Seeed Studio Tiny Frame Interface

Fall detection

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1. Application project

For different application projects, all messages related to TF frames are listed for users to refer to and complete the analysis. The message classes and message data bits that appear in the document are equipped with corresponding actual projects.

1.1. Fall detection project

Message type: Report fall detection project test result 0x0E02

The message type is 0x0 E02 and only supports one-way data transmission mode .

The radar sends data to the host computer: MSG_ IND_ FALL_STATUS					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	For reporting fall test results.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0E 02	
HEAD_CKSUM	1 byte	uint8	header checksum	F3	
DATA	1 byte	uint8	[is_fall]	01	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

The following is the corresponding meaning of each DATA bit :

- [is_fall] : Determine whether to fall.
  - Value is 0 : normal.
  - Value 1: Fall.

Message type: Set installation height 0x0E04

The message type is 0x0 E04 and supports bidirectional data transmission mode .

The host computer sends data to the radar: MSG_ IND_ FALL_ SET _HIGH					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Used to set the radar installation height.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 04	
TYPE	2 bytes	uint16	Frame type	0E 04	
HEAD_CKSUM	1 byte	uint8	header checksum	F0	
DATA	4 bytes	float	[high]	00 00 20 40	
DATA_CKSUM	1 byte	uint8	Data checksum	9F	

The following is the corresponding meaning of each DATA bit :

- [high] : Set the radar installation height, ranging from 1 to 5m.

Convert to float: For example, the [x_point] bits are 0x66 , 0x66 , 0xA2 , 0x41. First, spell them into uint 32- bit integer. Since the TF frame Data bits are little endian, the value is 0x41A26666 , and then perform float type enhancement. Turn, the final result is: 20.3 .

```
int main( void )
{
unsigned int param = 0x41A26666;
    float res = *( float *)&param;

printf( "data: %f\n" , res);
    return 0;
}
```

Message type: Return result 0x0E04 after setting the installation height

The radar returns data to the host computer: MSG_ IND_ FALL_ RES					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Used to return the status after setting the radar installation height.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0E 04	
HEAD_CKSUM	1 byte	uint8	header checksum	F5	
DATA	1 byte	uint8	[result]	01	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

When the radar receives TYPE of 0x0E04 , the radar will return the data. [result] There are two results:

- Value is 0 : Failed to set altitude.
- A value of 1 : Set height successfully.

Message type: Get radar parameters 0x0E06

The message type is 0x0E06 and supports bidirectional data transmission mode .

The host computer sends data to the radar: MSG_ IND_ FALL_ GET _HIGH					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Get the lower computer parameters.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 00	
TYPE	2 bytes	uint16	Frame type	0E 06	
HEAD_CKSUM	1 byte	uint8	header checksum	F6	

The upper computer issues a command to the radar, requesting data from the lower computer. The radar will reply with a signal of type 0x0E06. See the details below.

Message type: After obtaining the radar parameters, the result is returned 0x0E06

The radar returns data to the host computer: MSG_ IND_ FALL_ GET _HIGH					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Send radar parameters to the host computer.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 1C	
TYPE	2 bytes	uint16	Frame type	0E 06	
HEAD_CKSUM	1 byte	uint8	header checksum	/	
DATA	4 bytes	f loat	[high]	/	
DATA	4 byte	float	[threshold]	/	
DATA	4 byte	uint32	[sensitivity]	/	
DATA	4 byte	float	[rect_XL]	/	
DATA	4 byte	float	[rect_XR]	/	
DATA	4 bytes	float	[rect_ZF]	/	
DATA _	4 bytes	float	[rect_ZB]	/	
DATA_CKSUM	1 byte	uint8	Data checksum	/	

When the radar receives TYPE of 0x0E06 , the radar will return the data. There are two results:

- Value is 0 : Failed to obtain.
- Value is other: acquisition is successful.

Message type: Set fall threshold 0x0E08

The message type is 0x0 E08 and supports bidirectional data transmission mode .

