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```
%%%%%%  
% Code for LLS data analysis  
% Author : Siddharth Pantoji @ TU Delft  
% Description :  
% This script is to fuse data from the 4 sensors (2 LLS, tracker, camera) for  
% 1) Distributions  
% 2) Time independent predictions  
%%%%%
```

## Load run data for all runs

---

```
format shortG  
clear all  
close all  
clc  
  
% Get to storage folder for LLS  
cd 'O:\Siddharth Experiment 31 straight lines 26th July\LLS\Straight lines\All runs widths'  
  
% load all mats.  
mat = dir('*.mat');  
for q = 1:length(mat)  
    load(mat(q).name);  
end  
  
% Get to storage folder for Laser tracker  
cd 'O:\Siddharth Experiment 31 straight lines 26th July\Laser tracker\Straight lines\All straight line mats'  
  
% load all mats.  
mat = dir('*.mat');  
for q = 1:length(mat)  
    load(mat(q).name);  
end  
  
% Get to storage folder for Camera Data  
cd 'O:\Siddharth Experiment 31 straight lines 26th July\Camera\Straight lines\All straight line camera mats'  
  
% load all mats.  
mat = dir('*.mat');  
for q = 1:length(mat)  
    load(mat(q).name);  
end
```

## Inspect velocity profiles of all 31 runs tracker data

---

start and end indices from Z plots

```
figure;  
hold on  
tracker = TrackerData_1p2.TimeStamp(1153)-TrackerData_1p2.TimeStamp(473);  
trackerduration1 = duration(tracker, 'Format', 'hh:mm:ss.SSS')  
velocity = diff(TrackerData_1p2.X_mm_)./seconds(diff(TrackerData_1p2.TimeStamp));  
plot(TrackerData_1p2.X_mm_(473:1153),velocity(473:1153));
```

```

tracker = TrackerData_2.TimeStamp(1661)-TrackerData_2.TimeStamp(979);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_2.X_mm_)./seconds(diff(TrackerData_2.TimeStamp));
plot(TrackerData_2.X_mm_(979:1661),velocity(979:1661));

tracker = TrackerData_3.TimeStamp(1961)-TrackerData_3.TimeStamp(1277);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_3.X_mm_)./seconds(diff(TrackerData_3.TimeStamp));
plot(TrackerData_3.X_mm_(1277:1961),velocity(1277:1961));

tracker = TrackerData_4.TimeStamp(1625)-TrackerData_4.TimeStamp(941);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_4.X_mm_)./seconds(diff(TrackerData_4.TimeStamp));
plot(TrackerData_4.X_mm_(941:1625),velocity(941:1625));

tracker = TrackerData_5.TimeStamp(1390)-TrackerData_5.TimeStamp(704);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_5.X_mm_)./seconds(diff(TrackerData_5.TimeStamp));
plot(TrackerData_5.X_mm_(704:1390),velocity(704:1390));

tracker = TrackerData_6.TimeStamp(1419)-TrackerData_6.TimeStamp(732);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_6.X_mm_)./seconds(diff(TrackerData_6.TimeStamp));
plot(TrackerData_6.X_mm_(732:1419),velocity(732:1419));

tracker = TrackerData_7.TimeStamp(1298)-TrackerData_7.TimeStamp(612);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_7.X_mm_)./seconds(diff(TrackerData_7.TimeStamp));
plot(TrackerData_7.X_mm_(612:1298),velocity(612:1298));

tracker = TrackerData_8.TimeStamp(1396)-TrackerData_8.TimeStamp(711);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_8.X_mm_)./seconds(diff(TrackerData_8.TimeStamp));
plot(TrackerData_8.X_mm_(711:1396),velocity(711:1396));

tracker = TrackerData_9.TimeStamp(1636)-TrackerData_9.TimeStamp(952);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_9.X_mm_)./seconds(diff(TrackerData_9.TimeStamp));
plot(TrackerData_9.X_mm_(952:1636),velocity(952:1636));

