

## **Robotic Surgical Assistants: New Robot Controls and Operating Methodology Allow Robots to Assist Surgeons**

Adept Technology

**Robots have been assisting surgeons since 1985 for remote surgery, unmanned surgery and minimally invasive surgery. Robotic surgical assistance has many advantages including smaller incisions, decreased blood loss, less pain, quicker healing time and the ability to pinpoint locations very precisely. Automated systems that support surgeons in procedures such as the implantation of prosthetics used in hip replacements are becoming a more common fixture in the operating room.**



"Successfully using a robotic system in surgery demands a completely different set of robot operating modes than robotic systems used in industrial settings. Using robots as surgical assistants requires a highly interactive system that does not replace the surgeon but rather supports him/her in certain procedures where human senses and skills are limited," says Jürgen Wahrburg, doctor of engineering and graduated headmaster at the *Zentrum für Sensorsysteme (ZESS)* (Center for Sensor Systems) at the University of Siegen, in Siegen, Germany.

For several years and in close cooperation with physicians, information scientists, and industrial partners the ZESS center has been designing the modiCAS (modular interactive Computer Associated Surgery) project under the direction of Jürgen Wahrburg. This project using new robot controlling and operating methodology uses

robots as a surgical assisting system for surgeries. The system is involved in all the surgical steps from planning to operation. modiCAS is the world's first robotic system to support the implantation of acetabular cups, a prosthesis often used in human hip replacements. The system uses an articulated robot provided by Adept Technology as one component of the surgical assistance system. The robot provides an arm length of 854 mm, a weight of 29 kgs, and uses open controls to enable the direct activation of the individual joints with precise speeds and torque values.

3D digitizing devices are used to register the patient's anatomy while the robot is applied as a mechatronic extension of the navigation system for guiding and



positioning the surgical instruments. Using customized controlling and operating functions the articulated robot is able to be accurately aligned to the specific surgical requirements. The physician chooses the required robot feature that corresponds to operation task needed, e.g. haptic guidance of the robot by hand or automatic tracking of slight patient movements.

## Range of application possibilities

The robot's key task as an assistance system in an operating room consists of guiding surgical devices, e.g. endoscopes, cutters, trephines. Even in complex neurosurgery the robot mechatronic assistants can very precisely position surgical devices in an environment where millimeters can make the difference between success and the loss of important nerve tracts.

The advantages of applying a robotic system are obvious. In addition to the exact implementation of the preoperative planning during the surgical procedure and the achievement of very precise drilling and reaming results due to concise tool guidance, the surgeon also benefits from a lower stress-level during a procedure. The robot allows the surgeon to move and rotate devices without any tremor at a precisely defined speed. In spite of these evident advantages, the establishment of mechatronic assistants in the surgical operating arena will still take some time however the potential is clear.

Surgery is handcraft in the truest sense of the word. By implementing robots as mechatronic assistants more precise procedures can succeed even in the case of difficult anatomical preconditions. The physician is able to operate in a more stress-free manner resulting in more safety.

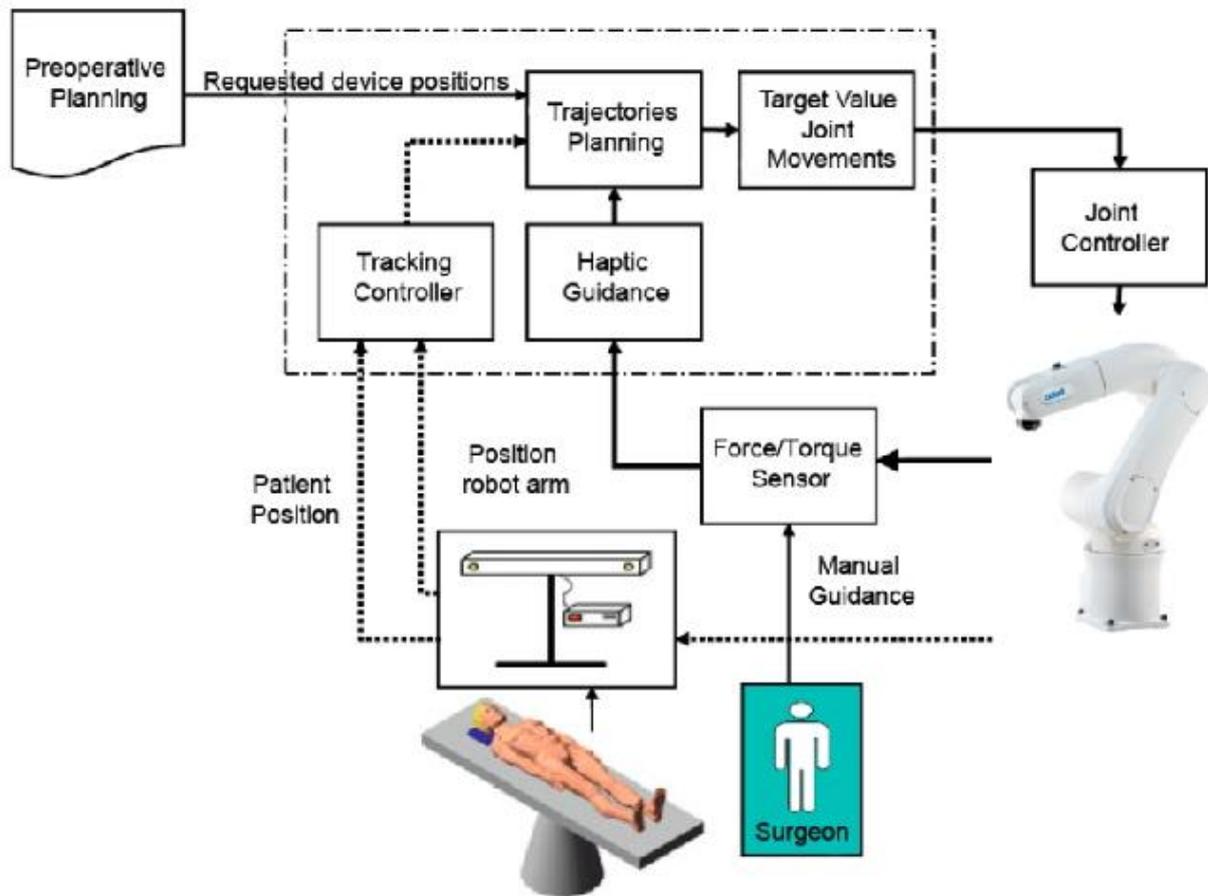
First and foremost the incidence and potential depend on the following factors:

- The physician must feel confident and see his/her advantage
- Robotic systems are assistants to but not a replacement of a physician
- Cost factor for the hospital: The hospital management must see their advantage: no additional costs for the hospital, risks of follow-up therapy are reduced, staff savings, thus cost savings

- Patient must accept robot as mechatronic assistant, smaller and more precise cuts, thus higher safety

At present, orthopedy, head surgery, and osseous surgery offer the highest potential for medical robotic assistance systems.

Robotic surgical assistance will no doubt increase as technology advances and having fewer personnel in the operating room could ultimately lower the cost of health care. This coupled with the advantages stated above make surgical robotic assistants a valuable asset to the medical field.



For additional information on the products and technologies discussed in this article, see [Adept Technology](#). [1]

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### **Links:**

[1] <http://www.adept.com>