镭神智能

LeiShen Intelligent System

The leader of the global lidar industry

Lidar UAV 3D Modeling System——"Gold eye-1"

www.leishen-lidar.com

1. Introduction

LiDAR can quickly, accurately, and massively acquire 3D spatial information point cloud data of target objects, and restore the 3D model of the building by pre-processing point cloud data, extracting and matching features, and incrementally constructing maps.

"God Eye-1" is a LiDAR point cloud data acquisition system for geographic information detection independently developed by Leishen. It integrates LiDAR, GNSS / INS positioning and attitude measuring system (POS), camera and storage control unit. Combined with the needs of surveying and mapping applications such as forestry surveys, topographic mapping, smart cities, power inspections, and emergency surveys, it has two specific solutions: real-time 3D modeling and offline 3D modeling. It can be mounted on various multi-rotor drones. The flying platform can quickly and massively collect high-precision point cloud data and rich image information, which is widely applicable to the acquisition of three-dimensional spatial information in the fields of surveying and mapping, electric power, forestry, agriculture, land planning, geological disasters, and mine safety.

2. System configuration

2.1 Real-time 3D modeling system

The real-time 3D modeling system is mainly composed of UAV flight control platform, LiDAR,IMU,HD camera (optional later), data acquisition and data processing core algorithm unit, processor module, data transmission module and ground remote server:

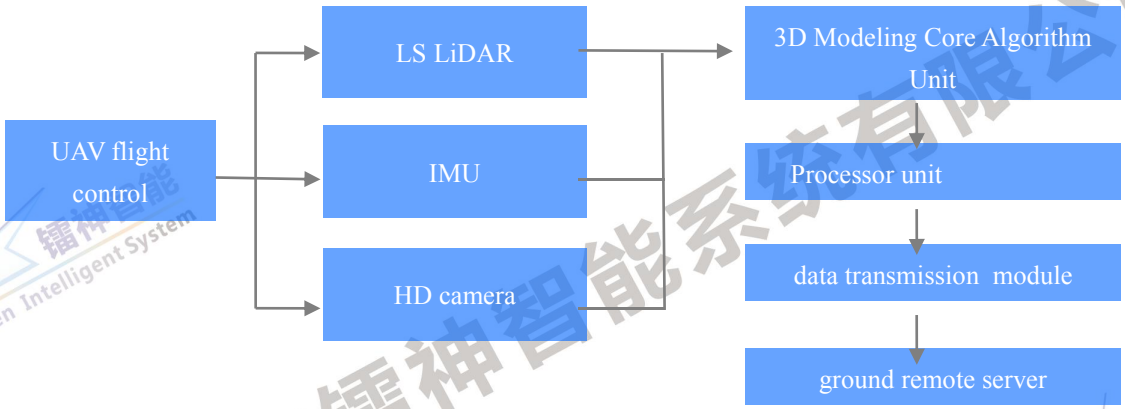


Figure 2 Architecture diagram of real-time 3D modeling system

(1)UAV flight control platform: provides a system to collect data, according to the field operating environment, complete the collection of 3D point cloud data of the entire operation scene by flying around the building.

(2) LS LiDAR: the core sensor of the system, through loading the UAV gimbal, can provide real-time point cloud data for the operating environment within the space radius of 200-300m.

(3)IMU: provides real-time data and spatial position transformation data of the UAV flight control platform, which is the reference basis for laser point cloud data registration and provides positioning data for the system in the world coordinate system.

(4)3D Modeling Core Algorithm Unit: real-time point cloud data collection and preprocessing of the surrounding environment through LiDAR,and 3D modeling of the entire spatial increment through registration modeling algorithms.

(5) Processor module: It is the hardware processing platform for the entire system algorithm. The high-performance processor guarantees the real-time performance of big data processing and modeling algorithm operations.

(6) Data transmission module: transmits the real-time 3D scene map after the system is built back to the ground remote server.

(7) Ground remote server: present the real-time 3D map through 3D display software.

