Navigation for ***AR & Surgical Robotics***

- Calibration & Computer Vision & Sensor Fusion

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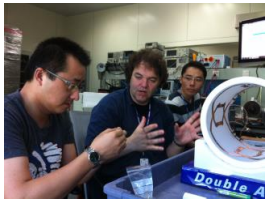
2020



What is Navigation and How?

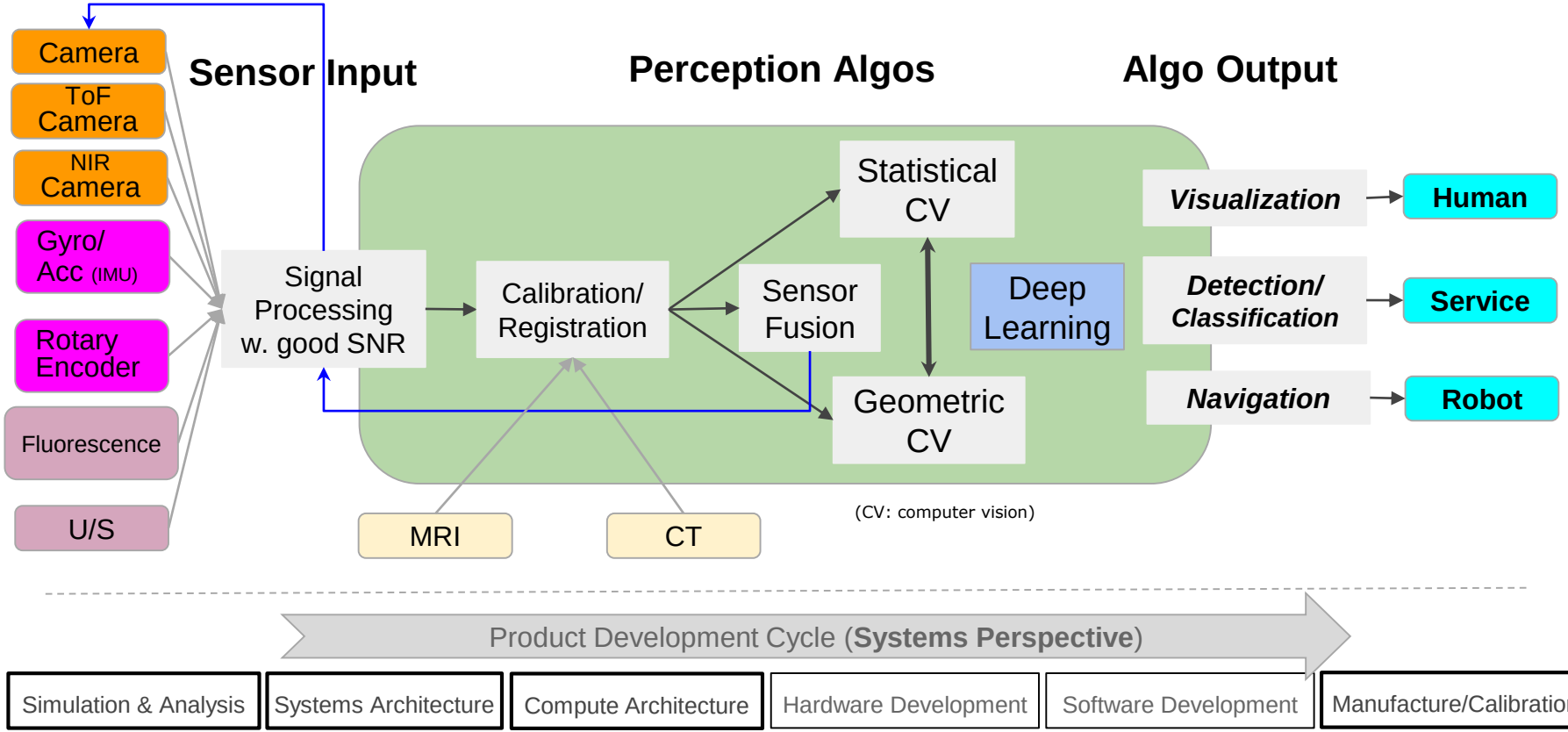
navigation noun

2. the science of getting ships, aircraft, or spacecraft from place to place
especially : the method of determining **position**, **course**, and **distance traveled**

