Paritic Inc.

Pari-Path
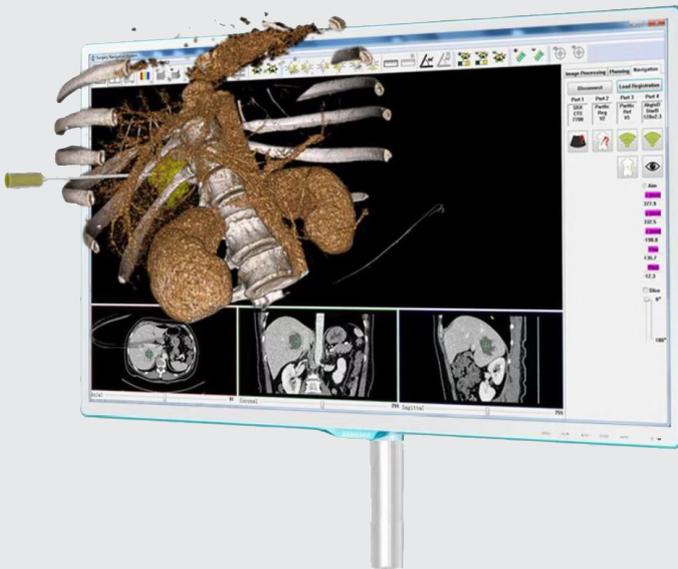
Surgical Navigation System

Accurate Guidance | Easy to Use

Three Functions

Navigate with CT
Navigate with Ultrasound
Navigate with CT & Ultrasound

Five Advantages

Highly Accurate for Navigate Direction (including far field)
Easy and Accurate Registration (including far field)
Easy and Accurate Fusion of CT and Ultrasound Images
Applicable for Multiple Types of Needles
Sensors Reusable

Key Issues:

Navigation Accuracy
Convenience of Use

Although electromagnetic (EM) surgical navigation technology has been developed for many years, it still cannot meet very well the requirements of clinical use, in terms of navigation accuracy and convenience of use, resulting in fewer usages in daily clinical practices.

Paritic Inc. has been dedicated to in-depth research for many years, overcoming the challenges of navigation accuracy and convenience of use, and meeting clinical needs.

FDA 510(k) cleared

Pari-Path surgical navigation system, K133901

Indications for Use

It is a stereotactic accessory for Computed Tomography (CT) and Ultrasound (US), intended for use in clinical interventions.

Benefits

For patients: Reduce the number of CT radiation scans; Reduce puncture times.

For doctors: Direct visual guidance; Reduce surgical difficulty; Minimize the number of puncture adjustments; Improve surgical accuracy.

For hospitals: Reduce the time of a procedure; Reduce surgical risks; Shorten the time for training surgeons; Prolong the use time of CT x-ray tubes.

Electromagnetic Navigation vs. Infrared Navigation

Paritic's EM Navigation System	Infrared Navigation System
The sensor fixture used: small and light easy to clip onto surgical needles	The reflective ball attachment tool used: large and heavy inconvenient to install on surgical needles
Applicable to multiple kinds of needles	Applicable to some kinds of needles

Function 1
In Conjunction with CT   Achieving Real-Time Surgical Navigation

Real Time Navigation with CT

Side View   Front View

Accurate Navigation   Easy to Use

	Pari-Path Navigation System	Other EM Navigation System
Position Accuracy	about 1-2 mm RMS* in a relatively wide area	low accuracy in the far field
Direction Accuracy	about 0.5-1^0 RMS* in a relatively wide area	N/A
Applicable Needles	various needles from other companies	specific needles
Sensor	reusable	expensive disposable

Accurate and Convenient Registration Method
(registration: correlation of the image space and physical space)

Paritic Registration Method	Other Registration Methods
• higher registration accuracy in a relatively wide area • about 1-2 mm (RMS) • No need to register point by point; just click the mouse to complete	**Metal Marker Method** • need to register each marker point by point **Sensors themselves act as markers** • better accuracy in the near field • poor accuracy in the far field • no need to register point by point

Note: *parameters (in root mean square) are typical on static objects under normal operations, may vary and are not guaranteed.