(8) HD camera: It is an optional functional component that provides fusion registration data and mapping information for laser point cloud processing through calibration and lidar coordinate parameters.

2.2 Offline 3D modeling system

The offline 3D modeling system is mainly composed of UAV flight control platform,LiDAR, IMU, HD camera (optional), data acquisition and data processing core algorithm unit, processor module and ground remote server :

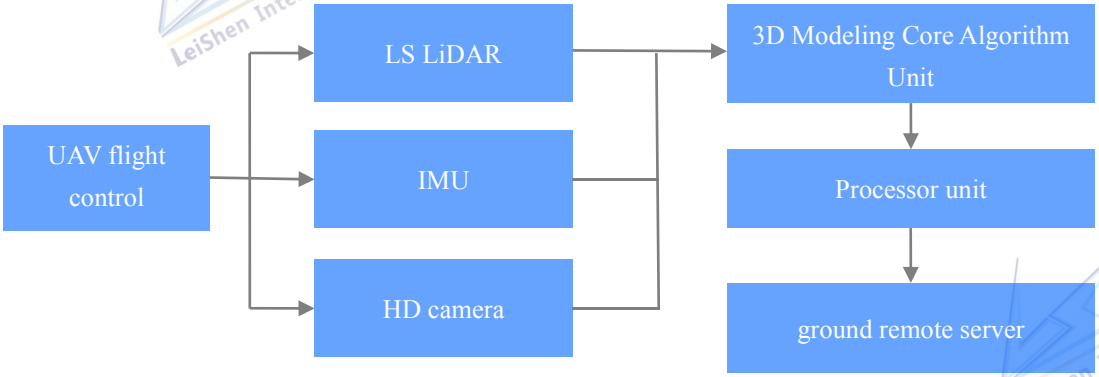


Figure 3 Architecture diagram of offline 3D modeling system

3. The main equipment of the system

LiDAR (also compatible with other other LS LiDAR)	Model		MS-C16	MS-CH32
	Laser safety level		meets first-level eye safety standards IEC60825-1:2014	
	Longest detection distance		200m	300m
	Accuracy		±3cm	±2cm
	Horizontal FOV		360°	120°
	Angle Resolution	Horizontal	0.18°	0.18°
		Vertical	1.33°	0.33°
	Measuring point rate	Single return	320k point/s	426K point/s
		Dual return	640k point/s	852 K point/s
	Operating temperature		-20℃ - 60℃	-40℃ - 85℃
	Environmental Protection		IP67	IP67
IMU System	GNSS		GPS, GLONSS, GALILEO, BD	
	Real-time accuracy heading angle		0.2°	
	Real time accuracy		0.1°	
	Speed accuracy		0.02m/s	
	Bias stability		< 5° /h	
	Data update rate		200Hz	
	Operating temperature		-40℃-70℃	
IPC	CPU		Intel Core J1900	
	Ram		DDR3L 4G	
	Storage		128G	
Data transmission module (Offline 3D modeling system doesn't contain this module)	Frequency		1.4Ghz	
	Bandwidth		10Mhz	
	Rate		30Mbps	
	Transmission distance		>3Km	
	Operating temperature		-20℃- 75℃	
Remote server	PC			

HD camera (Optional)	Optical zoom	15times
	Dynamic effective pixels	above 300w
	Anti-shake function	Optical physical image stabilization
	Lens focal length	12.8-167mm
Adapt software	LiDAR point cloud preprocessing software	
	LiDAR control and calculation	
	Point cloud processing and analysis software	

4. System Features

(1) Non-contact acquisition security

Laser scanning technology uses a non-contact scanning target method to measure. It does not require any surface treatment to scan the target object and collects the 3D point cloud data on the surface of the object directly, solve situations where dangerous targets, environments, and personnel are difficult to reach.

(2) Fast and high sampling rate

Lidar data acquisition rate can reach hundreds of thousands of points per second, and angular resolution can reach 0.01 degrees.