tracker = TrackerData_10.TimeStamp(1418)-TrackerData_10.TimeStamp(737);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_10.X_mm_)./seconds(diff(TrackerData_10.TimeStamp));
plot(TrackerData_10.X_mm_(737:1418),velocity(737:1418));

tracker = TrackerData_11.TimeStamp(1494)-TrackerData_11.TimeStamp(809);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_11.X_mm_)./seconds(diff(TrackerData_11.TimeStamp));
plot(TrackerData_11.X_mm_(809:1494),velocity(809:1494));

tracker = TrackerData_12.TimeStamp(1660)-TrackerData_12.TimeStamp(977);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_12.X_mm_)./seconds(diff(TrackerData_12.TimeStamp));
plot(TrackerData_12.X_mm_(977:1660),velocity(977:1660));

tracker = TrackerData_13.TimeStamp(1410)-TrackerData_13.TimeStamp(724);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_13.X_mm_)./seconds(diff(TrackerData_13.TimeStamp));
plot(TrackerData_13.X_mm_(724:1410),velocity(724:1410));

tracker = TrackerData_14.TimeStamp(1287)-TrackerData_14.TimeStamp(600);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_14.X_mm_)./seconds(diff(TrackerData_14.TimeStamp));
plot(TrackerData_14.X_mm_(600:1287),velocity(600:1287));

tracker = TrackerData_15.TimeStamp(1261)-TrackerData_15.TimeStamp(576);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_15.X_mm_)./seconds(diff(TrackerData_15.TimeStamp));
plot(TrackerData_15.X_mm_(576:1261),velocity(576:1261));

tracker = TrackerData_16.TimeStamp(1279)-TrackerData_16.TimeStamp(593);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_16.X_mm_)./seconds(diff(TrackerData_16.TimeStamp));
plot(TrackerData_16.X_mm_(593:1279),velocity(593:1279));

tracker = TrackerData_17.TimeStamp(1275)-TrackerData_17.TimeStamp(590);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_17.X_mm_)./seconds(diff(TrackerData_17.TimeStamp));
plot(TrackerData_17.X_mm_(590:1275),velocity(590:1275));

```

```

tracker = TrackerData_18.TimeStamp(1293)-TrackerData_18.TimeStamp(609);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_18.X_mm_)./seconds(diff(TrackerData_18.TimeStamp));
plot(TrackerData_18.X_mm_(609:1293),velocity(609:1293));

tracker = TrackerData_19.TimeStamp(1132)-TrackerData_19.TimeStamp(449);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_19.X_mm_)./seconds(diff(TrackerData_19.TimeStamp));
plot(TrackerData_19.X_mm_(449:1132),velocity(449:1132));

tracker = TrackerData_20.TimeStamp(1209)-TrackerData_20.TimeStamp(526);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_20.X_mm_)./seconds(diff(TrackerData_20.TimeStamp));
plot(TrackerData_20.X_mm_(526:1209),velocity(526:1209));

tracker = TrackerData_21.TimeStamp(1222)-TrackerData_21.TimeStamp(539);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_21.X_mm_)./seconds(diff(TrackerData_21.TimeStamp));
plot(TrackerData_21.X_mm_(539:1222),velocity(539:1222));

tracker = TrackerData_22.TimeStamp(1189)-TrackerData_22.TimeStamp(506);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_22.X_mm_)./seconds(diff(TrackerData_22.TimeStamp));
plot(TrackerData_22.X_mm_(506:1189),velocity(506:1189));

tracker = TrackerData_23.TimeStamp(1184)-TrackerData_23.TimeStamp(499);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_23.X_mm_)./seconds(diff(TrackerData_23.TimeStamp));
plot(TrackerData_23.X_mm_(499:1184),velocity(499:1184));

tracker = TrackerData_24.TimeStamp(1341)-TrackerData_24.TimeStamp(657);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_24.X_mm_)./seconds(diff(TrackerData_24.TimeStamp));
plot(TrackerData_24.X_mm_(657:1341),velocity(657:1341));

