CelexMatlabToolbox User Guide

Introduction

CelexMatlabToolbox is a matlab toolbox to process the events collected using Celex IV Dynamic Vision Sensor.

- **File structure and Functions**
  - `createImgFromRawData.m`
    - Real-time decoding of events from raw data.
    - Real-time showing and saving binary pics from raw data.
    - Real-time showing and saving gray pics from raw data..
    - Real-time showing and saving accumulated gray pics from raw data..
  - `functions`: a collection of matlab functions.
    - Decode from raw data(`.bin` file) in batches and return events in format of `x,y,adc,t`, where `t` is the **continuous time stamp**.
    - Save decoded events as mat file in memory-efficient way.
    - Load events from mat file.
    - Show and save binary pics from events.
    - Show and save gray pics from events.
    - Show and save accumulated gray pics from events.
    - Show and save denoised binary pics from events.
    - Show and save denoised gray pics from events.
    - Display 3D events flow from events.
  - `demo.m`
    - An executable demo file, which includes all sample usage to call the functions in folder `functions`.

Usage

- Before you use
  - Right click on the `CelexMatlabToolbox` folder to **include folder and its subfolders**;
  - Modify the directory and filepath in `demo.m` .
- For each function in `functions` folder, the description of its corresponding function, input and output is offered. To read the description, please run `help <functionName>` , for instance `help showAllPic`.
- You can find sample usage of all functions in `demo.m`.

`functions` API Intruduction

- **Decode from bin file, save and load events and crop them**

Prototype	Description
`events=getAllEventsAndSaveAsMat(binPath,eventsMatPath)`	Read bin file from `binPath`, decode raw data into `events` struct of format [x,y,a,t] and return the struct, meanwhile save the events as mat file specified by `eventsMatPath`.
`events=loadEventsMat(eventsMatPath)`	Read `events` struct from `eventsMatPath` and return it.
`croppedEvents=getCroppedEvents(events,startEventsNum,eventsSum)`	Crop a length of `eventSum` events from `events` struct starting from index `startEventNum`.

Notice: To save storage space, the decoded event data is stored in 4 arrays (`events_X`, `events_y`, `events_adc`, `events_t`)of different data type instead of saving the `events` struct. To get the `events` struct, call function `loadEventsMat`.

- **Showing and saving 2D pics**

Prototype	Description
`showAllPic(events,eventDelta,displayTime)`	Show the concatenated pic of pics in *binary*, *gray*, *accumulatedGray* mode. Each pic is formed by accumulating events of the number of `eventsDelta`, and each pic will be shown for some time specified in `displayTime`.
`showBinaryPic(events,eventDelta,displayTime)`	Show *binary pic*.
`showGrayPic(events,eventDelta,displayTime)`	Show *gray pic*.
`showAccumulatedGrayPic(events,eventDelta,displayTime)`	Show *accumulated gray pic*
`saveAllPic(events,eventDelta,saveDir)`	Save *binary pic, gray pic, accumulated gray pic* at the same time. Each pic is formed by accumulating events of the number of `eventsDelta`. Above pics will be saved under folders `binaryPics`, `grayPics` and `accumulatedGrayPics` in directory `saveDir`.
`saveBinaryPic(events,eventDelta,saveDir)`	Save *binary pic*.
`saveGrayPic(events,eventDelta,saveDir)`	Save *gray pic*.
`saveAccumulatedGrayPic(events,eventDelta,saveDir)`	Save *accumulated gray pic*.

- **Events denosing and results saving**

Prototype	Description
`showDenoisedBinaryComparison(events,eventDelta,displayTime)`	Show the concatenated pic of *binary pic and denoised binary pic* . Each pic is formed by accumulating events of the number of `eventsDelta`, and each pic will be shown for some time specified in `displayTime`.
`showDenoisedBinaryPic(events,eventDelta,displayTime)`	Show *denoised binary pic*.
`saveDenoisedGrayComparison(events,eventDelta,saveDir)`	Show the concatenated pic of *gray pic and denoised gray pic* .
`showDenoisedGrayPic(events,eventDelta,displayTime)`	Show *denoised gray pic*.
`saveDenoisedGrayComparison(events,eventDelta,saveDir)`	Save the concatenated pics of *binary pic and denoised binary pic* . Each pic is formed by accumulating events of the number of `eventsDelta`. Pics are saved under folder `denoisedGrayComparison` in directory `saveDir`.
`saveDenoisedGrayPic(events,eventDelta,saveDir)`	Save *denoised gray pics* under folder `denoisedGrayPics` in directory `saveDir`.
`saveDenoisedBinaryComparison(events,eventDelta,saveDir)`	Save the concatenated pics of *binary pic and denoised binary pic* under folder `denoisedBinaryComparison` in directory `saveDir`.
`saveDenoisedBinaryPic(events,eventDelta,saveDir)`	Save *denoised binary pics* under folder `denoisedBinaryPics` in directory `saveDir`.

- **3D events flow showing**

Prototype	Description
`showEventsFlow3D( events )`	Dynamically show the 3D events flow based on the input `events` struct.