(3) Real-time, dynamic and active (real-time 3D modeling system)

The real-time 3D modeling system scans the real-time dynamic environment while collecting data and processing the modeling, and the incremental mapping is an active scanning of the scene.

(4) Massive data offline processing (offline 3D modeling system)

The offline 3D modeling system can read the laser point cloud data and the combined

IMU data offline. The modeling process can be preprocessed multiple times offline, and the point cloud data can be processed in large quantities with high accuracy.

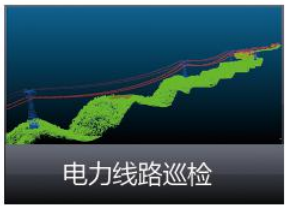
(5) High resolution, high precision and high density

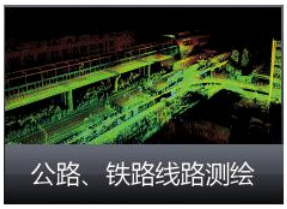
LiDAR can acquire massive data of the scene with centimeter-level accuracy, and can perform high-density repeated angle overlapping acquisition.

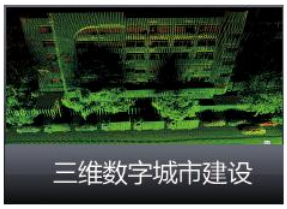
(6) Optional HD digital camera

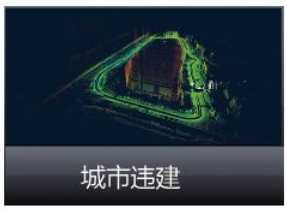
The optional use of high-definition digital camera enhances the acquisition of color information for scene modeling, making target information more clear and detailed.