tracker = TrackerData_25.TimeStamp(1218)-TrackerData_25.TimeStamp(532);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_25.X_mm_)./seconds(diff(TrackerData_25.TimeStamp));
plot(TrackerData_25.X_mm_(532:1218),velocity(532:1218));

tracker = TrackerData_26.TimeStamp(1199)-TrackerData_26.TimeStamp(512);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_26.X_mm_)./seconds(diff(TrackerData_26.TimeStamp));
plot(TrackerData_26.X_mm_(512:1199),velocity(512:1199));

tracker = TrackerData_27.TimeStamp(1394)-TrackerData_27.TimeStamp(712);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_27.X_mm_)./seconds(diff(TrackerData_27.TimeStamp));
plot(TrackerData_27.X_mm_(712:1394),velocity(712:1394));

tracker = TrackerData_28.TimeStamp(1217)-TrackerData_28.TimeStamp(531);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_28.X_mm_)./seconds(diff(TrackerData_28.TimeStamp));
plot(TrackerData_28.X_mm_(531:1217),velocity(531:1217));

tracker = TrackerData_29.TimeStamp(1207)-TrackerData_29.TimeStamp(521);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_29.X_mm_)./seconds(diff(TrackerData_29.TimeStamp));
plot(TrackerData_29.X_mm_(521:1207),velocity(521:1207));

tracker = TrackerData_30.TimeStamp(1162)-TrackerData_30.TimeStamp(476);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_30.X_mm_)./seconds(diff(TrackerData_30.TimeStamp));
plot(TrackerData_30.X_mm_(476:1162),velocity(476:1162));

tracker = TrackerData_31.TimeStamp(1208)-TrackerData_31.TimeStamp(520);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')
velocity = diff(TrackerData_31.X_mm_)./seconds(diff(TrackerData_31.TimeStamp));
plot(TrackerData_31.X_mm_(520:1208),velocity(520:1208));

xlabel('X (mm)')
ylabel('Velocity (mm/sec)')
set(gca,'fontsize',14)

hold off

% Add the velocity and weights array to the tracker tables
% skipped for now as the sampling which follows will require interp1
% effort is to use the data as is

```

```
trackerduration1 =  
duration  
00:00:06.800  
  
tracker =  
duration  
00:00:06.820  
  
tracker =  
duration  
00:00:06.840  
  
tracker =  
duration  
00:00:06.840  
  
tracker =  
duration  
00:00:06.860  
  
tracker =  
duration  
00:00:06.870  
  
tracker =  
duration  
00:00:06.860  
  
tracker =  
duration  
00:00:06.850  
  
tracker =  
duration  
00:00:06.840  
  
tracker =  
duration  
00:00:06.810  
  
tracker =  
duration  
00:00:06.850  
  
tracker =  
duration
```

00:00:06.830

tracker =

duration

00:00:06.860

tracker =

duration

00:00:06.870

tracker =

duration

00:00:06.850

tracker =

duration

00:00:06.860

tracker =

duration

00:00:06.850

tracker =

duration

00:00:06.840

tracker =

duration

00:00:06.830

tracker =

duration

00:00:06.830

tracker =

duration

00:00:06.830

tracker =

duration

00:00:06.830

tracker =

duration

00:00:06.850

tracker =

```
duration
```

```
00:00:06.840
```

```
tracker =
```

```
duration
```

```
00:00:06.860
```

```
tracker =
```

```
duration
```

```
00:00:06.870
```

```
tracker =
```

```
duration
```

```
00:00:06.820
```

```
tracker =
```

```
duration
```

```
00:00:06.860
```

```
tracker =
```

```
duration
```

```
00:00:06.860
```

```
tracker =
```

```
duration
```

```
00:00:06.860
```

```
tracker =
```

```
duration
```

```
00:00:06.880
```

## Aligning camera data to true time (tracker time)

