

IMAGE GUIDANCE SYSTEM



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IMAGE GUIDANCE

- ✓ Refers to the use of a Probe which is tracked by the system as the probe moves through the target sites
- ✓ Allows surgeons to know almost precisely where any given structure is at any given point during surgery
- ✓ Facilitates localization of target structures and their anatomical relations
- ✓ Allows preoperative planning of the ideal, minimal risk, trajectory

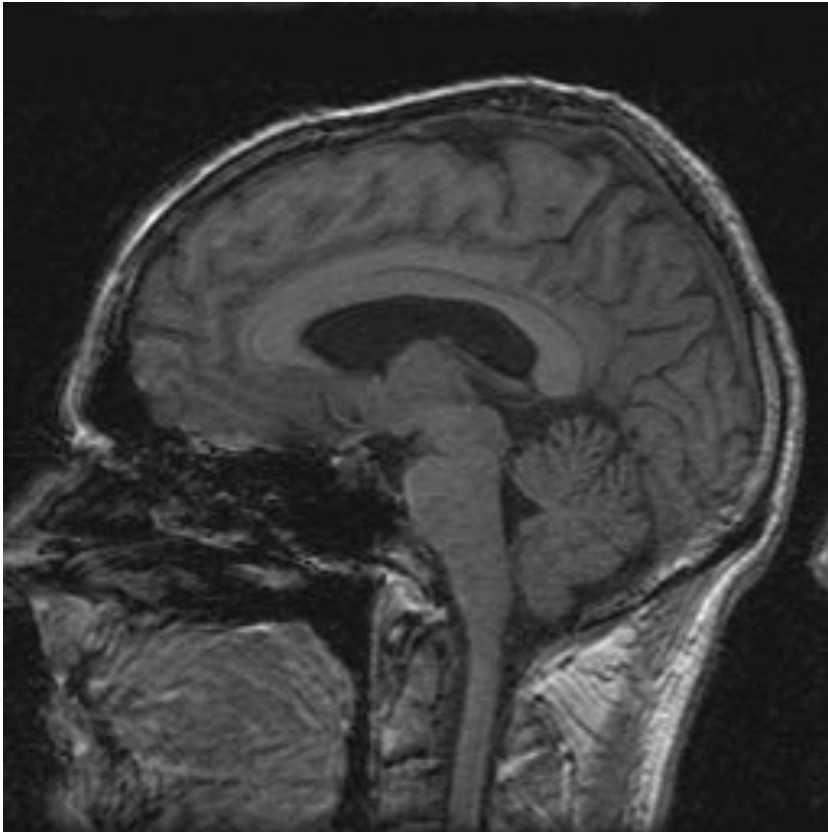
PRINCIPLE

Depends on the registration of pre-operatively acquired images with the physical space of the patient on the operating table

