

TOWARDS ROBOT-ASSISTED FRACTURE SURGERY FOR INTRA-ARTICULAR JOINT FRACTURES

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Abstract

Background Treating fractures is expensive and includes a long post-operative care. Intra-articular fractures are often treated with open surgery that require massive soft tissue incisions, long healing time and are often accompanied by deep wound infections. Minimally invasive surgery (MIS) is an alternative to this but when performed by surgeons and supported by X-rays does not achieve the required accuracy of surgical treatment.

Methods Functional and non-functional requirements of the system were established by conducting interviews with orthopaedic surgeons and attending fracture surgeries at Bristol Royal Infirmary to gain first-hand experience of the complexities involved. A robot-assisted fracture system (RAFS) has been designed and built for a distal femur fracture but can generally serve as a platform for other fracture types.

Results The RAFS system has been tested in BRL and the individual robots can achieve the required level of reduction positional accuracy (less than 1mm translational and 5 degrees of rotational accuracy). The system can simultaneously move two fragments. The positioning tests have been made on Sawbones.

Conclusions The proposed approach is providing an optimal solution by merging the fracture reduction knowledge of the orthopaedic surgeon and the robotic system's precision in 3D.

Level of Evidence The current level of evidence is limited and based on the Sawbones testing.

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