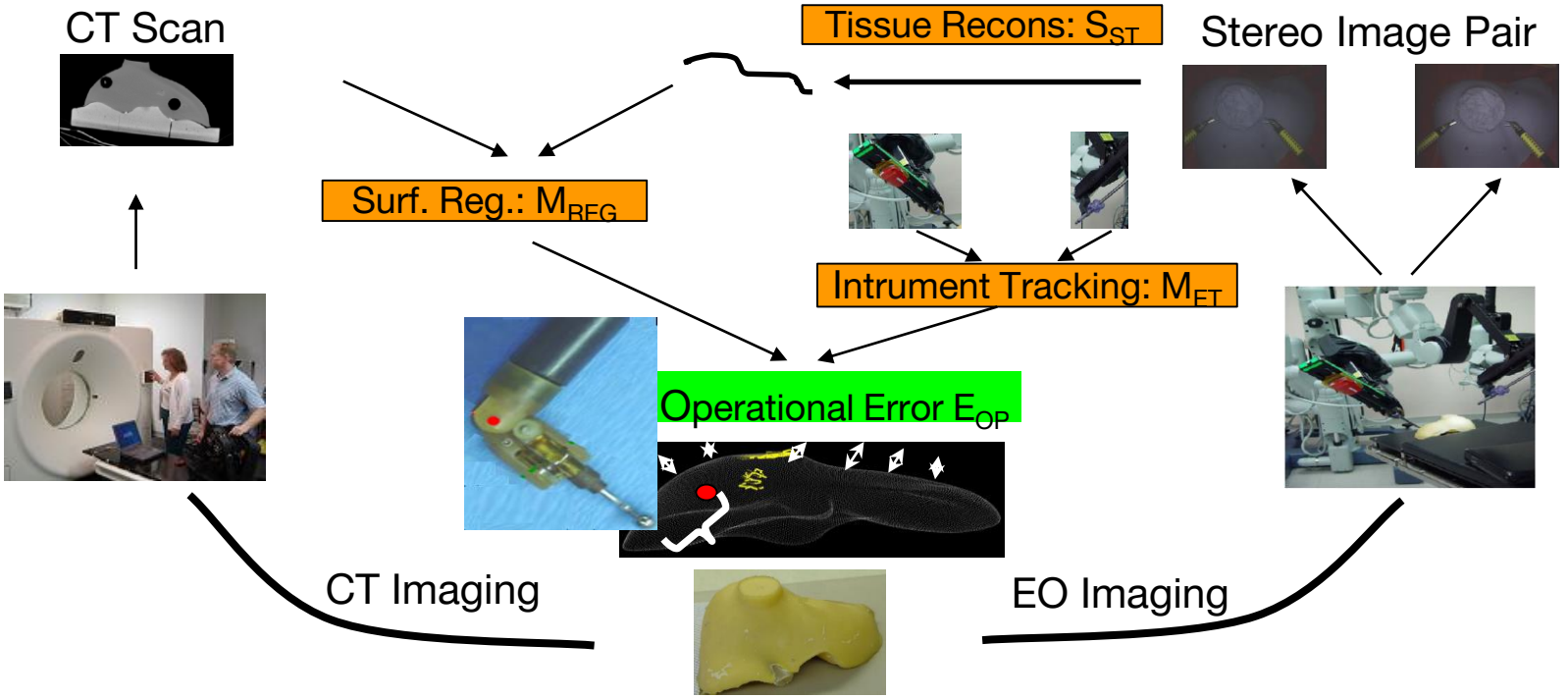
The compass was invented more than 2000 years ago. The first compasses were made of lodestone, a naturally magnetized stone of iron, in Han dynasty China (20 BC – 20 AD).The compass was later used for navigation during the Chinese Song Dynasty (960–1279 AD), as described by Shen Kuo. Later compasses were made of iron needles, magnetized by striking them with a lodestone. Magnetized needles and compasses were first described in medieval Europe by the English theologian Alexander Neckam (1157–1217 AD).

Vikings navigated using sundials calibrated to show the direction of the North Pole. While there is no physical evidence for the navigational techniques adopted on cloudy days, there are references in the Viking sagas to "sunstones" being used.

