

Radiographic Marking of Patient's Gravity Line on X-Ray Images

Chunhui Wu, Amir A. Mehbod, and Ensor Transfeldt
FASK, 913 E 26th St, Suite 600, Minneapolis, MN 55404

Objective: To develop a clinically feasible apparatus for measuring and marking patient's gravity line position on spinal x-ray images. **Background:** Spinal balance of patients with deformity or instability is an important clinical parameter for patient diagnosis, surgery planning and treatment outcome evaluation. Traditional assessment of spinal balance is performed on full spine x-ray images using C7 plumb line relative to central sacral line in the coronal plane or posterior superior corner of S1 in the sagittal plane. Researchers have developed measurement techniques using a force plate synchronized with x-ray equipment and offline x-ray image processing. The complexity of these techniques limits their

clinical applications. In this study, we present a new system to mark gravity line directly on an x-ray image. **Methods:** The system consists of a force plate, a signal conditioner and processor, a motion controller and a motor assembly that moves a radio-opaque marker. The processor calculates the location of gravity line and marker position, and transmits motion commands to the motion controller, which drives a motor assembly and moves the marker to appropriate positions. The acquired x-ray image has a mark indicating the instantaneous gravity line position. **Evaluation:** A prototype was installed in the radiology department. More than 200 patients were instructed to stand on the force plate. Exposure was performed as in routine x-ray imaging. The system does not affect routine x-ray workflow and provides valuable information for spine surgeons.