

Author

Seyr, Martin (None AT) | Dipl.-Ing. Dr.
Otto Bock Healthcare Products GmbH - R&D

Title

CAA - Computer Aided Alignment: A Novel Method of Electronical Measuring for Improved Leg Prosthesis Alignment Based on Objective Criteria

Coauthors

Schneider GLS, Kampas PA, van Vliet JW

Summary

A method has been developed to give component dependent bench alignment recommendations on a PC screen. For this, sensors in a knee prosthesis compute components and position of the static ground reaction force relative to the prosthesis. This method allows objective alignment without a gait-lab.

Introduction

Alignment of leg prostheses is treated as a high art performed by the CPO. CPOs rely on their experience to fit the prosthesis to the need of the wearer. Yet, in the typical setup feedback on the success is limited to visual impressions and the remarks of the wearer, and therefore imprecise by nature. To date, objective data could only be retrieved in a gait-lab. Commonly, patients are not fitted in a gait-lab. Goal of this work is to provide means that help the CPO to see "inside the prosthesis" how it is actually loaded and how forces pass critical landmarks of the prosthesis. Through a PC software, optical feedback of the actual reaction forces is given and optimization recommendations are computed. These recommendations help the CPO to improve the result of the fitting.

Methods

Internal sensors of a microprocessor controlled knee prosthesis are used to measure the ground reaction force. The inputs of the sensors are processed to provide information on the position of the ground reaction force relative to critical landmarks of the prosthesis as well as the cartesian components of the ground reaction force relative to the ground. This information is prepared for a visual display and has been compared to experts opinions for an optimization

of the alignment. Based on the experts opinions rules for optimization recommendations have been found.

Since the prosthetic foot influences the alignment, characteristics of different feet have been measured to give an individual bench alignment recommendation based on the foot actually used.

Results

Computer aided alignment has been realized in form of a microprocessor controlled knee prosthesis and a PC software. The PC software gives an individual bench alignment recommendation based on the components used in the prosthesis. It also displays the cartesian components of the ground reaction force and the position of the ground reaction force relative to the prosthesis online. The information is used to give optimization recommendations to the CPO.

Conclusion

A tool has been developed to aid the CPO in aligning a leg prosthesis. It measures objective data of the loading situation of the prosthesis. The data is used to give a visual feedback of the loading condition and to give optimization recommendations to the CPO. By integration of the tool in the prosthesis and the PC software to set it up, high quality data can be obtained without the need of a gait-lab.

References

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