The host computer sends data to the radar: MSG_ IND_ FALL_SET_THRESHOLD					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Set the fall threshold. The default fall threshold of the radar is 0.6 m.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 04	
TYPE	2 bytes	uint16	Frame type	0E 08	
HEAD_CKSUM	1 byte	uint8	header checksum	FC	
DATA	4 bytes	float	[set_threshold]	9A 99 19 3F	
DATA_CKSUM	1 byte	uint8	Data checksum	DA	

Convert to float: For example, the [high] bit is 0x9A , 0x99 , 0x19 , 0x3F . First spell it into uint 32 -bit integer. Since the TF frame Data bit is little endian, the value is 0x 3F19999A , and then perform float type strong Turn, the final result is: 0.6 .

```
1.  int main( void )
2.  {
3.  unsigned int param = 0x41A26666;
4.      float res = *( float *)&param;
5.
6.  printf( "data: %f\n" , res);
7.      return 0;
8.  }
```

Message type: Set the fall threshold and return the result 0x0E08

The radar returns data to the host computer: MSG_ IND_ FALL_SET_THRESHOLD					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	After setting the fall threshold, return the status.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0E 08	
HEAD_CKSUM	1 byte	uint8	header checksum	F7	
DATA	1 byte	uint8	[value]	01	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

When the radar receives a TYPE of 0x0E08 , the radar will return the data. The data returned has two results:

- Value is 0x00 : Failed to obtain.
- Value is 0x01 : acquisition successful.

Message type: Set fall sensitivity 0x0E0A

The message type is 0x0E0A and supports bidirectional data transmission mode .

The host computer sends data to the radar: MSG_ IND_ FALL_SET_ SENSITIVITY					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Set the fall sensitivity, the initial value is 3 , which represents an average of 3 frames of data. (Range 3~ 3 0)
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0E 0A	
HEAD_CKSUM	1 byte	uint8	header checksum	FB	
DATA	4 bytes	uint32	[high]	03 00 00 00	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

Set the fall sensitivity, the initial value is 3, which represents an average of 3 frames of data. (range 3~10)

Message type: Return result 0x0E0A after setting fall sensitivity

The radar returns data to the host computer: MSG_ IND_ FALL_SET_ SENSITIVITY					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	When the radar receives the TYPE of 0x0E0A , the radar will return the data. The data returned has two results: Value is 0 : Failed to obtain. Value is 1 : acquisition successful.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0E 0A	
HEAD_CKSUM	1 byte	uint8	header checksum	FB	
DATA	1 byte	uint8	[value]	01	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

Message type: Height upload result 0x0E0E

The radar returns data to the host computer: MSG_ IND_ FALL_SET_ SENSITIVITY					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	The radar automatically uploads the height information of the current target point
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0E 0E	
HEAD_CKSUM	1 byte	uint8	header checksum	FB	
DATA	1 byte	Uint 32	[value]	01 00 00 00	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

Message type: Turn on or off User log information 0x010E

The message type is 0x010E , which only supports one-way data transmission mode.

The host computer sends data to the radar					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	0: Close User log information 1: Open User log information
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 04	
TYPE	2 bytes	uint16	Frame type	01 0E	
HEAD_CKSUM	1 byte	uint8	header checksum	FB	
DATA	4 bytes	uint32	[value]	01 00 00 00	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

- The value is 0x 00 : Turn off User log information.
- The value is 0x 01 : Turn on User log information.

Message type: Set alarm area parameters 0x0E0C

The message type is 0x0E0C and supports bidirectional data transmission mode.

The host computer sends data to the radar					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Set the fall alarm area range, the setting range is 0.3~1.5
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 10	
TYPE	2 bytes	uint16	Frame type	0E 0C	
HEAD_CKSUM	1 byte	uint8	header checksum	68	
DATA	4 bytes	float	[rect_XL]	00 00 00 3F	
DATA	4 bytes	float	[rect_XR]	00 00 00 3F	
DATA	4 bytes	float	[rect_ZF]	00 00 00 3F	
DATA	4 bytes	float	[rect_ZB]	00 00 00 3F	
DATA_CKSUM	1 byte	uint8	Data checksum	F F	

Set the fall alarm area range, the setting range is 0.3~1.5

Message type: Set alarm area parameters and return result 0x0E0C

The radar sends data to the host computer					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	0: failed 1: Success
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 04	
TYPE	2 bytes	uint16	Frame type	0E 0C	
HEAD_CKSUM	1 byte	uint8	header checksum	FB	
DATA	1 byte	u int 8	[value]	01	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

- Value is 0x00 : Failed to obtain.
- Value is 0x01 : acquisition successful.