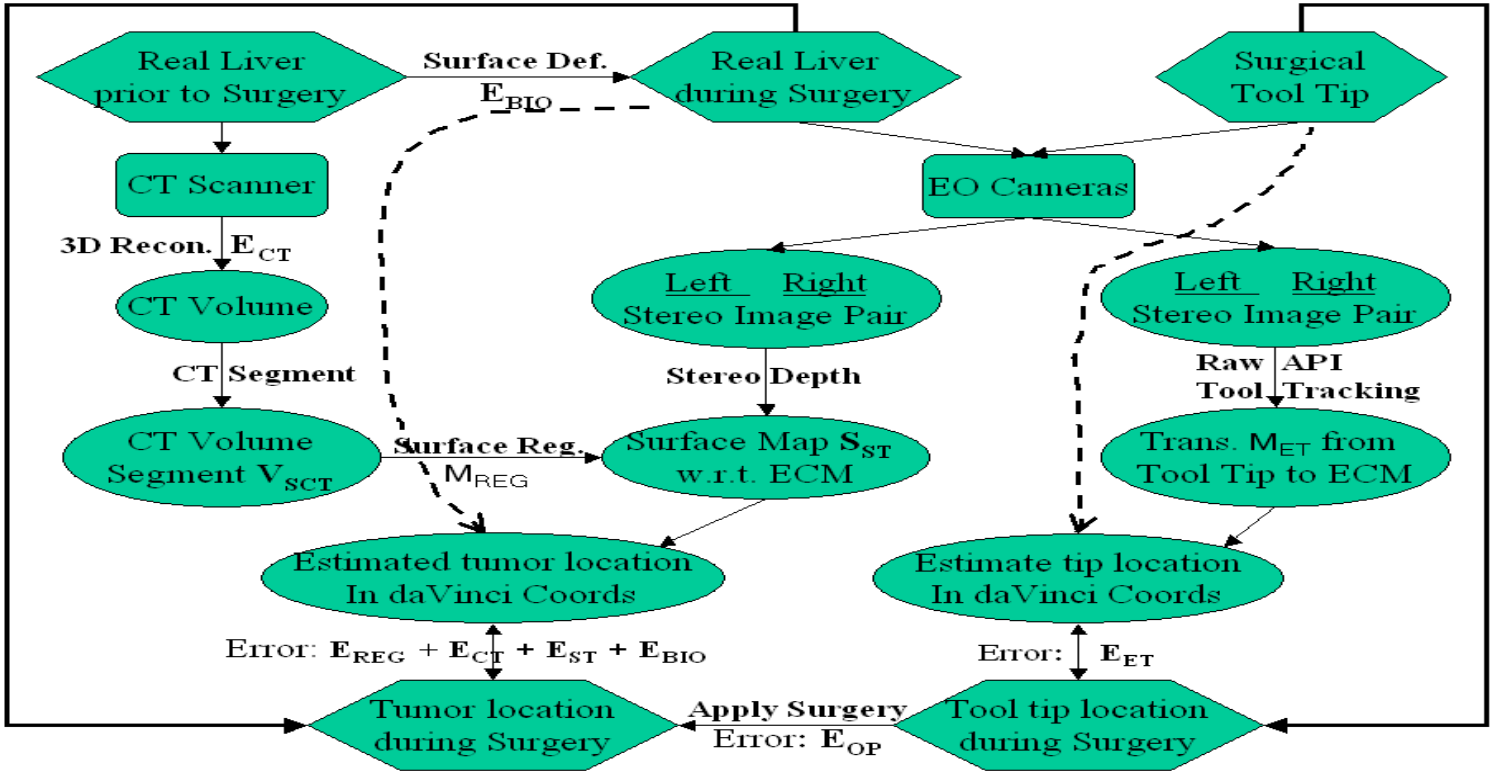
Machine Perception (AI): Wenyi's Systems Perspective



