

用於無輻射脊柱側彎評估的便攜式三維超聲成像系統

Palm-sized 3D Ultrasound Imaging System for Radiation-free Scoliosis Assessment

用於篩查、診斷、監察脊柱畸變及提供相關實時治療反饋的嶄新成像技術

A new technology for screening, diagnosing, monitoring and providing real-time treatment feedback for spinal deformity

專利編號: 200810094381.9 (中國), 8,900,146 B2 (美國), ZL201080040696.0 (中國), 5849048 (日本), 2,769,150 (加拿大), 2010278526 (澳洲)
專利申請編號及國家: EP10803888.6 (EPT), PCT/CN2010/075287 (PCT)

脊柱側彎是青少年最常見的脊柱疾病，而目前脊柱側彎的臨床診斷金標準就是X光成像。但最新研究結果證實，接受X光照射的人士在25年後的癌症發病率將是比同齡人士高出5倍。為推動以安全而無輻射的三維超聲成像作為脊柱側彎的評估方法，理大團隊以創新的三維光學傳感方法，追蹤能夠實時獲取肌骨超聲影像的無線超聲探頭，這使三維超聲成像系統的體積可以縮至手掌大小，便於攜帶。此外，團隊開發了相關軟件，以進行三維圖像重建、可視化、分割及量度。此系統有助實現脊柱側彎的大規模準確篩查及對患者持續的觀察，從而減少嚴重的側彎個案及X光照射的劑量。

特色與優點

- 無輻射
- 超級小巧，便於攜帶
- 以患者為中心，而不是以機器為中心
- 具備自動測量功能
- 價錢遠比現有成像儀器低

應用

- 脊柱側彎的大規模篩查
- 對患者持續的觀察
- 對治療效果的評估
- 非手術治療過程中期間的實時反饋
- 因X光成像的不良作用而無法進行的研究工作

獎項

- 俄羅斯特別大獎(2019年4月)
- 第47屆瑞士日內瓦國際發明展 - 評判特別嘉許金獎 (2019年4月)
- 羅馬尼亞錫比烏協會優異獎 (2019年4月)



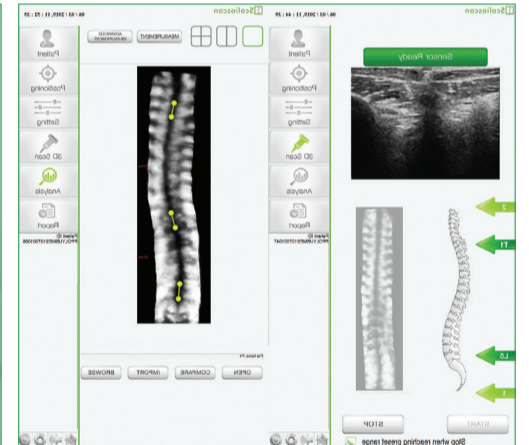
便攜式三維超聲成像系統取得的脊柱圖像
Images of spine obtained by the palm-sized 3D ultrasound imaging



便攜式超聲探頭
Palm-sized ultrasound probe



便攜式的三維超聲成像系統
Portable 3D Ultrasound Imaging System



基於便攜式超聲探頭的三維脊柱側彎成像系統
Diagram of 3D ultrasound imaging system with a palm-sized probe

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Scoliosis is the most common spinal disease among kids, and X-ray is currently the clinical gold standard for diagnosing scoliosis. However, according to a recent study, X-ray-diagnosis increases the risk of cancer among scoliosis patients by 500% 25 years after treatment, with average of 16 radiographs taken during the treatment period. To facilitate safe and easy use of radiation-free ultra-sound 3D imaging technology for assessing scoliosis, our research team uses a novel 3D optical tracking method to capture the movements of the wireless ultrasound probe, which obtains real-time ultrasound images of musculoskeletal tissues. The size of the 3D ultrasound imaging system can thus be greatly reduced to palm-sized. In addition, a programme has been developed for volume reconstruction, visualization, segmentation and measurement. The new system enables accurate mass screening for scoliosis in places such as schools and frequent monitoring of scoliosis progression to reduce severe cases and X-ray dosage.

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Special Features and Advantages

- Radiation-free
- Ultra-portable
- Brings the device to patients, rather than bringing patients to the device
- Equipped with automatic measurement
- Much lower in cost when compared with available imaging devices

Applications

- Mass screening for scoliosis
- Frequent monitoring of patients
- Outcome measurement for treatment
- Real-time feedback during non-surgical treatment
- Research works currently not possible because of X-ray hazards

Awards

- Prize of the Legal Company «Goroditsky & Partners», Russia (Apr 2019)
- Gold Medal with the Congratulations of Jury – 47th International Exhibition of Inventions of Geneva, Switzerland (Apr 2019)
- Special Merit Award from Romanian Association for Alternative Technologies Sibiu, Romania (Apr 2019)



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