (CFD), to model the levels of residual moisture remaining after the sterilisation cycle in an autoclave.



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- Build a simplified computational model of an autoclave.
- Define a coupled fluid- and thermo-dynamic model.
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- Bernd Simon, Claus Gerber



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- Two successful Master Thesis campaigns concluded.
- Follow-up project ideas sketched and available for upcoming master thesis candidates.