Methods and Systems for Image-Guided Placement of Implants

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Description: Pedicle screw insertion is an orthopaedic spinal fixation procedure involving the placement of screws through individual spine pedicles and secured in spinal vertebrae. Pedicle anatomy varies widely within and across the patient population, and many complications have been reported with the surgical technique. To reduce complications, an automated procedure was developed that utilizes patient-specific medical imaging data to predetermine optimum pedicle screw size, length, and trajectory. The procedure involves importing medical imaging scans into the software, creating uniform voxel data for algorithm simplicity, segmenting the bony anatomy of the spine and defining its boundary, and identifying the pedicle using a search algorithm. The operations are performed in two-dimensions in the coordinate system of the medical imaging data. For each image slice, the minimum pedicle width is identified, and examining all slices identifies the overall minimum pedicle width. The optimum trajectory is determined using a 3D linear least squares fit to the array of minimum pedicle width midpoints. With the optimum trajectory determined, the maximum screw size and length are determined.