

The Climbing Sensor

3-D Modeling of Narrow Areas for Cultural Heritage

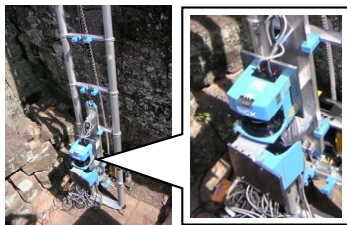
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We propose a novel type of 3-D scanning system named ‘Climbing Sensor.’ This system has been designed for scanning narrow and stalky spaces, which are hard or extremely inefficient to scan by ordinary commercial laser range scanners due to their dimensions and limitation of FOVs. The climbing sensor equips a platform with two line scanners on a commercial lift, and they scan through the whole target while the lift moves upwards or downwards along a ladder. One scanner is for scanning the target, which scans horizontally as the lift moves vertically, and the other scanner is for localizing the platform, which scans vertically. By using spatio-temporal range image acquired from the vertical scanning, we can accurately calculate the speed of the moving platform, with which a correct 3-D model can be constructed from horizontal scans.

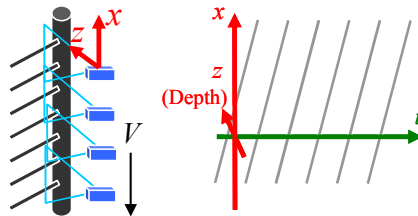
We applied this system to The Bayon Temple in Cambodia as a part of our digital archiving project of cultural assets. The scanning results proved that the system gives a sufficiently accurate 3-D model and also proves the effectiveness of our proposed system and speed estimating process.

Publication

- [1] K. Matsui, S. Ono, K. Ikeuchi, “The Climbing Sensor: 3-D Modeling of a narrow and vertically stalky space by using spatio-temporal range image,” in *Proc. Int’l Conference on Intelligent Robots and Systems (IROS)*, Aug. 2005



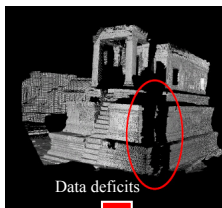
Outlook of the system



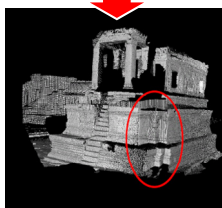
Spatio-temporal range image for localization



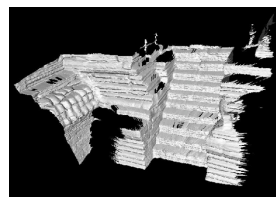
Narrow area (in Bayon)



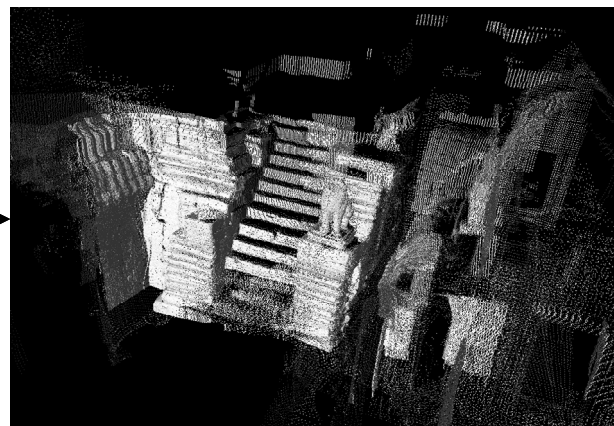
Data deficits



Effect of the system



Modeling result by our system and Z+F Imager



Aligned result