Hand gestures as computer mouse

For 3D surgical planning

An internship position is available at the Biomedical Engineering and Physics department of the Academic Medical Center (AMC). In our group, new treatment and diagnostic procedures based on innovative physical techniques are developed. Research is performed by a multidisciplinary team that includes physicists, engineers, mathematicians, medical doctors, biologists, and chemists.

Background

In approximately 5% of the cases, a bone fracture leads to malunion of bone segments, causing chronic pain, reduced function and finally osteoarthritis. The AMC is one of the leading academic hospitals in 3D surgical planning for corrective surgery in which a malunited bone is cut and the segments are repositioned in 3D space[1,2], as virtually planned, normally using the mirrored contralateral bone as reference[3]. Interaction in 3D, however, is hampered by the fact that the computer mouse is basically a 2D input device, while a 3D input device based on hand gestures[4] would potentially provide an easier interaction with the virtual plan. Contactless 3D input devices may further enable utilization as computer mouse in a sterile environment, such as during surgery.

Research description

In this project you will: Develop a software module for contactless 3D interaction with a virtual surgical plan that will be incorporated into existing planning software. You will evaluate the technique and are encouraged to think of possible ways to further improve 3D interaction using hand gestures for virtual planning.

Requirements

Bachelor/Master student (engineering sciences) with interest in 3D imaging and knowledge of C/C++ programming. The internship duration can be adjusted according to the curriculum.

Learning outcome

The student will gain knowledge in the field of 3D imaging techniques in general and with surgical planning in particular, develop technical and programming skills. Being part of an interdisciplinary and international research group the student will acquire competences including: collaboration, scientific writing, and presentations.

References

1. Dobbe J.G.G., Strackee S.D., Schreurs A.W., Jonges R., Carelsen B., Vroemen J.C., Grimbergen C.A., Streekstra G.J., “Computer-assisted planning and navigation for corrective distal radius osteotomy, based on pre- and intraoperative imaging”, IEEE Trans. Biomed. Eng., 58(1), pp. 182-190, Jan. 2011.
2. J.C. Vroemen, J.G.G. Dobbe, S.D. Strackee, G.J. Streekstra, “Position evaluation of corrective osteotomy for the malunited radius: 3-D CT versus 2-D radiographs”, J Orthopedics, 36:2, e193-e199, 2013.
3. J.G.G. Dobbe, J.C. Vroemen, S.D. Strackee, G.J. Streekstra, “Corrective distal radius osteotomy: including bilateral differences in 3-D planning”, Med Biol Eng Comput, 51(7):791-799, 2013.
4. https://www.leapmotion.com/

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