```
% Finding time difference between Tracker and camera

% Finding tracker stop for some runs
StopTimeByTracker(1) = TrackerData_1p2.TimeStamp(973);%1043
StopTimeByTracker(10) = TrackerData_10.TimeStamp(1238);%1308
StopTimeByTracker(15) = TrackerData_15.TimeStamp(1078);%1147
StopTimeByTracker(20) = TrackerData_20.TimeStamp(1029);%1097
StopTimeByTracker(31) = TrackerData_31.TimeStamp(1025);%1095

% Finding camera data stop time from correlating frame number
StopTimeByCamera(1) = CameraData_1.Timestamps(308);
StopTimeByCamera(10) = CameraData_10.Timestamps(307);
StopTimeByCamera(15) = CameraData_15.Timestamps(307);
StopTimeByCamera(20) = CameraData_20.Timestamps(306);
StopTimeByCamera(31) = CameraData_31.Timestamps(309);

% figure camera stops (done for a few runs. correlated frame no from video)
% figure; hold on;
% plot(CameraData_1.TapeCenterLine);
% plot(CameraData_2.TapeCenterLine);
% plot(CameraData_3.TapeCenterLine);
% plot(CameraData_4.TapeCenterLine);
% plot(CameraData_5.TapeCenterLine);
```

```

% plot(CameraData_6.TapeCenterLine);
% plot(CameraData_7.TapeCenterLine);
% plot(CameraData_8.TapeCenterLine);
% plot(CameraData_9.TapeCenterLine);
% plot(CameraData_10.TapeCenterLine);
% plot(CameraData_11.TapeCenterLine);
% plot(CameraData_12.TapeCenterLine);
% plot(CameraData_13.TapeCenterLine);
% plot(CameraData_14.TapeCenterLine);
% plot(CameraData_15.TapeCenterLine);
% plot(CameraData_16.TapeCenterLine);
% plot(CameraData_17.TapeCenterLine);
% plot(CameraData_18.TapeCenterLine);
% plot(CameraData_19.TapeCenterLine);
% plot(CameraData_20.TapeCenterLine);
% plot(CameraData_21.TapeCenterLine);
% plot(CameraData_22.TapeCenterLine);
% plot(CameraData_23.TapeCenterLine);
% plot(CameraData_24.TapeCenterLine);
% plot(CameraData_25.TapeCenterLine);
% plot(CameraData_26.TapeCenterLine);
% plot(CameraData_27.TapeCenterLine);
% plot(CameraData_28.TapeCenterLine);
% plot(CameraData_29.TapeCenterLine);
% plot(CameraData_30.TapeCenterLine);
% plot(CameraData_31.TapeCenterLine);

% figure; hold on;
% plot(CameraData_1.TapeCenterLine+0.1);
% plot(CameraData_2.TapeCenterLine+0.2);
% plot(CameraData_3.TapeCenterLine+0.3);
% plot(CameraData_4.TapeCenterLine+0.4);
% plot(CameraData_5.TapeCenterLine+0.5);
% plot(CameraData_6.TapeCenterLine+0.6);
% plot(CameraData_7.TapeCenterLine+0.7);
% plot(CameraData_8.TapeCenterLine+0.8);
% plot(CameraData_9.TapeCenterLine+0.9);
% plot(CameraData_10.TapeCenterLine+0.10);
% plot(CameraData_11.TapeCenterLine+0.11);
% plot(CameraData_12.TapeCenterLine+0.12);
% plot(CameraData_13.TapeCenterLine+0.13);
% plot(CameraData_14.TapeCenterLine+0.14);
% plot(CameraData_15.TapeCenterLine+0.15);
% plot(CameraData_16.TapeCenterLine+0.16);
% plot(CameraData_17.TapeCenterLine+0.17);
% plot(CameraData_18.TapeCenterLine+0.18);
% plot(CameraData_19.TapeCenterLine+0.19);
% plot(CameraData_20.TapeCenterLine+0.20);
% plot(CameraData_21.TapeCenterLine+0.21);
% plot(CameraData_22.TapeCenterLine+0.22);
% plot(CameraData_23.TapeCenterLine+0.23);
% plot(CameraData_24.TapeCenterLine+0.24);
% plot(CameraData_25.TapeCenterLine+0.25);
% plot(CameraData_26.TapeCenterLine+0.26);
% plot(CameraData_27.TapeCenterLine+0.27);
% plot(CameraData_28.TapeCenterLine+0.28);
% plot(CameraData_29.TapeCenterLine+0.29);
% plot(CameraData_30.TapeCenterLine+0.30);
% plot(CameraData_31.TapeCenterLine+0.31);