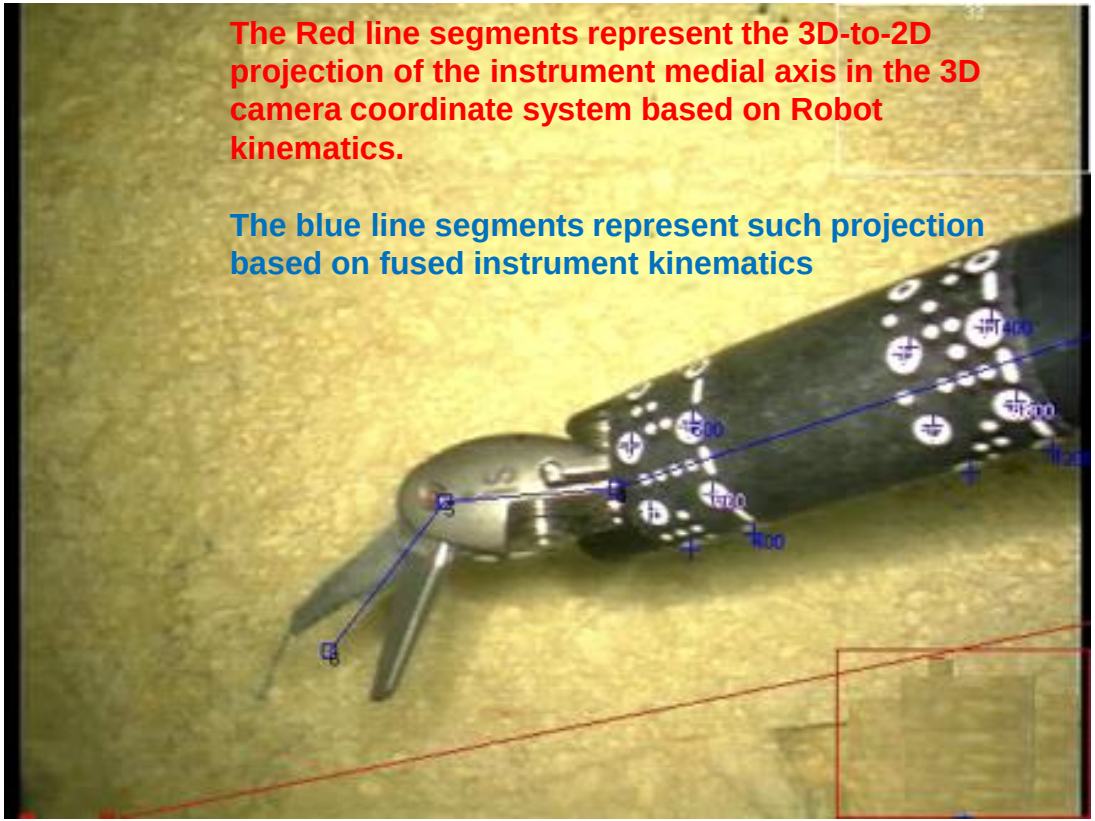
Surgical Robotics Application: Image Guided Surgery



Navigation Application: Image Guided Surgery



Navigation for Surgical Robotics: Instrument Tracking

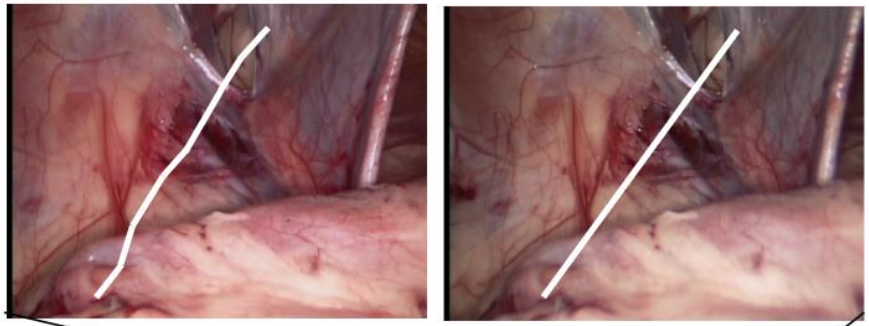


daVinci Instrument Tracking

3D Teletration based on Sparse Tissue Tracking

Mentor drawing on
2D Touch Screen
(local or remote)

Algorithm drawing ← Mentor drawing



Resident seeing where the
mentor draws in 3D

Intuitive Surgical: 2007 -