Function 2

In Conjunction with Ultrasound　Achieving 3D Surgical Navigation

Navigation with Ultrasound Imaging

Needle in US plane　　　　　Needle out of US Plane

Accurate Navigation　Easy to Use

|	Paritic Navigation	Other Navigations	No Navigation
2D/3D	guiding needles in 3D space and in the 2D ultrasound plane	guiding needles within the 2D ultrasound plane	
Position Accuracy	about 1-2 mm RMS* in a relatively wide area	various	the needle should be in the ultrasound plane
Direction Accuracy	about 0.5-1⁰ RMS* in a relatively wide area	N/A	no 3D guidance
Applicable Needles	various needles from other companies	specific needles	not easy to see the needle tip
Sensor	reusable	expensive disposable	

Note: *parameters (in root mean square) are typical on static objects under normal operations, may vary and are not guaranteed.

Function 3

In Conjunction with Fusion of CT & Ultrasound
## Achieving Combined Surgical Navigation
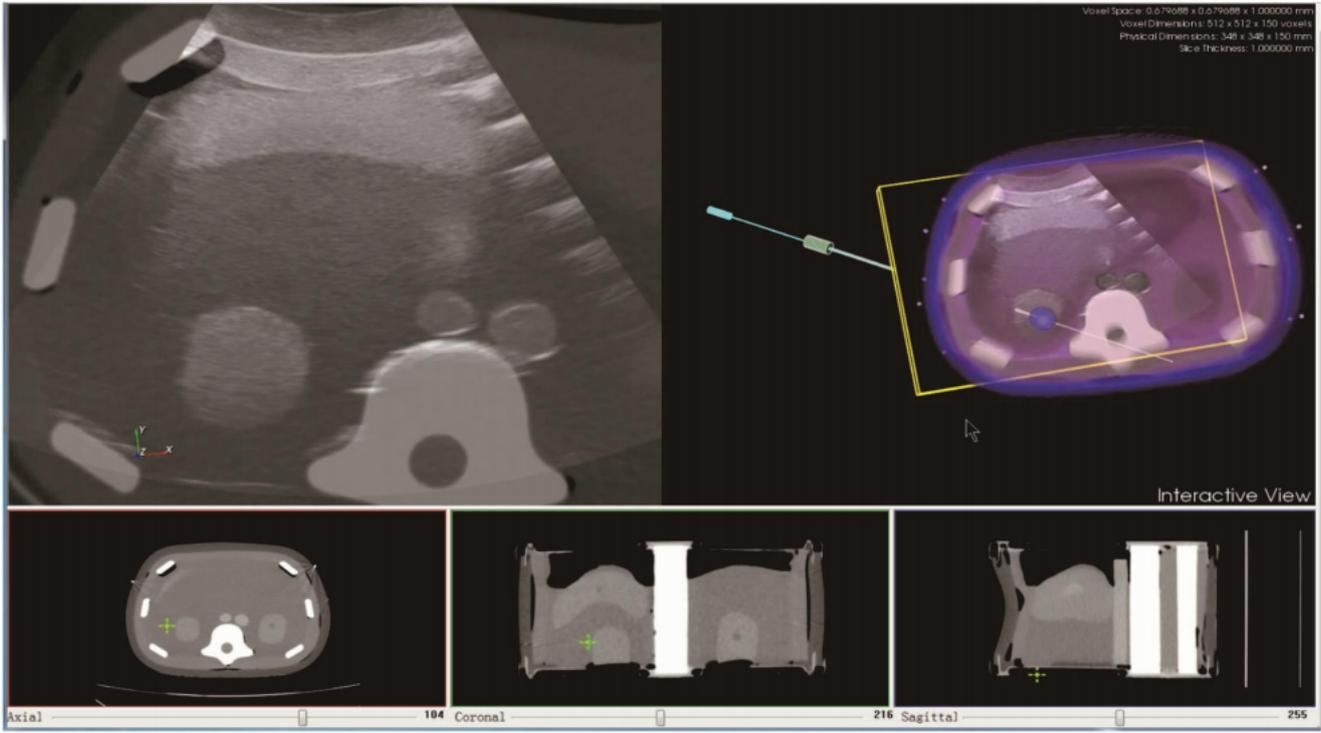
Accurate Navigation   Easy to Use

