Stereoscopic Three-Dimensional X-Ray Reconstruction Processing: A Low-Radiation Cost-Effective Versatile Medical Imaging Procedure for Safe and Rapid Scanning

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Although Computer Axial Tomography (CT) scans are used every day as a critical medical imaging process, there are risks of radiation exposure involved with such a process. This research aims to pioneer a new method of medical imaging called stereoscopic x-ray reconstruction to minimize radiation risks involved in CT scans. Using a stereoscopic reconstruction algorithm to calculate depth and generate a three-dimensional view will significantly reduce radiation dosages while still creating three-dimensional models crucial for cancer detection and treatment. First, a stereoscopic reconstruction algorithm was created, and then each specific step in the entire reconstruction pipeline was assessed and optimized. The steps of enhancement included utilization of image filters, feature detection, triangulation, and experience-based reconstruction. The algorithm was finally holistically examined in the areas of safety, accuracy, and efficiency. Following experimentation and then optimization, the algorithm and methods were much more effective in accurately diagnosing and locating cancerous cells. Results highlighted the fidelity of the stereoscopic reconstruction approaches to three-dimensional modeling, with generated models over 98.2% accurate and on average less than 0.07 mm off from control models. In comparison to CT scans, stereoscopic reconstruction can reduce the radiation by a factor of over a hundred, reducing a 25 mSv dosage of ionized radiation to less than 0.2 mSv. This is crucial to saving the thousands of lives that are lost each year.

Awards Won:
Third Award of $1,000
Fondazione Bruno Kessler: Award to participate in summer school "Web Valley" in Trento, Italy