Bone drilling haptic interaction for orthopedic surgical simulator

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摘要

Abstract

Drilling procedure is widely used in orthopedic surgery to position reduced fractured bones and prosthetic components. However, successful execution of bone drilling requires a high level of dexterity and experience, because the drilling resistance is large and sometimes vibrates violently to difficultly grasp the hand-piece or even break the slender drill. This paper introduces haptic functions that are added to a volume based surgical simulator to simulate the drilling process. These haptic functions compute drilling forces and torques based on reliable metal removing theorem. Therefore, accurate prediction for the drilling process can be obtained to provide effective surgery training and rehearsal. A simulation example of screw and plate surgery for positioning the hip trochanter fracture illustrates the practicality and versatility of the proposed method.