STAGES

- ✓ Acquisition
- ✓ Segmentation
- ✓ Registration
- ✓ Tracking

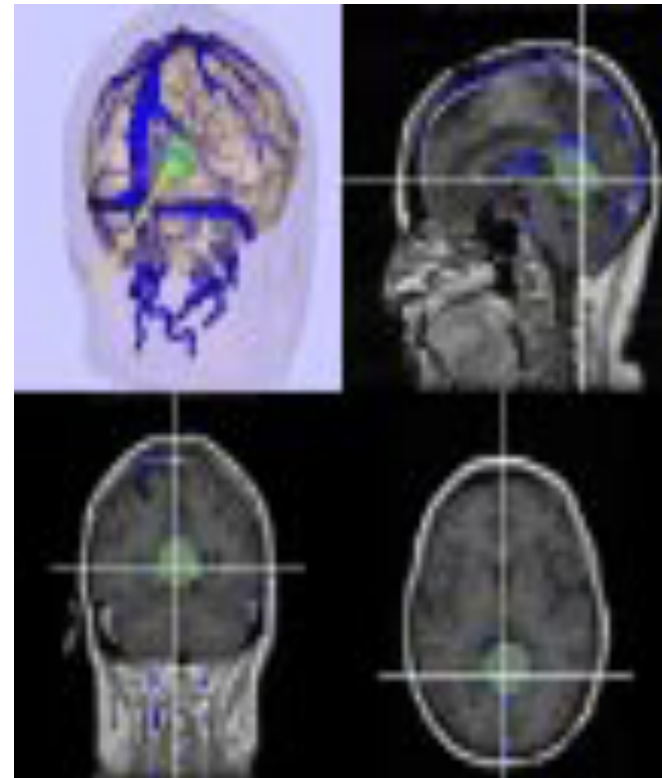
ACQUISITION- *Image Guidance Scan*



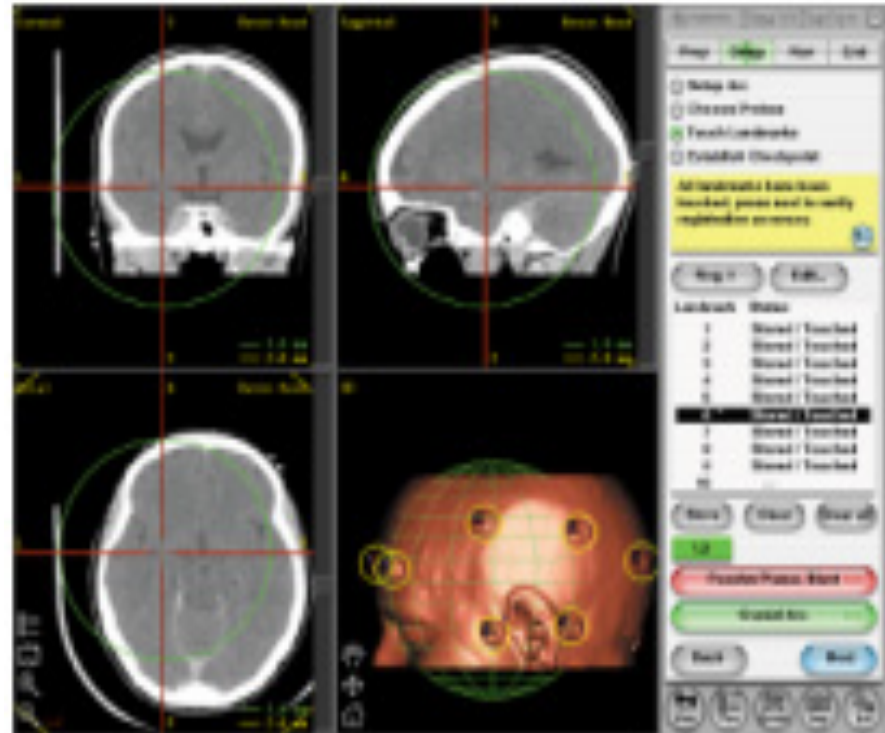
*Normal CT or
MR Images are
acquired*

SEGMENTATION

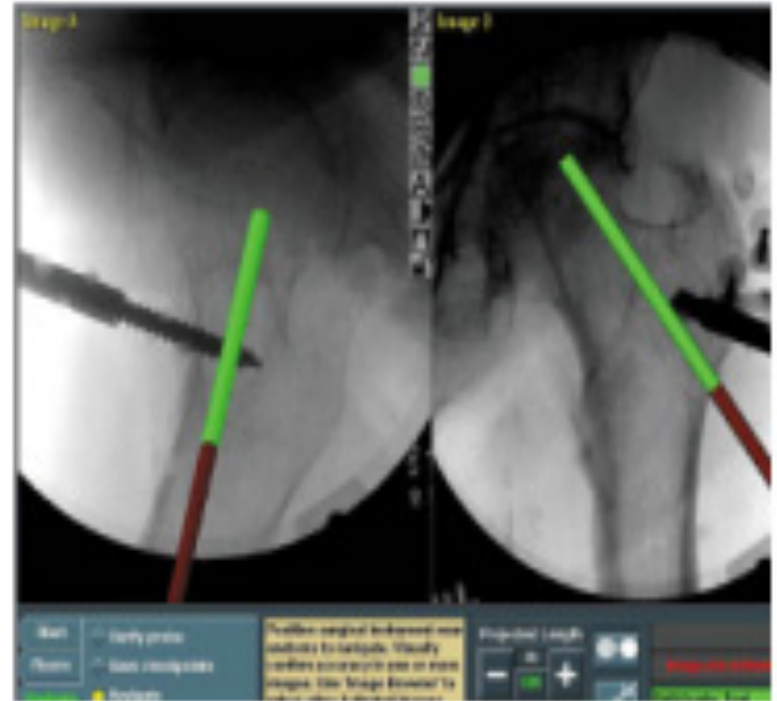
converts standard medical imagery into information that more directly reflects patient anatomy