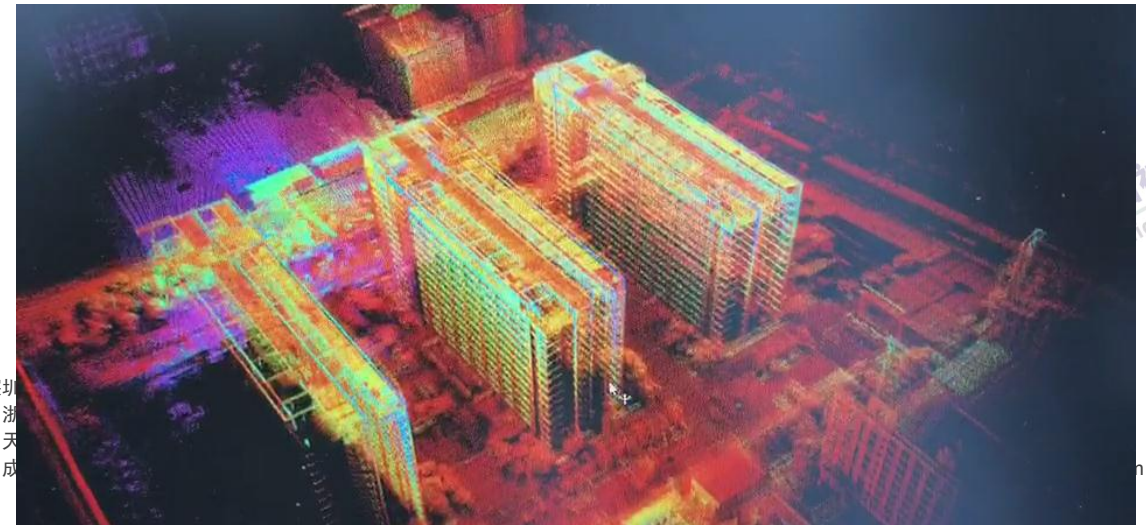
5. Application fields











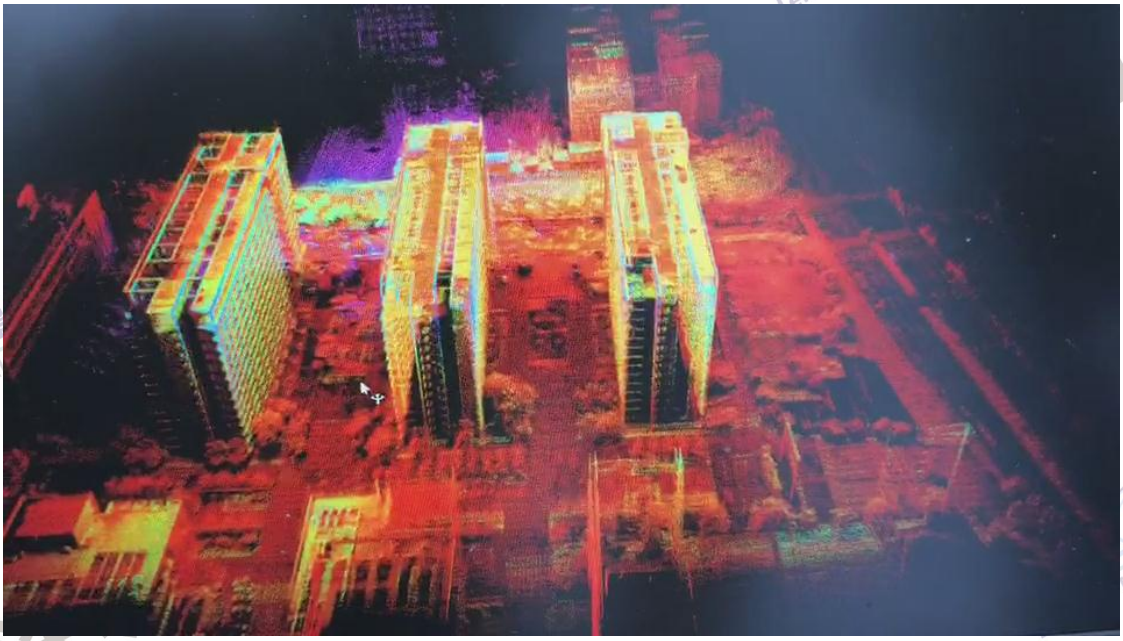


Figure 4 Real-time 3D modeling effect

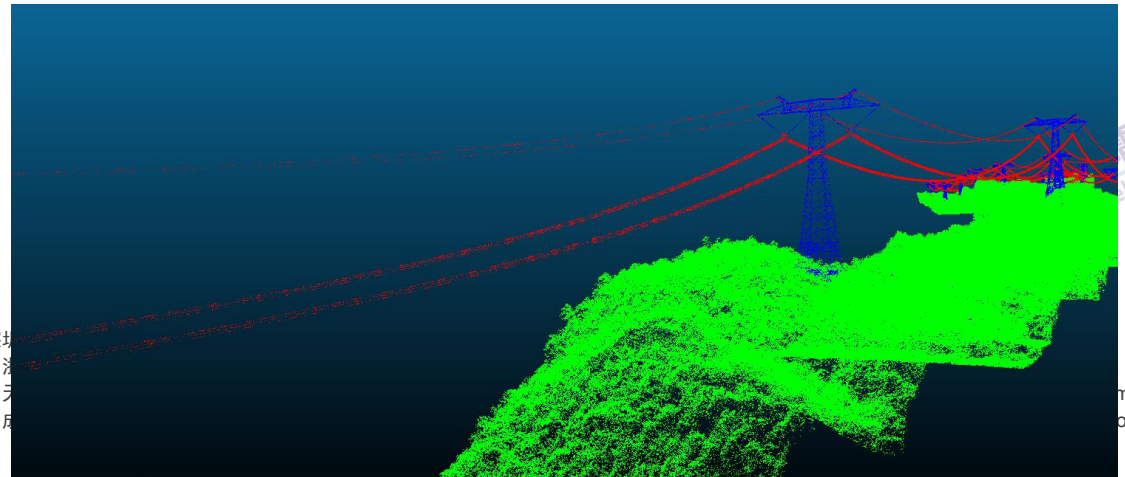


Figure 5 Offline 3D modeling effect

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