% figure; hold on;
% len = length(CameraData_1.TapeCenterLine);
% plot3(CameraData_1.TapeCenterLine+1,1:1:len,zeros(len));
% len = length(CameraData_2.TapeCenterLine);
% plot3(CameraData_2.TapeCenterLine+2,1:1:len,zeros(len));
% len = length(CameraData_3.TapeCenterLine);
% plot3(CameraData_3.TapeCenterLine+03,1:1:len,zeros(len));
% len = length(CameraData_4.TapeCenterLine);
% plot3(CameraData_4.TapeCenterLine+04,1:1:len,zeros(len));
% len = length(CameraData_5.TapeCenterLine);
% plot3(CameraData_5.TapeCenterLine+05,1:1:len,zeros(len));
% len = length(CameraData_6.TapeCenterLine);
% plot3(CameraData_6.TapeCenterLine+06,1:1:len,zeros(len));
% len = length(CameraData_7.TapeCenterLine);
% plot3(CameraData_7.TapeCenterLine+07,1:1:len,zeros(len));
% len = length(CameraData_8.TapeCenterLine);
% plot3(CameraData_8.TapeCenterLine+08,1:1:len,zeros(len));
% len = length(CameraData_9.TapeCenterLine);
% plot3(CameraData_9.TapeCenterLine+09,1:1:len,zeros(len));
% len = length(CameraData_10.TapeCenterLine);
% plot3(CameraData_10.TapeCenterLine+010,1:1:len,zeros(len));

```

```

% len = length(CameraData_11.TapeCenterLine);
% plot3(CameraData_11.TapeCenterLine+011,1:1:len,zeros(len));
% len = length(CameraData_12.TapeCenterLine);
% plot3(CameraData_12.TapeCenterLine+012,1:1:len,zeros(len));
% len = length(CameraData_13.TapeCenterLine);
% plot3(CameraData_13.TapeCenterLine+013,1:1:len,zeros(len));
% len = length(CameraData_14.TapeCenterLine);
% plot3(CameraData_14.TapeCenterLine+014,1:1:len,zeros(len));
% len = length(CameraData_15.TapeCenterLine);
% plot3(CameraData_15.TapeCenterLine+015,1:1:len,zeros(len));
% len = length(CameraData_16.TapeCenterLine);
% plot3(CameraData_16.TapeCenterLine+016,1:1:len,zeros(len));
% len = length(CameraData_17.TapeCenterLine);
% plot3(CameraData_17.TapeCenterLine+017,1:1:len,zeros(len));
% len = length(CameraData_18.TapeCenterLine);
% plot3(CameraData_18.TapeCenterLine+018,1:1:len,zeros(len));
% len = length(CameraData_19.TapeCenterLine);
% plot3(CameraData_19.TapeCenterLine+019,1:1:len,zeros(len));
% len = length(CameraData_20.TapeCenterLine);
% plot3(CameraData_20.TapeCenterLine+020,1:1:len,zeros(len));
% len = length(CameraData_21.TapeCenterLine);
% plot3(CameraData_21.TapeCenterLine+021,1:1:len,zeros(len));
% len = length(CameraData_22.TapeCenterLine);
% plot3(CameraData_22.TapeCenterLine+022,1:1:len,zeros(len));
% len = length(CameraData_23.TapeCenterLine);
% plot3(CameraData_23.TapeCenterLine+023,1:1:len,zeros(len));
% len = length(CameraData_24.TapeCenterLine);
% plot3(CameraData_24.TapeCenterLine+024,1:1:len,zeros(len));
% len = length(CameraData_25.TapeCenterLine);
% plot3(CameraData_25.TapeCenterLine+025,1:1:len,zeros(len));
% len = length(CameraData_26.TapeCenterLine);
% plot3(CameraData_26.TapeCenterLine+026,1:1:len,zeros(len));
% len = length(CameraData_27.TapeCenterLine);
% plot3(CameraData_27.TapeCenterLine+027,1:1:len,zeros(len));
% len = length(CameraData_28.TapeCenterLine);
% plot3(CameraData_28.TapeCenterLine+028,1:1:len,zeros(len));
% len = length(CameraData_29.TapeCenterLine);
% plot3(CameraData_29.TapeCenterLine+029,1:1:len,zeros(len));
% len = length(CameraData_30.TapeCenterLine);
% plot3(CameraData_30.TapeCenterLine+030,1:1:len,zeros(len));
% len = length(CameraData_31.TapeCenterLine);
% plot3(CameraData_31.TapeCenterLine+031,1:1:len,zeros(len));