REGISTRATION



Contd..



TRACKING

Surgical instruments are tracked relative to patient and model allowing the surgeon to effectively execute procedures

Types of tracking systems :

- ✓ Mechanical
- ✓ Ultrasonic
- ✓ Electromagnetic
- ✓ Optical



Optical tracking

COMPONENTS



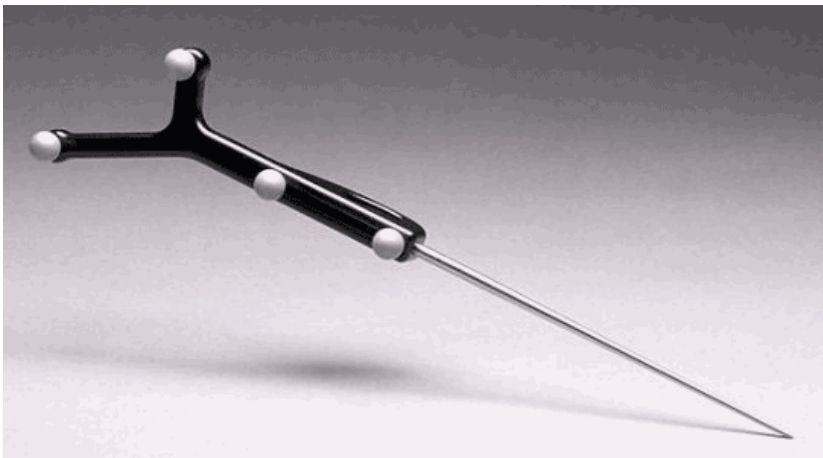
A powerful computer system



Retro reflective spheres



Optical Imaging System



