Thoughts on Feature Extracting for Point cloud

Part I: TLS and BS Yang 2016, Elsevier

7/6/2017

Scanning (TLS)

- Similar to Sonar and Radar but uses Light (Light Detection and Ranging)
- Initial of LiDAR use began in the 1960's in studies of atmospheric composition, surveying, law enforcement, etc.
- Transmits a pulse of light and records the returned pulse of light – records time, divides by two, and multiplies by the speed of light for distance
- Able to record thousands of points a second recording target position (X,Y,Z), intensity, and color (RBG)
- Capable of relative positioning at mm to cm accuracy

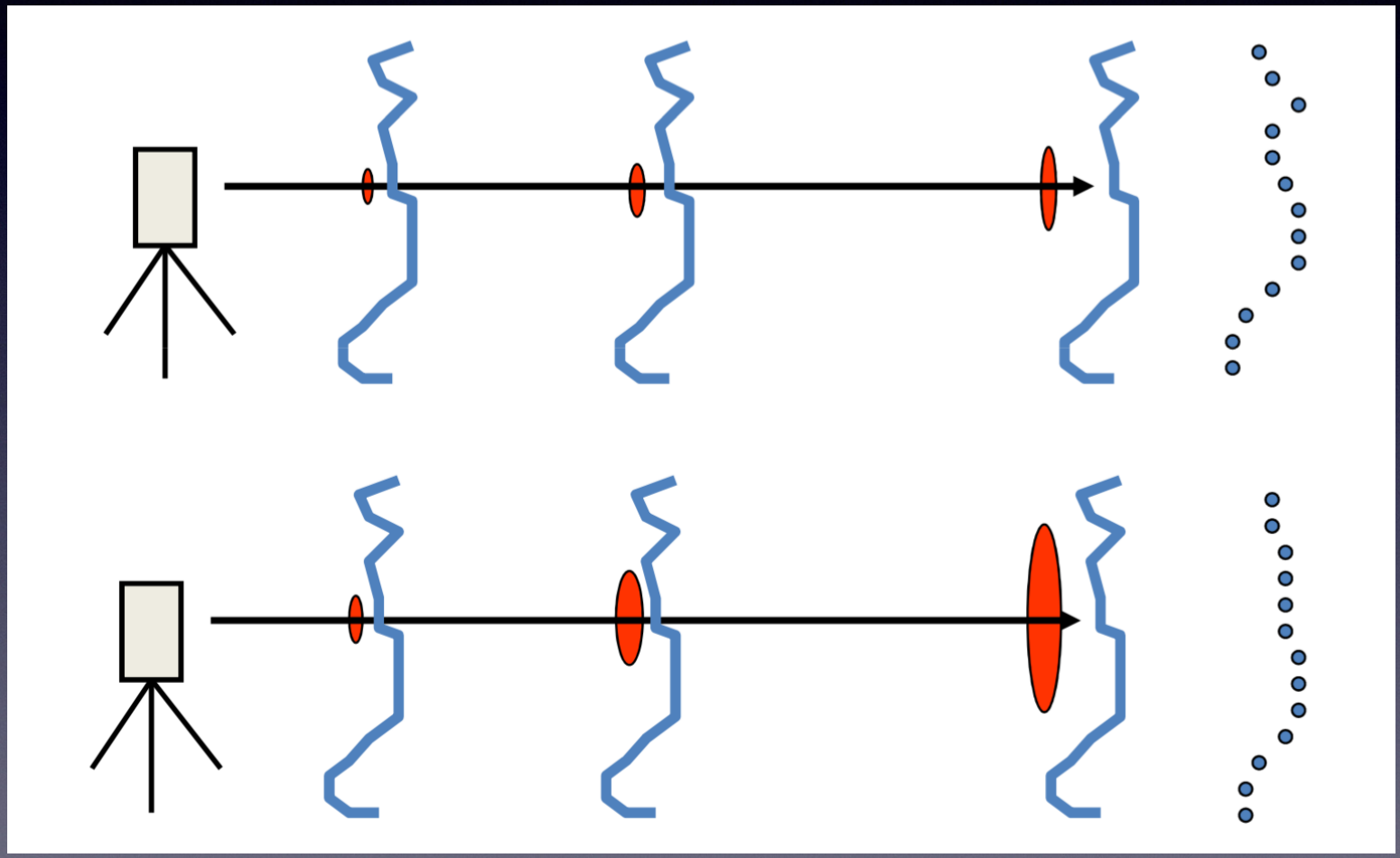
LASER SCANNERS

- Beam deflection mechanism provides elevation and azimuth of the transmitted pulse
- Return-beam detection device records return time and provides range calculation from two-way travel time
- Energy of the return pulse (intensity) and the color (RBG) is recorded
- Full waveform now recorded on some TLS instruments

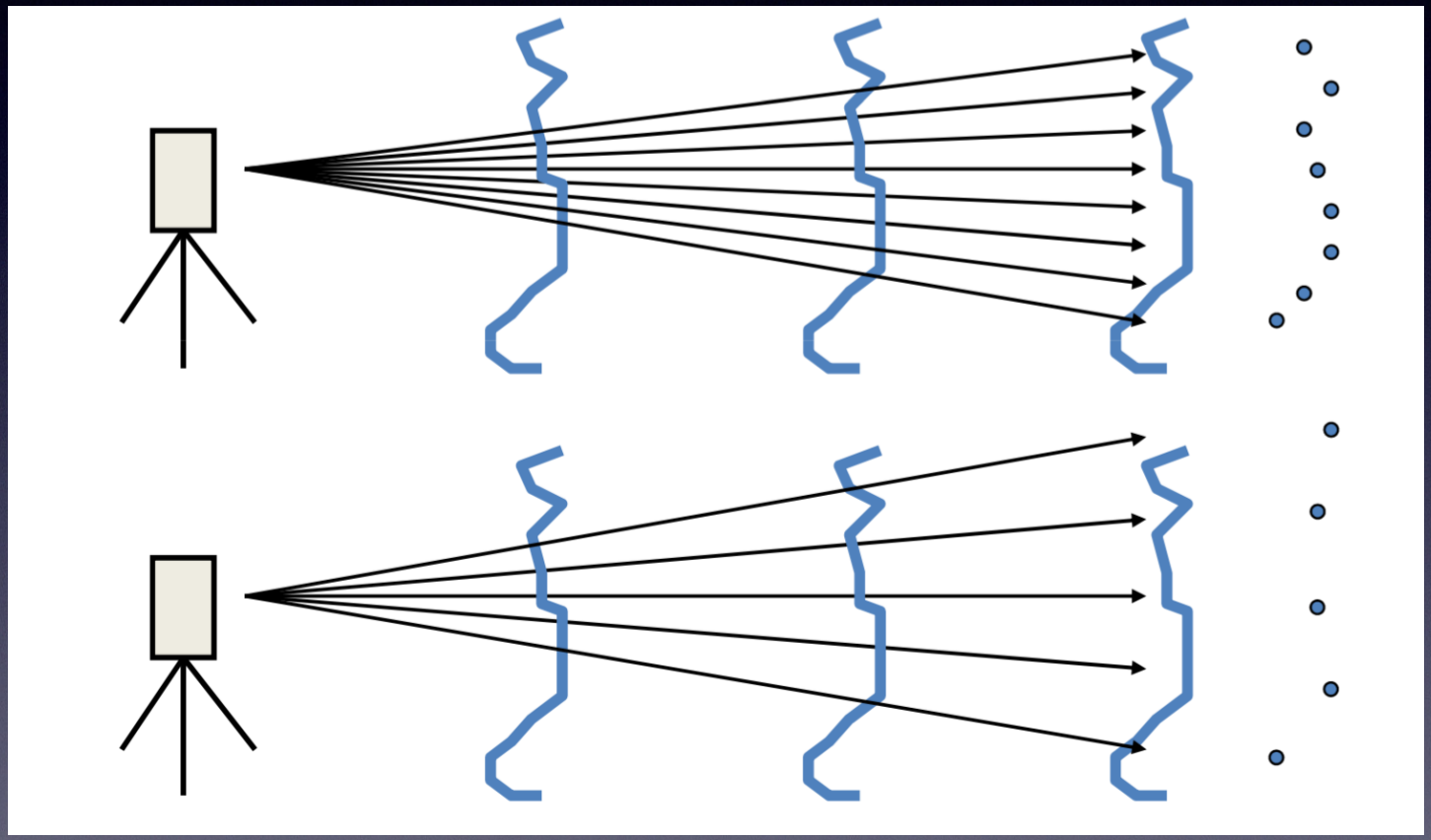
Scanner Parameters

- Beam Divergence
- Angular Step
- Range Distance
- Field of View
- Points Per Second
- Size and Weight