Message type: Radar initialization setting parameters 0x2110

The message type is 0x2110 and supports one-way data transmission mode.

The host computer sends data to the radar					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Radar initialization setting parameters High:2.2 Threshold:0.5 Sensitivity:3 Rect_XL:0.5 Rect_XR :0.5 Rect_ZF:0.5 Rect_ZB :0.5
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 00	
TYPE	2 bytes	uint16	Frame type	2110	
HEAD_CKSUM	1 byte	uint8	header checksum	F7	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

When receiving TYPE of 0x2110 , the radar initializes the setting parameters.

High:2.2

Threshold:0.5

Sensitivity:3

Rect_XL:0.5

Rect_XR:0.5

Rect_ZF:0.5

Rect_ZB:0.5

The set content is related to the content of TYPE type 0x0E06

Message type: Report 3D point cloud detection project test results 0x0A08/ 0x0A04

The message types are 0x0A08 and 0x0A04 , and only support one-way data transmission mode (automatic upload after the User log is turned on).

The radar sends data to the host computer: MSG_ IND_ 3D_CLOUD _RES					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	For reporting 3D point cloud detection results. The message type is 0x0A08 , which is point cloud information, and the message type is 0x0A04 , which is target information.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	\	
TYPE	2 bytes	uint16	Frame type	0A 08/0A 04	
HEAD_CKSUM	1 byte	uint8	header checksum	\	
DATA	4 byte	int32	[target_num]	\	
DATA	4 byte	int32	[cluster_index]		
DATA	4 byte	float	[x_point]	\	
DATA	4 byte	float	[y_point]	\	
DATA	4 byte	float	[z_point]	\	
DATA	4 bytes	float	[speed]	\	
DATA_CKSUM	1 byte	uint8	Data checksum	\	

The following is the corresponding meaning of each DATA bit :

- [t target_num] : Number of targets.
- [cluster_index] : Clustering target ID.
- [x_point] : x coordinate, unit: m.
- [y_point] : y coordinate, unit: m.
- [z_point] : z coordinate, unit: m.
- [z_point] : z coordinate, unit: m.
- [speed] : Speed, unit: m/s.

Message type: Report unmanned detection project test result 0x0F09

The message type is 0x0F09 and only supports one-way data transmission mode .

The radar sends data to the host computer: MSG_ IND_ FALL_STATUS					
Format	Number of bytes	basic type	frame structure	Example frame	Frame meaning
SOF	1 byte	uint8	start frame	01	Used to report unattended test results.
ID	2 bytes	uint16	Frame ID	00 00	
LEN	2 bytes	uint16	Data frame length	00 01	
TYPE	2 bytes	uint16	Frame type	0 F 0 9	
HEAD_CKSUM	1 byte	uint8	header checksum	F3	
DATA	1 byte	uint8	[is_human] _	01	
DATA_CKSUM	1 byte	uint8	Data checksum	FE	

The following is the corresponding meaning of each DATA bit :

- [is_ human] : Determine whether there is a human being .
  - Value is 0 : no one .
  - Value 1: There is someone .

2. programming interface

2.1. Encode TF message

void tinyFramefTx(TF_TYPE type, uint8 *data, TF_LEN len) ;

Type is the sending data type, u int16 type, for example, when personnel detection data results are reported, the data type is 0x0A10 . See 4.2.1.6 for details.

U int8* data is the address to send data.

L en is the length of the sent data, u int16 type.

2.2. Decode TF message

TinyFrameRx tinyFramefRx(void) ;

After successfully receiving the message, the received data is returned to a variable of type TinyFrameRx .

of each CKSUM is as follows:

HEAD_CKSUM : TF frame header checksum [from the first byte to the previous byte of the HEAD_CKSUM bit]

DATA_CKSUM : TF data checksum [the first byte of DATA to the previous byte of DATA_CKSUM bit]

calculating C KSUM is as follows:

```
unsigned char getCksum(unsigned char *data, unsigned char len)
{
unsigned char ret = 0;

   for ( int i = 0; i < len; i++)
right = right ^ data[i];

right = ~right;

   return right;
}

```

2.3. Example code

If you want a demo of parsing TF frame data (including C language demo and Python language demo in Linux environment and Keil μVision5 environment), you can directly communicate with sales to obtain it.