hand-held surgical probe

TECHNOLOG

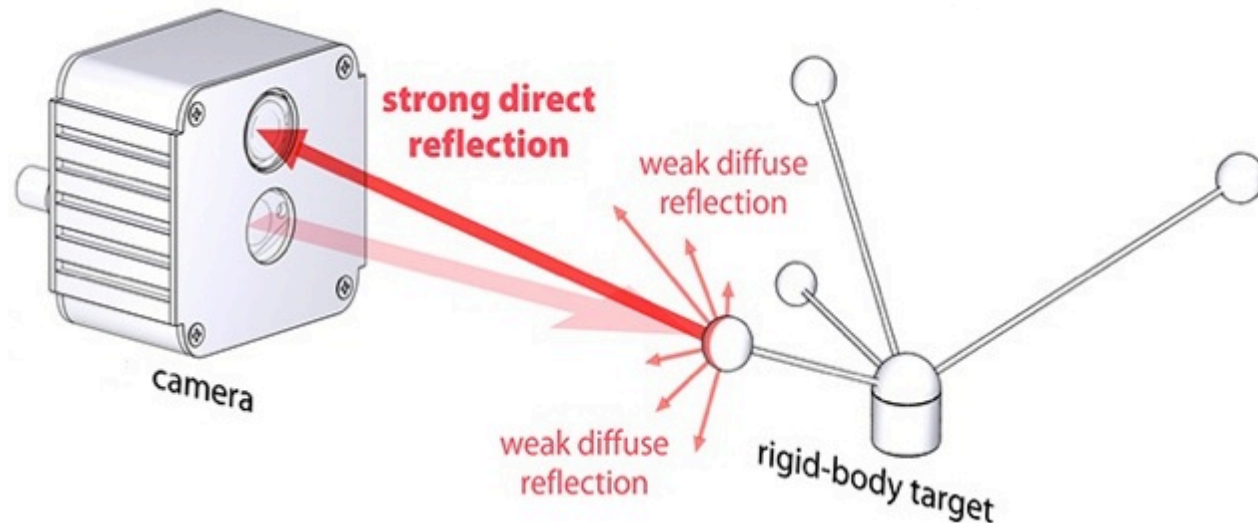
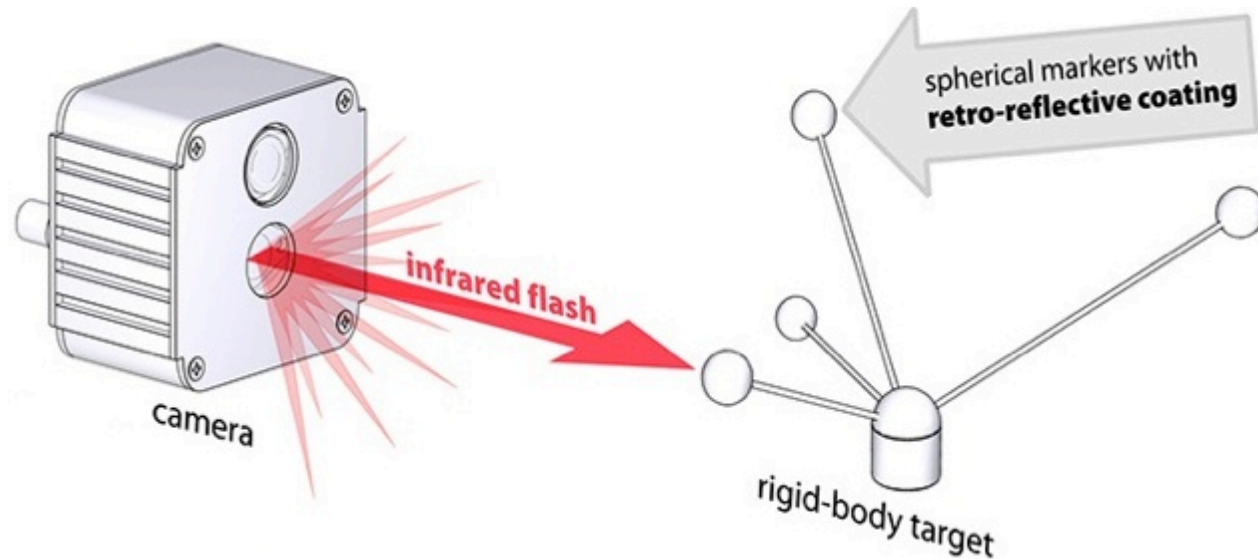
Y

Optical tracking uses a position sensor to detect infrared-emitting or retro-reflective markers affixed to a tool or object

The position sensor calculates the position and orientation of the tool based on the information the position sensor receives from those markers