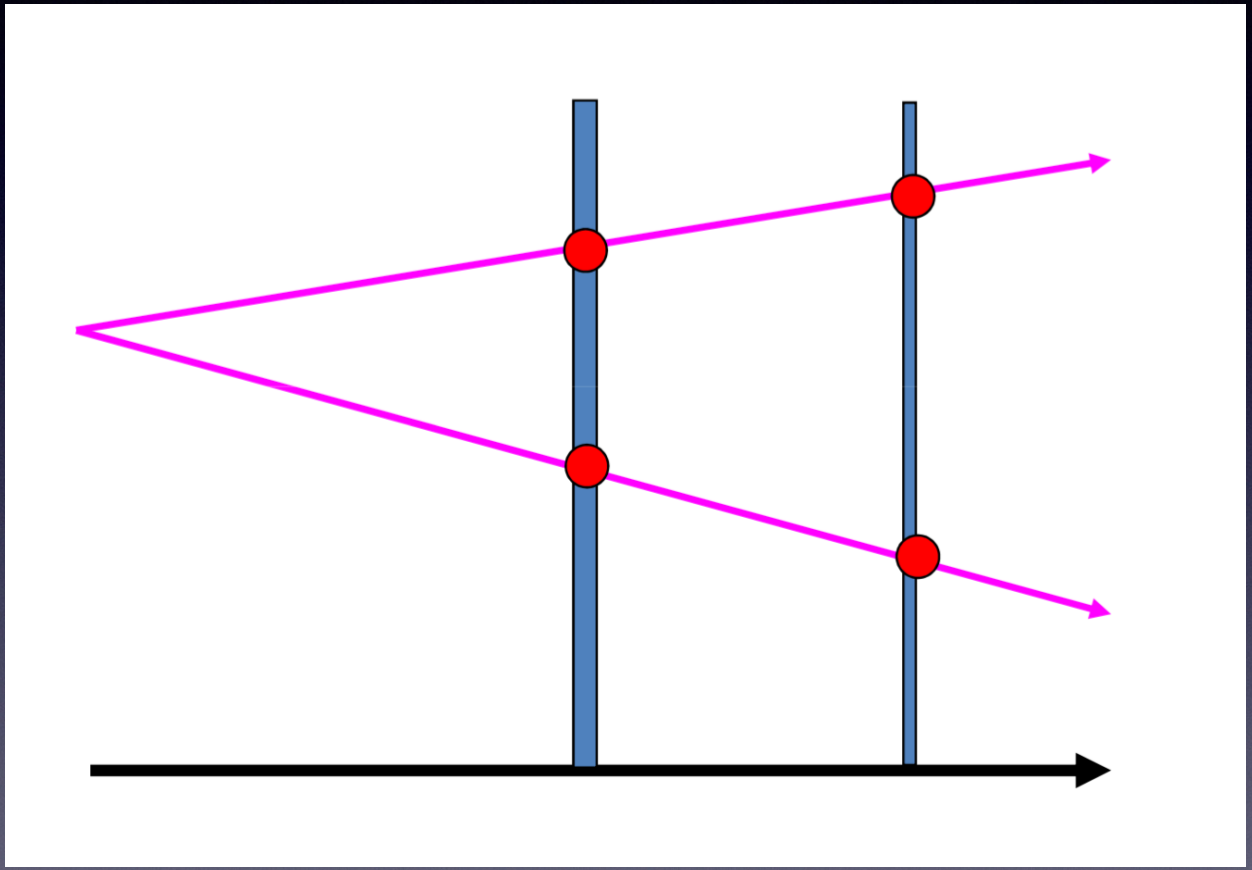
Beam Divergence



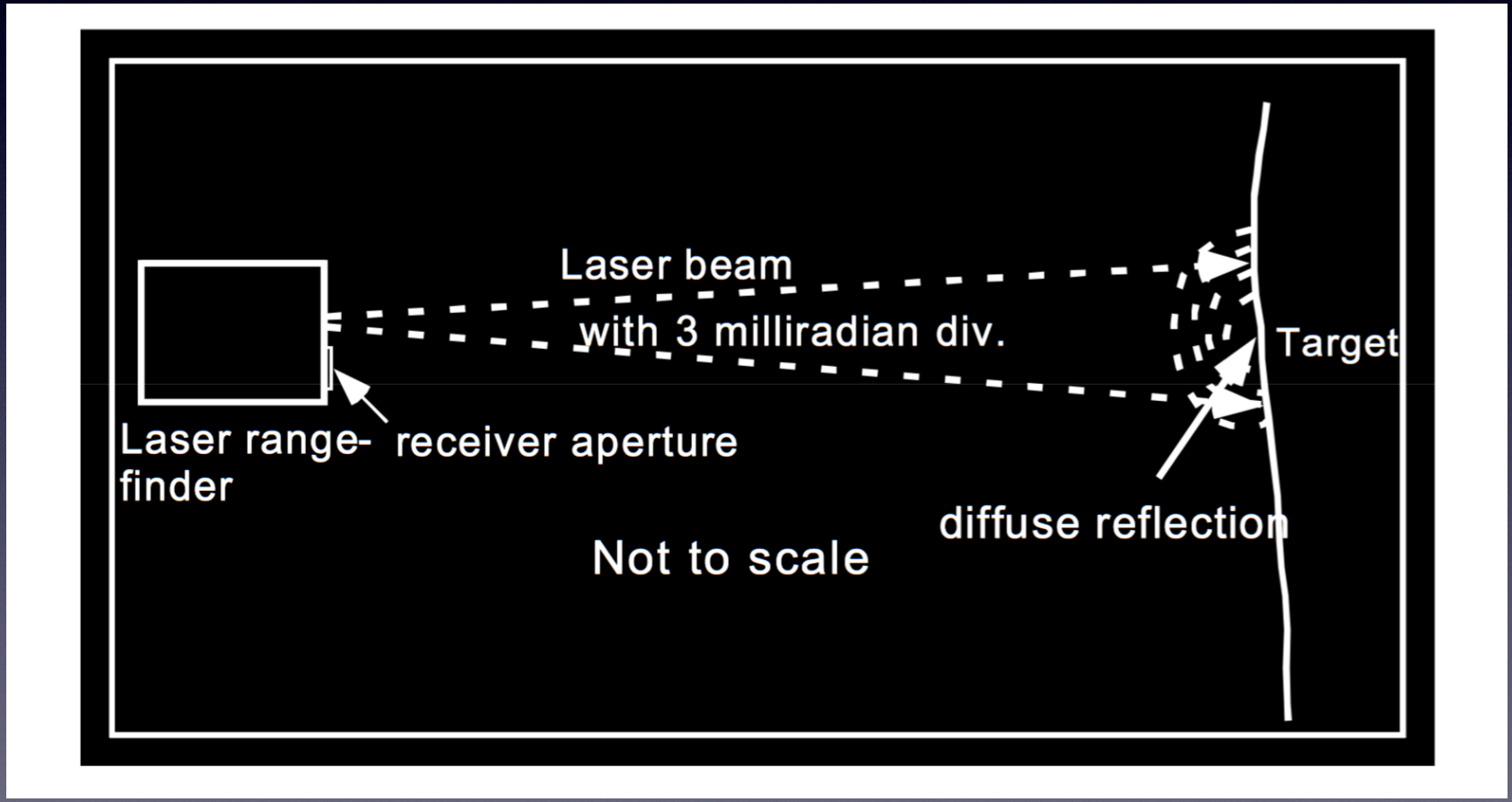
