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Innovative AI-supported bionic leg

In Germany, there are between 60,000 and 80,000 amputations per year, with an upward trend. In a European comparison, Germany is at the top of the list. According to documentation, the most common amputations are hand and finger amputations, followed by forearm and lower leg amputations. Only about 10% are considered macroamputations, which involve the severing of the entire leg or arm. If a link in the body is missing, affected persons are confronted with major limitations that can already be largely compensated for by various designs of prostheses. A newly developed AI-assisted prosthetic leg now promises unprecedented success.

A bionic leg based on a combination of motors, processors and artificial intelligence is expected to provide sufferers with strength and mobility in the future so that they no longer have to compensate for the lack of support using their healthy, functional leg and upper body.

The technology behind the Utah Bionic Leg is similar in function to a muscle cell in the nervous system of the leg. With the help of specially developed force and torque sensors, as well as accelerometers and gyroscopes, it is possible to determine the position of the bionic leg in space. To implement the movement of the prosthetic joints, the sensors are networked with a computer chip that relays the sensor input in real time. Based on the real-time data, the leg provides power to the individual motors in the joints, allowing them to assist with standing up, walking, climbing stairs or avoiding obstacles.

INNOVATIVE TECHNOLOGICAL APPROACH

- **Research Institute / Company:** University of Utah, Ottobock SE & Co. KGaA
- **Technological basis:** Motors, processors, AI, force and torque sensors, accelerometer, gyroscope
- **Field of application:** Prosthetics (lower leg prosthesis)
- **Advantages:** Intuitive and efficient control (even over a long period of time)

  Light weight

  Real-time data use

The prosthesis‘s AI-powered transmission system provides the link between the electric motors and the robotic joints, capable of adjusting the behavior and response of the joints for each activity. This allows patients to intuitively and effectively control their prosthetic leg as if it were an intact limb, even over a longer period of time, thanks to the robotic knee, ankle and toe joints.

The innovative prosthesis also benefits from its weight: at just six pounds, it is half the weight of the next lightest bionic leg available on the market. This makes them easier to use on a day-to-day basis and also means that less energy is needed to keep the prosthesis attached to the user‘s residual limb.

The University of Utah and Ottobock are currently collaborating to develop a state-of-the-art motion analysis system that will include a strength-measuring staircase and treadmill, as well as 3D motion capture cameras and other instruments. This will further explore the utility of the Utah Bionic Leg for users and pave the way for future improvements.