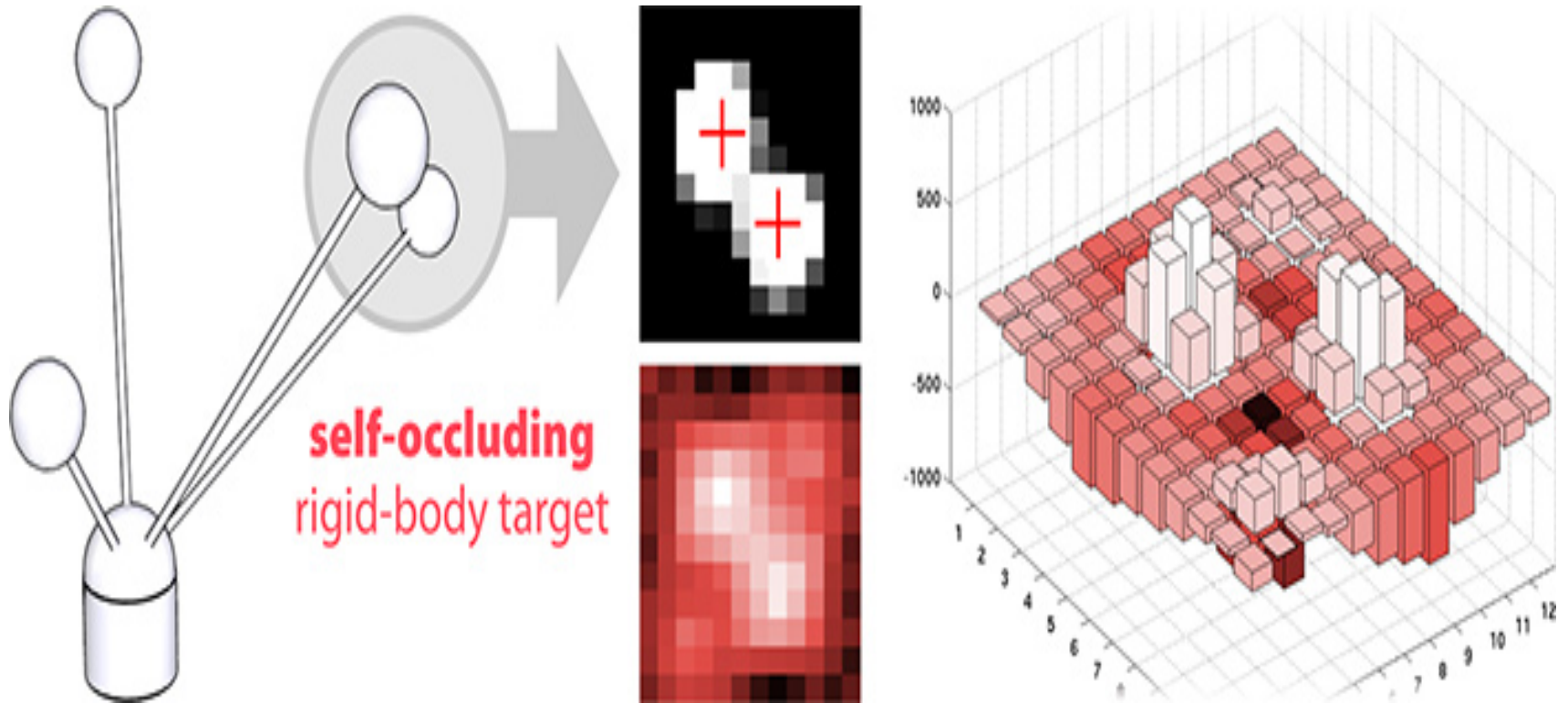


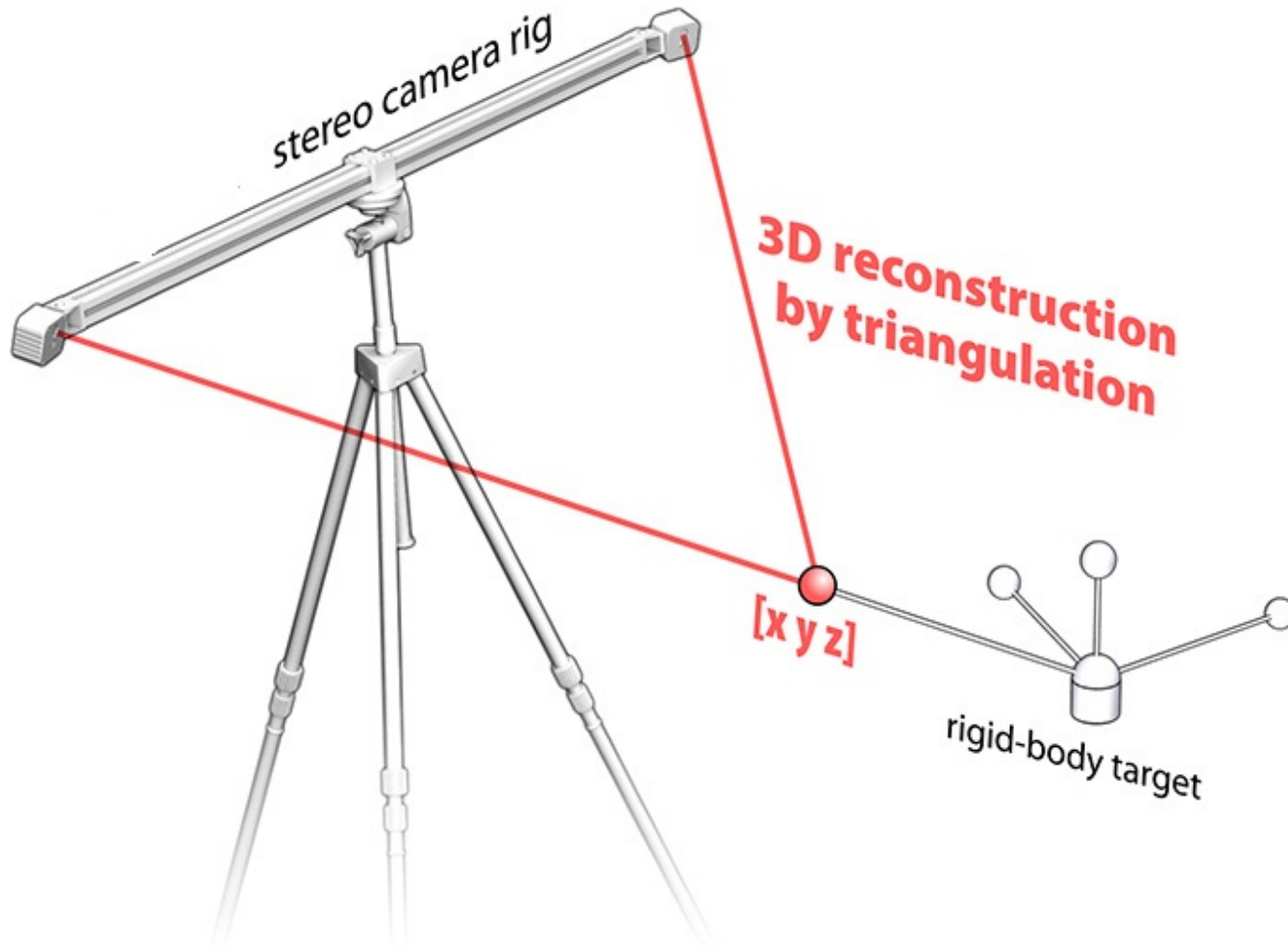
OPTICAL TRACKING



The coating reflects most of the IR by the camera's built in LED Strobe back to the imaging sensor