Angular Step



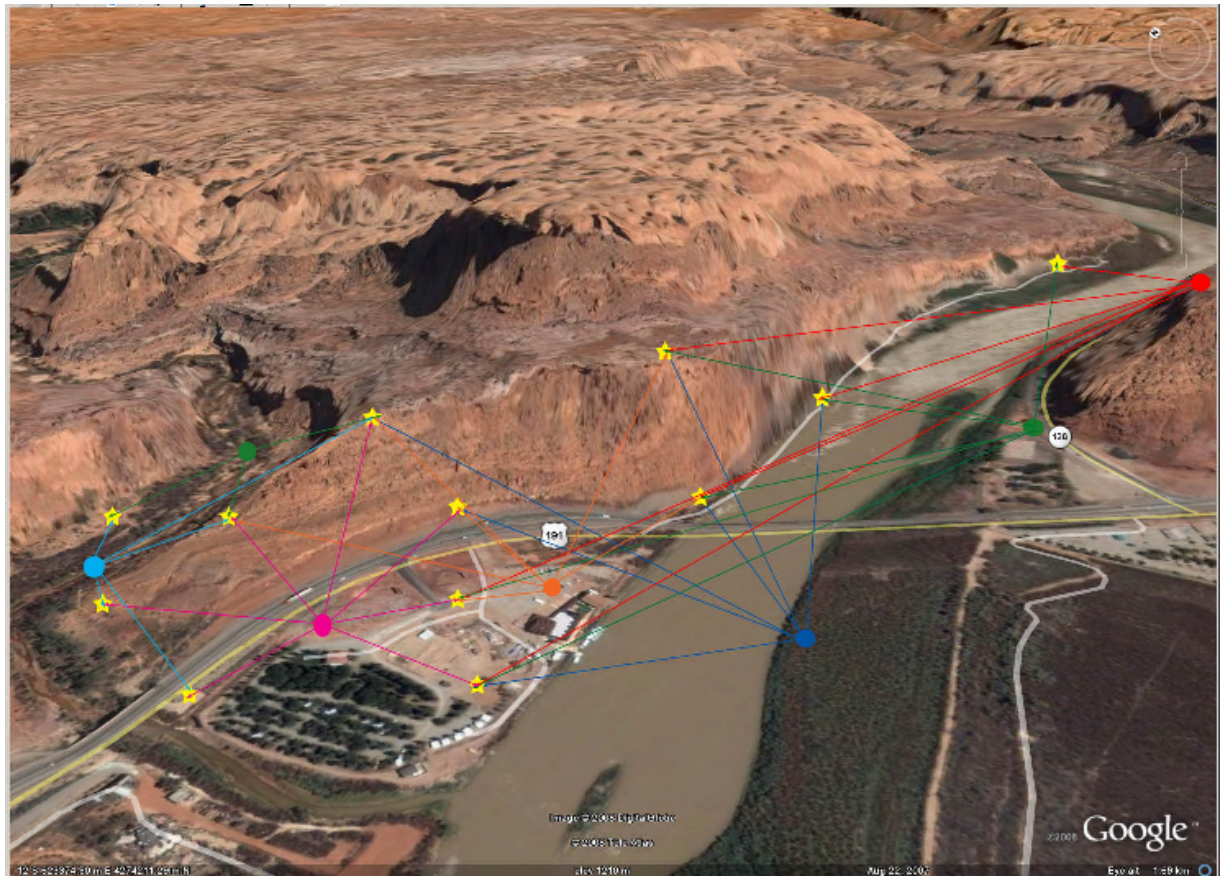
Range/Azimuth resolution



Diffuse


Laser beam
with 3 milliradian div.
Target
Laser range-
finder
receiver aperture
diffuse reflection
Not to scale