Paritic Method of Fusion CT & Ultrasound	Other Methods of Fusion CT & Ultrasound
fusion accuracy may be as good as 1~2 mm (RMS) typically	fusion accuracy may be poor to ~cm (RMS)
robust	not robust enough
not affected by the diversity and complexity of anatomical structures in Ultrasound and CT images	heavily affected by the diversity and complexity of anatomical structures in Ultrasound and CT images
no need for surgeons to select common spots on both CT images and Ultrasound images	need for surgeons to select common spots on both CT images and Ultrasound images

Note: *parameters (in root mean square) are typical on static objects under normal operations, may vary and are not guaranteed.

Function 4
Image Processing   Surgical Planning
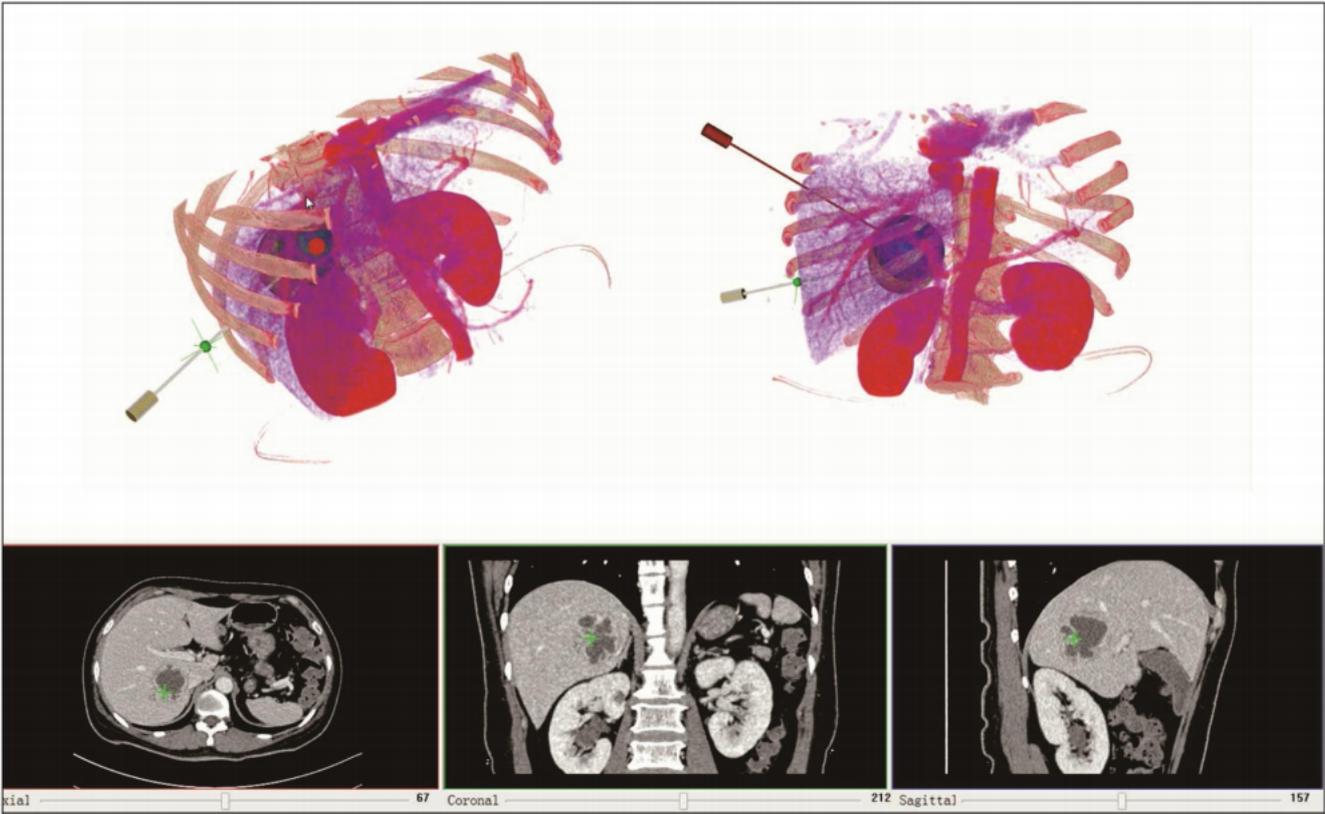
Paritic's Image Processing Software	CT Machine's Image processing Software
• basic CT workstation functions • regarding puncture targets, convenient and efficient segmentation and other advanced image processing functions	CT workstation functions