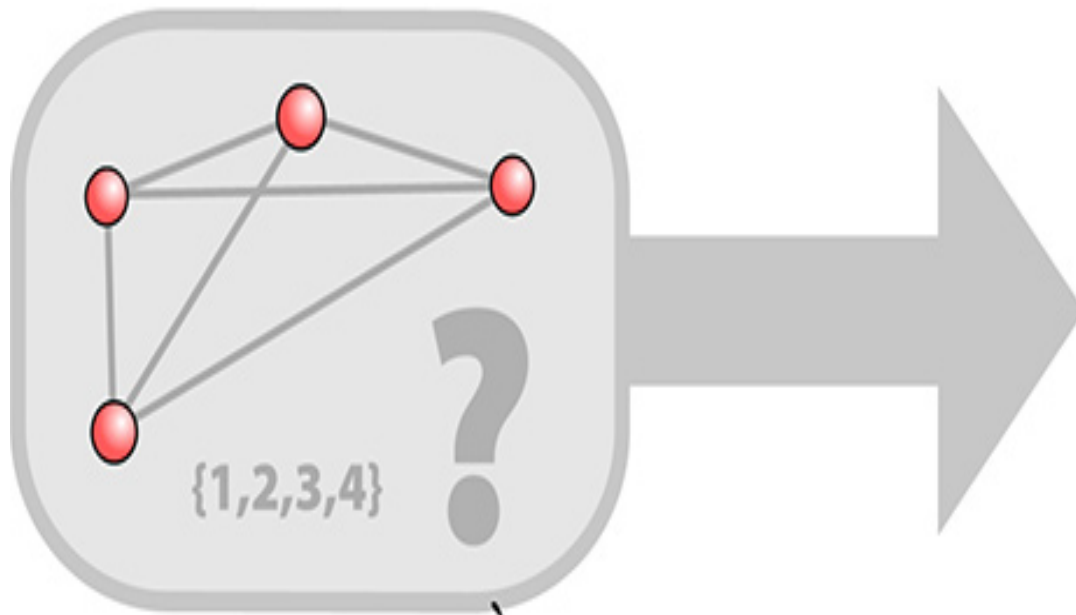
The software runs advanced image processing to calculate the projected centers of every marker in every camera image



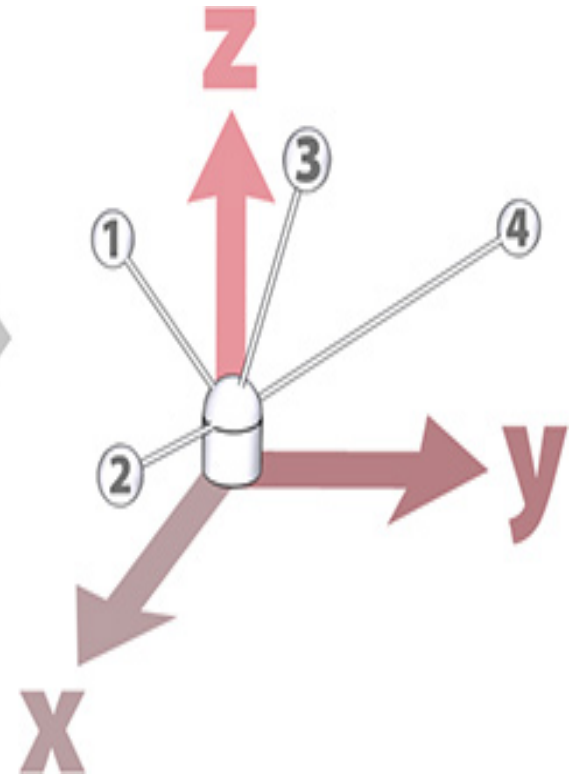


The 3D location of every marker is recovered by geometric triangulation

The software identifies pre-calibrated rigid body targets and computes their position and orientation (6-DOF Pose)



model-fitting & 6-DOF pose estimation



APPLICATIONS

- ✓ Stereotactic Biopsy
- ✓ Craniotomy
- ✓ Shunts
- ✓ Implants
- ✓ Functional Neurosurgery

ADVANTAGES

- ✓ Help Surgeons know the precise anatomy
- ✓ Help identify important landmarks during surgery
- ✓ Reduces operating time
- ✓ Decreases incision
- ✓ Reduces invasiveness

DISADVANTAGES

- ✓ All patients must undergo a CT scan or an MRI (exposure to extra dose of radiation in case of CT/ can be claustrophobic for patients in case of MRI)
- ✓ Registration may be inaccurate
- ✓ Brain shift can be a source of error
- ✓ Computer systems are susceptible to human error



OPEN SOURCE

- IGSTK is a software package oriented to facilitate the development of image guided surgery applications
- It is an OPEN SOURCE software toolkit designed to enable researchers to rapidly prototype and create new applications for image guided surgery
- Provides functionalities that are commonly needed when implementing image guided surgery applications, such as integration with optical and electromagnetic trackers, manipulation and visualization of datasets
- The cornerstone of IGSTK is robustness

THANK YOU