Placement and Survey of the Controls



Calibration

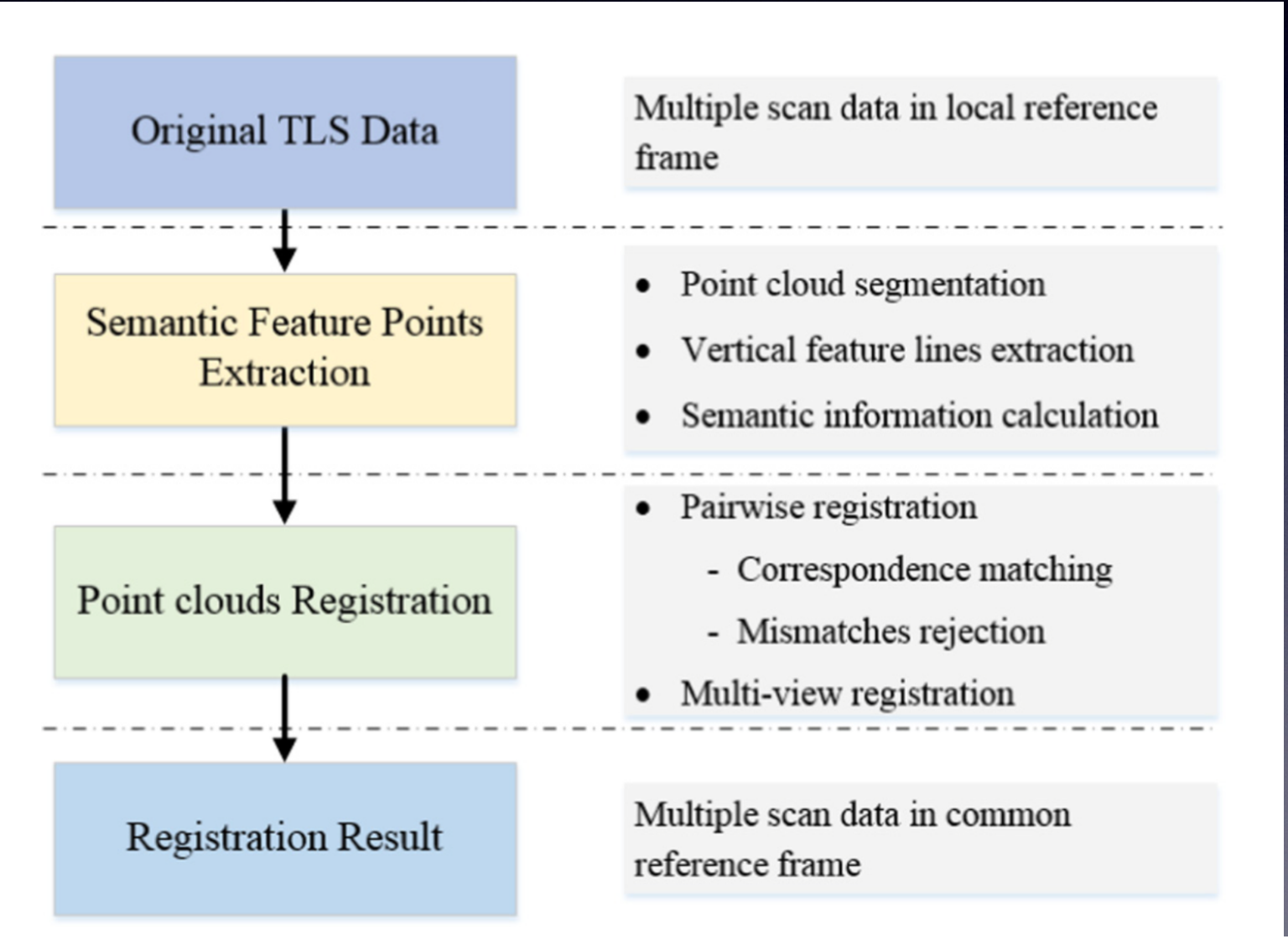
– Need to document multiple measurements of known geometry

