Advanced Dual-Orientation and High-Resolution CT Imaging Technology

Summary

Profile type
Technology offer

Company's country
Germany

POD reference
TODE20240904012

Profile status
PUBLISHED

Type of partnership
Investment agreement
Research and development cooperation agreement
Commercial agreement with technical assistance

Targeted countries
• World

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Term of validity
4 Sep 2024
4 Sep 2025

Last update
4 Sep 2024

General Information

Short summary

A German university has developed a new CT imaging technology that combines dual-orientation artifact reduction and high-resolution 2D/3D fusion. The innovative technology combines standard 3D CT imaging with high-resolution 2D imaging to generate exceptionally detailed 3D voxel data sets. The University is looking for cooperation partners, licensee and/or investors to further develop the new technology to series maturity.

Full description

Computed Tomography (CT) imaging has become an indispensable tool in both medical diagnostics and industrial applications. However, traditional CT techniques face significant challenges that limit their effectiveness in certain scenarios. These challenges include:

1. Limited resolution: Standard CT imaging often fails to capture fine details, especially when imaging complex structures or small objects.

2. Artifacts: CT scans frequently suffer from image artifacts, particularly when scanning objects containing metallic components or dense materials. These artifacts can severely distort the final image, making accurate analysis difficult.

3. Radiation exposure: In medical applications, there's an ongoing need to reduce radiation exposure while maintaining or improving image quality.

4. Industrial application limitations: In industrial CT, the examination of technical objects like printed circuit boards or metal components is often hindered by the limitations of traditional CT imaging.

Scientists at a German university have developed a high-resolution 3D voxel data generation method that combines standard 3D CT imaging with high-resolution 2D imaging to produce exceptionally detailed 3D voxel datasets. By incorporating high-resolution 2D images taken with the object closer to the X-ray source, this method significantly improves the overall resolution of the final 3D image. The integration of 2D and 3D datasets enables the capture of fine details that may be missed by standard CT scans, which is particularly beneficial for complex structures or small objects. By strategically combining standard and high-resolution imaging, this method can reduce the overall radiation exposure required for high-quality images.

In addition, the same scientists have developed an artifact-reduced voxel data generation method that focuses on the reduction of artifacts in CT images, a common problem especially in industrial CT applications. By acquiring two sets of CT images in which the object is tilted between scans, this method reduces the directionality of artifacts, especially those caused by beam hardening and reconstruction processes. The technique is particularly effective in minimizing streaks and shadows caused by metallic components, which significantly improves image clarity in industrial CT applications. An advanced iterative algorithm processes both sets of images, effectively reducing artifacts and improving overall image quality. The use of quaternions for precise orientation rendering ensures accurate alignment of the two image sets, which is crucial for effective artifact reduction.

Both technologies use an advanced implementation of the Maximum Likelihood Expectation Maximization (MLEM) algorithm, which iteratively refines image reconstruction, effectively copes with noise and produces high-quality images even from low-volume data.

This significantly improves image resolution and detail capture, enabling more accurate analysis in both medical and industrial applications. In addition, image artifacts and radiation exposure are significantly reduced, which is particularly beneficial for industrial CT where metallic components are common. Other benefits include improving the ability to examine complex objects with intricate internal structures and providing clearer, more reliable images for medical diagnostics, especially for implants or dense tissue.

These advances open new possibilities in a range of areas, from improved medical diagnostics and treatment planning to more efficient and accurate industrial quality control processes. The technologies have the potential to significantly impact areas such as orthopaedics, dentistry, aerospace, automotive and electronics, where precise, high-resolution 3D imaging is essential for innovation and quality assurance

Advantages and innovations

Advantages of the innovation are:

- Superior artifact reduction, particularly effective with metallic components
- Significantly enhanced resolution and detail in 3D reconstructions
- Versatile application across multiple industries and scientific disciplines
- Improved accuracy in 3D representations, critical for precise analysis and diagnostics
- Efficient automated reconstruction processes
- Customizable for specific applications and materials
- Advanced noise handling capabilities
- Potential for improved low-dose imaging in medical applications
- Optimized implementation to address computational intensity

Technical specification or expertise sought

Stage of development

Available for demonstration

Sustainable Development goals

- **Goal 9: Industry, Innovation and Infrastructure**
- **Goal 17: Partnerships to achieve the Goal**
- **Goal 3: Good Health and Well-being**

IPR Status

IPR granted

IPR Notes

Partner Sought

Expected role of the partner

The university is looking for partners who can integrate the new technology into their existing CT imaging systems. Furthermore, the university is also interested in collaborating on further research and development to expand applications and support commercialization and market penetration in specific industries. Another important aspect is the provision of industry-specific expertise to optimize the technology for specific use cases.

Type of partnership

Investment agreement

Research and development cooperation agreement

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Type and size of the partner

- **Other**
- **SME 50 - 249**
- **SME 11-49**
- **Big company**
- **SME <=10**

Dissemination

Technology keywords

- **01003012 - Imaging, Image Processing, Pattern Recognition**
- **05005 - Micro- and Nanotechnology**
- **09001008 - Other Non Destructive Testing**

Market keywords

- **05004005 - Diagnostic equipment**
- **05002002 - CAT scanning**
- **05002004 - Nuclear imaging**
- **08002005 - Machine vision software and systems**
- **08002002 - Industrial measurement and sensing equipment**

Targeted countries

- **World**

Sector groups involved