

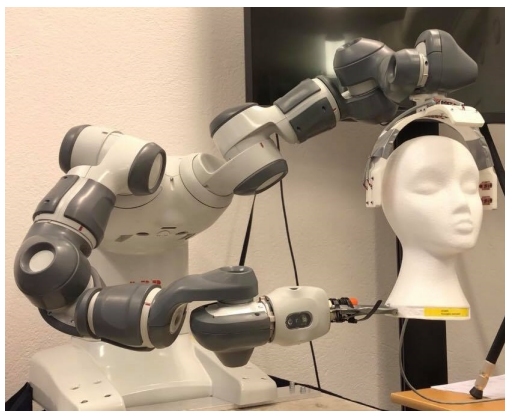
This robotic cameraman assists surgeons

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Popular science summary of master's thesis project
"Robot-held camera platform for medical applications"
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Using a collaborative robot and distance measuring laser sensors the goal of the vinnova project "Kirurgens perspektiv" is to make a camera carrying platform follow the field-of-view of a person. In this way the view can be filmed from the perspective of the wearer of the platform without burdening the individual. In the operation room this platform can effectively collect data during an operation, by letting the operating surgeon wear the platform. This data can then be used as learning material for surgeons, surgeons in training and potentially artificial intelligence.



A prototype of the platform, without cameras, (not) worn by a Styrofoam test-head.

Today all filming during surgical operations are made with overhead cameras, which has the obvious drawback of the operating surgeons being in the way during large parts of the operation. It would be more desirable if the cameras were in some way placed around the head of

the surgeon. Previously this has not been possible due to the strain the added weight of cameras would put on a surgeon's neck during long operations, but with the advent of collaborative robots that can carry the weight while also keeping the cameras slightly above and following the head motion this is now possible.

By placing distance measuring sensors on a platform, designed to fit around the head of a grown human, we have shown that it is possible to use methods from automatic control to make a robotic arm keep the platform at a desired distance away from and pointing in the same direction as a head. However, some more work and testing is necessary before this robot held platform can be deployed outside of test environments.

The prototype we have produced in the master's thesis project "Robot-held camera platform for medical applications" [Tvede-Möller, C. Master's thesis. LTH. TRFT-6070] (as a part of the vinnova project "Kirurgens perspektiv") is able to follow the translational movements of a test head well enough to start testing on real humans, but the following of rotational movements is less good. The platform may need to be redesigned somewhat in order to make more reliable measurements of head orientation in order to make better following of rotational movements possible.

Furthermore, by using a robot with seven joints more freedom is given in how the robot can move as it can reorient its arm without affecting the orientation and position of the held platform; similarly to how a human can reorient

one's arm without affecting the orientation and position of one's hand. This freedom can be used to ensure the arm does not collide with anything or to position the arm in some other advantageous orientation.

Placing cameras on a platform that is moved by a robot as in the suggested prototype will allow filming of operations without the surgeons obstructing the view. The data collected from this can lead to better and more learning material for surgeons, and a successful deployment of the robot-held platform could lead to more robotic helpers in both the operation room and in the world at large.