LVX

Specifications

v1.0.0.0

Document Release History		
Date	**Release**	**Change Description**
2019/2/25	V1.0.0.0	First release

CONTENTS

1 LVX Format v1.0

This document describes the specifications of LVX format v1.0. The LVX file is a point cloud file format developed by Livox, based on the company's LiDAR sensors. This file format allows users to play the point cloud file at a base frequency of 20 Hz. At the same time, users can also acquire point cloud data from a single device from this file for more complex algorithm development.

2 LVX Format Definition

The format contains binary data consisting of public header block, device info block, and point cloud data block.

PUBLIC HEADER BLOCK
DEVICE INFO BLOCK
POINT DATA BLOCK

All data are in little-endian format. The header block consists of file signature, version information, and a magic code. The length of the devices info block is variable, capable of accommodating any number of devices. The point cloud data block has point cloud data organized by package, and these packages are organized by frames in each file.

3 Data Types

The following data types are used in the LVX format.

- char (1 byte)
- unsigned char (1 byte)
- short (2 bytes)
- unsigned short (2 bytes)
- int (4 bytes)
- unsigned int (4 bytes)
- long long (8 bytes)
- unsigned long long (8 bytes)
- float (4 bytes IEEE floating point format)
- double (8 bytes IEEE floating point format)

4 Public Header Block

Item	Format	Size
File Signature (“livox_tech”)	char[16]	16 bytes
Version-A	char	1 byte
Version-B	char	1 byte
Version-C	char	1 byte
Version-D	char	1 byte
Magic Code	unsigned int	4 bytes

File Signature: The file signature must contain “livox_tech” as it is required by the LVX specification. These characters can be checked by Livox Viewer as an initial determination of file type. Note that the first 10 bytes should be “livox_tech”, and the last 6 bytes should be zero filled.

Version: Version a is 1, version b is 2, version c is 0, version d is 0.

Magic Code: This field should be a value of 0xac0ea767. Livox Viewer will not identify a LVX file with an incorrect Magic Code.

5 Device Info Block

Item	Format	Size
Device Count	unsigned char	1 byte
Device Info 0	struct	58 bytes
……		
Device Info N	struct	58 bytes

Device Count: The length of device info block is variable to suit several devices. This field should be a value of the count of devices;

Device Info: This is a field that provides information of each device. This field is defined as:

Item	Format	Size	Description
LiDAR SN Code	char[16]	16 bytes	LiDAR broadcast code
Hub SN Code	char[16]	16 bytes	Hub broadcast code Note that an empty Hub SN means there is no Hub connecting this LiDAR

Device Index	unsigned char	1 byte	Index in device info list
Device Type	unsigned char	1 byte	Device type: 0: Livox Hub 1: Mid-40/Mid-100 2: Tele-15 3: Horizon
Roll	float	4 bytes	Extrinsic parameters: Roll angle, Unit: degree
Pitch	float	4 bytes	Extrinsic parameters: Pitch angle, Unit: degree
Yaw	float	4 bytes	Extrinsic parameters: Yaw angle, Unit: degree
X	float	4 bytes	Extrinsic parameters: X translation, Unit: m
Y	float	4 bytes	Extrinsic parameters: Y translation, Unit: m
Z	float	4 bytes	Extrinsic parameters: Z translation, Unit: m

Note that users can use Device Index to extract point cloud data of each device from a LVX file.

6 Point Cloud Data Block

Data from the Point Cloud Data Block are composed of frames, and each frame is composed of packages.

Item	**Format**	**Size**
Frame 0	struct	N bytes
Frame 1	struct	N bytes
……		
Frame N	struct	N bytes

Frame is defined as:

Item	**Format**	**Size**
Frame Header	struct	16 bytes
Package 0	struct	1319 bytes
Package 1	struct	1319 bytes
……		
Package N	struct	1319 bytes

Frame Header is defined as:

Item	Format	Size	Description
Current Offset	long long	8 bytes	Absolute offset of the current frame in this file
Next Offset	long long	8 bytes	Absolute offset of next frame in this file
Frame Index	long long	8 bytes	Current frame index
Package Count	long long	8 bytes	Count of packages in this frame

Package is defined as:

Item	Format	Size	Description
Device Index	unsigned char	1 byte	Refer to Device Info
Version	unsigned char	1 byte	Package protocol version, 5 for the current version
Slot ID	unsigned char	1 byte	ID of the slot connecting LiDAR Device: For more details, please refer to Livox SDK Communication Protocol
LiDAR ID	unsigned char	1 byte	1: Mid-100 Left / Mid-40 / Tele-15 / Horizon 2: Mid-100 Middle 3: Mid-100 Right
Reserved	unsigned char	1 byte	
Status Code	unsigned int	4 bytes	LiDAR status indicator information, please refer to Livox SDK Communication Protocol for more details
Timestamp Type	unsigned char	1 byte	Timestamp Type, please refer to Livox SDK Communication Protocol for more details
Data Type	unsigned char	1 byte	Point Cloud Coordinate Format: 0: Cartesian Coordinate 1: Spherical Coordinate
Timestamp	unsiged char[8]	8 bytes	Nanosecond or UTC Format Timestamp, please refer to Livox SDK Communication Protocol for more details
Point 0	struct	13 bytes	Point information
Point 1	struct	13 bytes	Point information
……			
Point 99	struct	13 bytes	Point information

Point is defined as:

Item	Format	Size	Description
x	float	4 bytes	X axis, Unit: m Calculated by extrinsic parameters.
y	float	4 bytes	Y axis, Unit: m Calculated by extrinsic parameters.
z	float	4 bytes	Z axis, Unit: m Calculated by extrinsic parameters.
Reflectivity	unsigned char	1 byte	Reflectivity between 0-255