

Meta data in video file of Smart Tennis Sensor application

Meta data (Shot data) can be extracted from MP4 file, produced from Sony Tennis sensor app.

The meta data is the shot data shown on the application, namely, impact location, ball speed, ball spin, swing speed, and swing type.

1. Overview

The MP4 files are produced and stored in the device after Live mode video is taken by Sony Tennis Sensor app.

The MP4 contains the meta data in the extended area of MP4 file. By parsing the MP4 file, you can get the shot data and analyze the shot data along with the video.

The example of the meta data usage is Playmemories home. This application imports meta data in MP4 from the device, parses the meta data and shows it on the video.

http://www.smarttennissensor.sony.net/features/features_EN.html

2. MP4 file location in the device

Android

/sdcard/Smart Tennis Sensor/User/<Long User ID>/Movie/

Apple

Apps/Tennis Sensor/<Long User ID>/Movie/

3. MP4 File Format

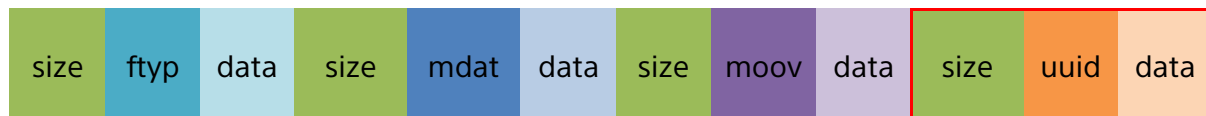
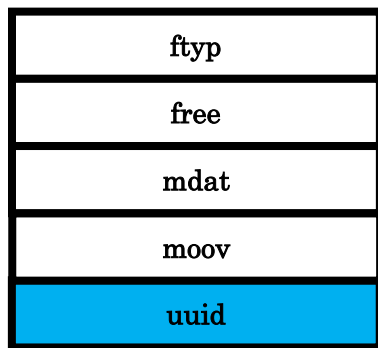
MP4 data structure is described in this doc.

<http://xhelmbboyx.tripod.com/formats/mp4-layout.txt>

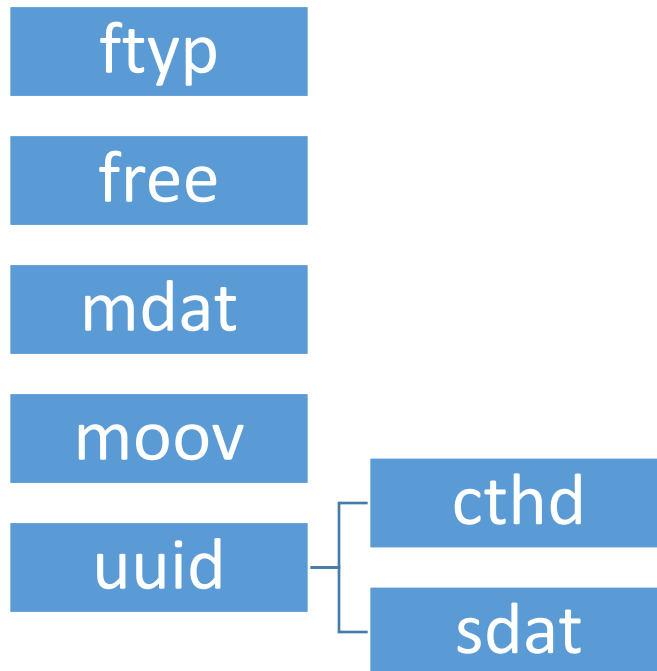
We added uuid box as an extension to store the meta data .

Note 1: The MP4 file structure is designed to be flexible, so the order of moov, mdat, and uuid may be different from below drawings.

Note 2: There may be one or more uuid. In case where there are multiple uuid, only one uuid contains the meta data. uuid, which has the meta data, has a key value in data section of uuid. The key can be found in section 4.1.



4. Uuid data structure



Size (byte)	Box Type	data	type	※1
variable	uuid	Sensor data top box	-	mandatory
0x1D	cthd	Category header	Binary+Text	mandatory
variable ※2	sdat	Meta data	Binary+Text	mandatory

※ 1 check if these data exist first, if some data is missing, stop reading meta data and don't show meta data info on the video.

※ 2 about 800 bytes /shot 1M bytes in two hours data (about 1000 shots)

4.1. uuid

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00h	Box size				Box type				uuid							
10h	uuid								cthd, sdat							

- Box size (4 bytes)
 - Integer
 - Variable (includes cthd, sdat size)
- Box type (4 bytes)
 - String
 - "uuid"
- uuid value (16 bytes)
 - Integer
 - 0xb48eb17e649711e4b3b5001bdc03dcc2
 - This is the key to find the target uuid, which contains the meta data.

