



MOBILE JOINT MONITORING

JOINT MONITORING SYSTEM FOR MOBILE APPLICATION TO THE PATIENT

At least since the last health reforms, within the bounds of increased transparency and quality management required by health policy, it has become more crucial in medicine to make quantitative statements on the case of illness, the course of therapy and the therapeutic effects. The patient is meant should be able to compare the course of his individual therapy with the therapy plan. Furthermore, transparency is required within the chain of service providers.

The »Orthopaedics and Motion Systems« department at the Fraunhofer Institute of Manufacturing Engineering and Automation IPA is researching on the fields of orthopaedics, prosthetics, medical device engineering and motion detection systems. One of these developments is the measuring of human kinematics by means of optical and inertial sensors.

Objective

For mobile therapy monitoring, the task is to develop a modular movement detecting system for shoulder, hip and knee. This new, cost-efficient system continuously detects the locomotive angle's amplitudes of the target joint, acutely signalizes in case of critical malposition and saves the data for offline evaluation and assessment by the therapist. The device comprises the following specifications:

- Suitable for everyday life
- Easy to integrate into bandages and clothes
- No limitation of mobility

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Procedure

For these purposes, technologies and procedures from the expertise of the Fraunhofer IPA are applied.

For highly integrated, cost-efficient angle measurement, compensated non-contact encoders are used which can be considerably easy integrated into bandages.

Three-dimensional joint monitoring places especially high demands on sensors. For this purpose, inertial motion sensors are applied. By means of sensor fusion software, the 3D-orientation and the rotational axis of the joints can be determined in real-time.

Over the relevant period of time, the detected rotational angles are continuously collected and saved in the measuring system.

Both the patient and the medical practitioner can utilize this data for evaluating the therapy. Parameters of particular interest are the operating range of the joints, the frequency of movements and maximal angle amplitudes.

Result

The result is a modular system of sensors which can be adapted according to its application to the patient and which continuously records the angles of the joints over a longer period. Combined with a downstream data evaluation, the patient

and the medical practitioner can assess the course of a therapy. Thus, also a direct comparison between different therapies and ways of treatment can be achieved.

Your advantage

The results of our research and our comprehensive expertise can be utilized for development projects in your company. The processes and technologies developed form the basis for a transfer into a prototype.

The technology of mobile angle measurement can also be utilized in other fields of application. For this purpose, our modular software structure and our sensor systems, adaptable to special customers' demands, are available.