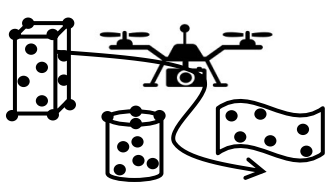
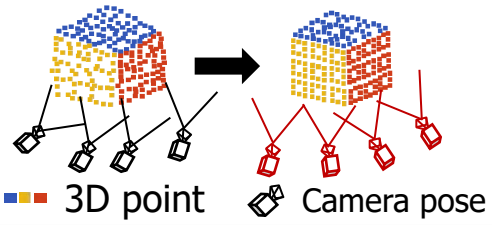
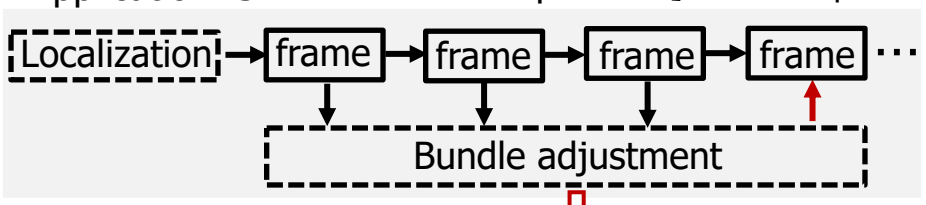
Point-to-Camera Search Based Partition and Visible Camera Counting Based Fusion for Hardware-Oriented Parallel Bundle Adjustment

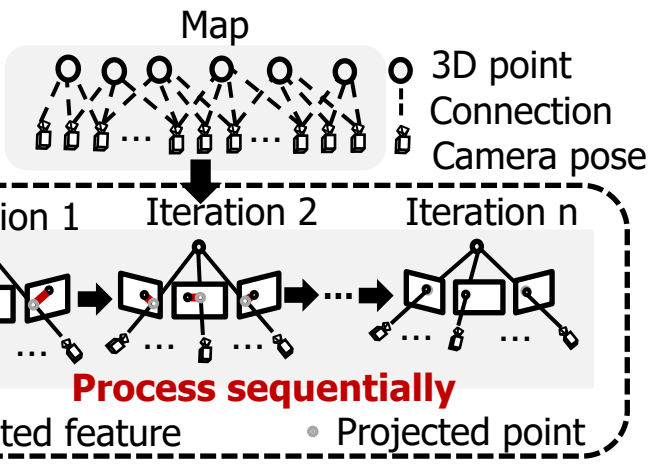
修士課程卒業　譚浩軒

➢ Research Background









Target

Hardware-oriented parallel bundle adjustment

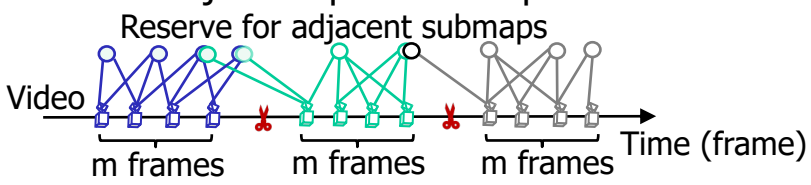
Challenge

To reduce data dependence of camera poses and points

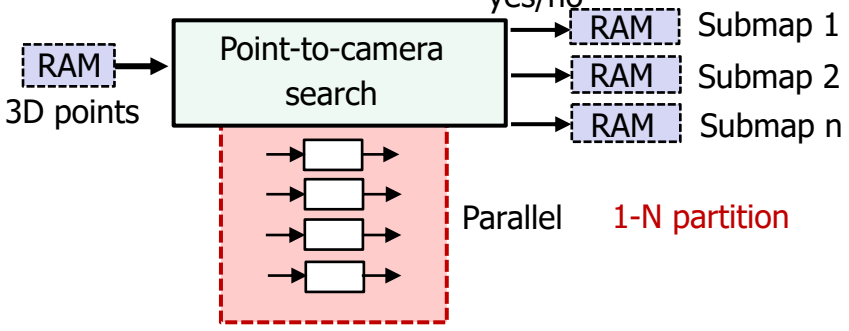
➢ Proposals

Submap partition

P1: Time-adjacent quantitative partition



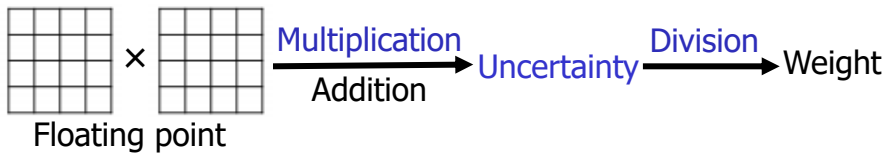
P2: Point-to-camera search



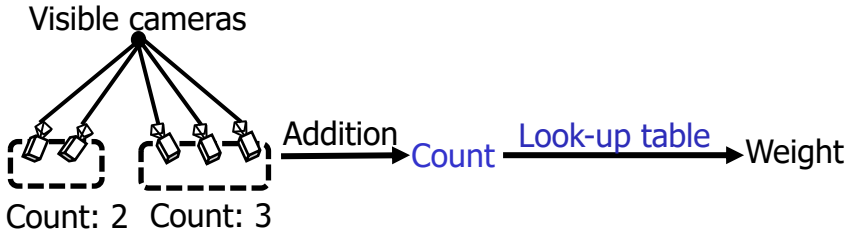
Submap fusion

P3:Visible camera counting

- Conventional work



- Proposal

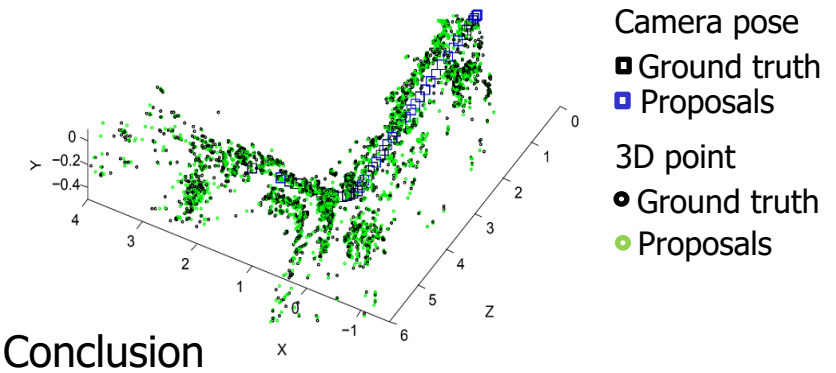


(Integers with limited values)

➢ Experiment Result

Error	Camera poses		3D points
	Rotation	Translation	Position
Dataset01-08	P1		P1+P3
Average	0.22°	1.1%	0.83%

	Time consumption on hardware by HLS(ms)		
	P1	P1+P3	P1+P2+P3
Partition	6.73	6.73	1.16
Fusion	0.46	0.19	0.19
Total	7.19	6.92	**1.35**
Frequency	123.457MHz		



➢Conclusion

- Acceleration of submap partition and fusion:

1.16 ms delay of partition and 0.19 ms delay of fusion on FPGA

- Reasonable error compared with original bundle adjustment

0.22° error of rotation, 1.1% relative error of translation of camera pose 0.83% relative error of position of 3D point

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