– Compare with allowable variance • QualityControl

– Multiple measurements of known geometry with multiple scanner positions

Point Registration

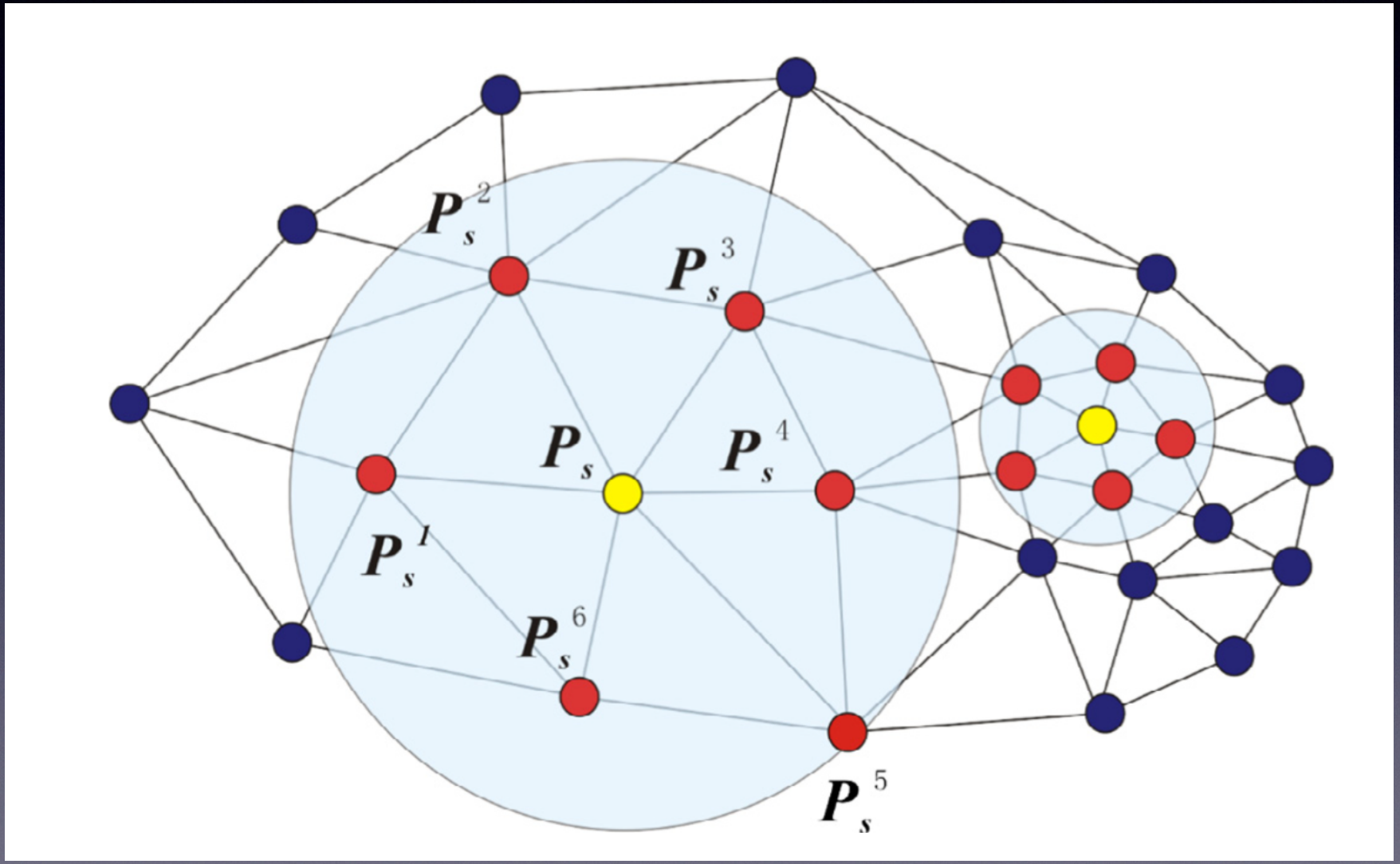
Reference: Bisheng Yang, 2016, Elsiver



Key Idea of BS Yang,2016

- 1.Feature selection and grouping:
- Vertical
- pole-like
- intersection
- 2. algorithm ICP? (it does not matter actually, just a tool)
- 3. Multi-view (We can not use in auto drive ?)

Segmentation of Vertical Planes



Brain storming

- what is good Feature Selection for outdoor environment?
- what is successful or effective Feature Selection for Point clouds obtained from auto drive?
- Always good to learn more, but there is also a need to focus on the unique properties of auto drive point cloud to lead to converge of our research. And here is the space we may have opportunities to play around some stuff and have our innovation and solve the real problem&pushing the edge of this area.