Paritic's Surgical Plan Software	CT Machine's Image Processing Software
Specialized and convenient surgical planning functions for surgical targets, including path, angle, depth, needle insertion point,and simulated ablation range, etc., on 3D images	no specific surgical plan function

■ Applicable Multiple Interventional Procedures

Biopsy, Drainage, Injection, Aspiration procedures
Tumor ablation (RF, Microwave, Cryoablation, Irreversible Electroporation)
Particle Implantation
Pain Management

■ Applicable Clinical Departments

Interventional Department   Ultrasound Department   CT Department
Imaging Department   Oncology Department

■ Product Components

Group 1 Hardware Equipment shelf life 10 years	Part 100. Host machine
	Part 200. Electro-Magnetic field generator with support arm
	Part 300. Display screen
Group 2 Replaceable Parts	Part 400. Positioning box
	Part 500. Needle sensor
	Part 600. Relative sensor (optional)
Group 3 Disposable Package per procedure sterile	Part 501. Needle clip (plastic)
	Part 401. Patch for positioning box
	Part 201. Cover (plastic) for electro-magnetic field generator
	Part 601. Patch for relative sensor (optional)
Group 4 Software	Part 700. Surgical plan
	Part 800. Navigation with CT images
	Part 900. Navigation with Ultrasound images (optional)
	Part 890. Navigation with fusion of CT and Ultrasound images (optional)

Easy to Use

Step	With Paritic Navigation	Time (min)	Without Navigation	Time (min)
1	Attach the positioning box on the skin	~1.5	Attach the positioning metal grid on the skin	~1
2	CT scanning	same	CT scanning	same
3	Transfer CT images to the navigation system via local network	~0.5	No	0
4	Software operation: segment, route plan, register	~2	Software operation on the CT system: measure, route plan	~1
5	Attach a reusable sensor with a disposable clip to the needle	~1	No	0
6	No	0	Measure and mark an insertion point on the skin surface	~1
7	Advance needle fewer times	short	Advance the needle, perform multiple CT scans, and adjust the needle multiple times	long

Paritic

Paritic Inc. started in an incubator at the Downstate Health Science University of SUNY a decade ago. Since exhibiting its first prototype of a surgical navigation system in 2009 at the RSNA meeting, it has been dedicated to research and development in 3D medical imaging software (including Virtual Reality, Artificial Intelligent), tracking technologies, surgical robots and integrated systems, to create excellent products for meeting mini-invasive surgical needs.
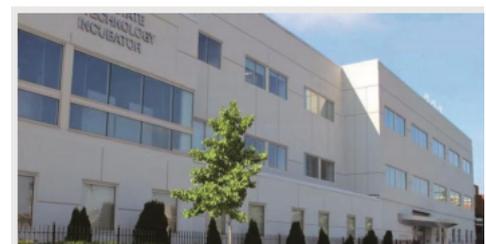
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