4.2. Category Header (cthd)

This header defines whether the meta should be read.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F		
00h	Box size				Box type				Extended box type				category header version					
10h	Category				Data form	File creation time												

- Box size (4 byte)
 - Integer
 - 0x0000001D
- Box type (4bytes)
 - String
 - Use this to determine if sdat should be read.
- Extended box type (4bytes)
 - String
 - Use this to determine if sdat should be read
- "SSSS" (Sony Smart Sports Sensor)
- Category header version (4bytes)
 - String
 - Use this to specify the contents of category header.
 - 1000
 - [Major version : 0-9,A-Z][minor version : 0-9,A-Z][local version : 0-9,A-Z][sub local version : 0-9,A-Z]
- Category
 - String
 - "TENN"(Tennis)

➤ Data form

Integer

- | | |
|---------|---------------|
| - 0*h : | No format |
| - 1*h : | XML |
| - 2*h : | TBD |
| | |
| - *0h : | No encryption |
| - *1h : | TBD |
| - *2h : | TBD |

➤ File Creation time

Integer

When video file edit is necessary, please do not use CreatedTime in the movie file, use this value to sync with the meta data.

UTCtime (1970/1/1 0:0, mill sec) no timezone

4.3. Sensor data (sdat)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00h	Box size				Box type				checksum	XML data						
10h																
-																

- Box size (4bytes)
 - Integer
 - Variable depending on the number of shots.
- Box type (4 bytes)
 - String
 - "sdat"
- Checksum (1byte)
 - Integer
 - Use lower 1 byte of sum of all word of XML data

➤ XML data (variable)

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<data>
```

```
<ai></ai>          <- app-info
```

```
<si></si>          <- sensor-info
```

```
<sd>               <- shot-data
```

```
    <A>2014-03-17T19:31:02.927+00:00</A>
```

```
    <B>8</B>
```

```
    <C> </C>
```

```
    <D></D>
```

```
    <E></E>
```

```
    <F> </F>
```

```
    <G> </G>
```

```
    <H></H>
```

```
    <I></I>
```

```
    <J>26</J>
```

```
    <K></K>
```

```
    <L></L>
```

```
    <M>999.999999999999</M>
```

```
    <N>-9999.0</N>
```

```
    <O>999.999999999999</O>
```

```
    <P></P>
```

```
    <Q>1</Q>
```

```
    <R></R>
```

```
    <S></S>
```

```
    <T></T>
```

```
</sd>
```

```
<sd>
```

```
    . . .
```

```
</sd>
```

```
    . . .
```

```
<sd>
```

```
    . . .
```

```
</sd>
```

```
</data>
```

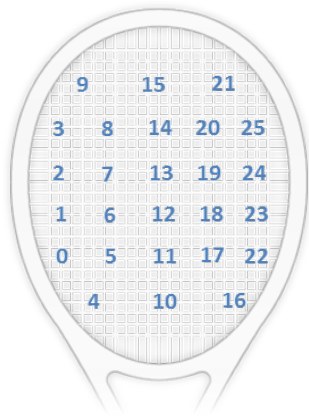

Element name	element	data	
ai	app_info	For future use	
si	sensor-info	For future use	
sd	shot-data	(parent element per shot)	
A	timestamp	UTCTime (with timezone)	
B	swing-type	0~8	See below
C	racket-id	Reserved	
D	sensor-udid	Reserved	
E	racket-model-version	Reserved	
F	sensor-model-name	Reserved	
G	sensor-region	Reserved	
H	sensor-firmware	Reserved	
I	sensor-engine	Reserved	
J	impact-position	0~26	See below
K	impact-position-prob	Reserved	
L	impact-energy	Reserved	
M	ball-speed	0.0~ ?	Km/h
N	ball-spin	0.0~ ?	rpm
O	swing-speed	0.0~ ?	Km/h
P	swing-type-prob	Reserved	
Q	dominant-hand	0~1	0:Right handed 1:Left handed
R	data-accuracy	Reserved	
S	delete-flag	Reserved	
T	update-flag	Reserved	

B Swing Type

- 0:Forehand Spin/Flat
- 1:Forehand Slice
- 2:Forehand Volley
- 3:Backhand Spin/Flat
- 4:Backhand Spin/Flat
- 5:Backhand Slice
- 6:Backhand Volley
- 7:Smash
- 8:Serve

Note that 3 and 4 can be considered as the same Backhand Spin/Flat.

J Impact Location



5. What developer's app can do

By parsing uuid data, developers' app can retrieve the meta data in the video from Smart tennis sensor app. The data and video can be saved in the app or app's cloud service.

The example usage is [Playmemories home](#).

- 1) video comparison show serve video side by side and compare the video and data
- 2) show data trend. Last month average ball speed was 70mph, this month 75mph.
- 3) find weakest point. By analyzing the saved data, the weakest point can be found. If the impact location of backhand varies, this player is not good on back hand.
- 4) Link to other data. The app can integrate the meta data and show rich data representation. Ball in average ball speed is XX, Back hand miss-shot rate is XX%, etc.