timediff1 = StopTimeByCamera(1) - StopTimeByTracker(1);
timediff(1) = duration(timediff1,'Format','hh:mm:ss.SSS');
timediff2 = StopTimeByCamera(10) - StopTimeByTracker(10);
timediff(2) = duration(timediff2,'Format','hh:mm:ss.SSS');
timediff3 = StopTimeByCamera(15) - StopTimeByTracker(15);
timediff(3) = duration(timediff3,'Format','hh:mm:ss.SSS');
timediff4 = StopTimeByCamera(20) - StopTimeByTracker(20);
timediff(4) = duration(timediff4,'Format','hh:mm:ss.SSS');
timediff5 = StopTimeByCamera(31) - StopTimeByTracker(31);
timediff(5) = duration(timediff5,'Format','hh:mm:ss.SSS');

TrackerCameraTimeDiff = mean(timediff);
% camera time is ahead of tracker time

```

### Code to correct all camera time tables to true time using avg calculated

lag

```

close all
manualshift = mean ([0.031 0.158 0.175 0.166 0.089 0.122]);

CameraData = CameraData_31;

for i = 1:height(CameraData)
    CameraData.TimeStamps(i) = CameraData.TimeStamps(i) - TrackerCameraTimeDiff - seconds(manualshift);
end

CameraData_Truetime_31 = CameraData;
save CameraData_Truetime_31.mat CameraData_Truetime_31;
clear CameraData;

%_8

%manual time alignment check
% figure;
% plot(CameraData_Truetime_6.TimeStamps,CameraData_Truetime_6.TapeWidth+923.8);

```

```
% hold on;
% plot(TrackerData_6.TimeStamp,TrackerData_6.X_mm_);
```

## Aligning LLS data to true time (tracker time)

```
% Finding time difference between Tracker and LLS

% Finding tracker stop for some runs (already done)
StopTimeByTracker(1) = TrackerData_1p2.TimeStamp(973);%1043
StopTimeByTracker(10) = TrackerData_10.TimeStamp(1238);%1308
StopTimeByTracker(15) = TrackerData_15.TimeStamp(1078);%1147
StopTimeByTracker(20) = TrackerData_20.TimeStamp(1029);%1097
StopTimeByTracker(31) = TrackerData_31.TimeStamp(1025);%1095

% finding duration of stop from tracker data

% StopDurationbyTracker1 = TrackerData_1p2.TimeStamp(1043) - TrackerData_1p2.TimeStamp(973);%
% StopDurationbyTracker(1) = duration(StopDurationbyTracker1,'Format','hh:mm:ss.SSS')
% StopDurationbyTracker10 = TrackerData_10.TimeStamp(1308)-TrackerData_10.TimeStamp(1238);%
% StopDurationbyTracker(10) = duration(StopDurationbyTracker10,'Format','hh:mm:ss.SSS')
% StopDurationbyTracker15 = TrackerData_15.TimeStamp(1147)-TrackerData_15.TimeStamp(1078);%
% StopDurationbyTracker(15) = duration(StopDurationbyTracker15,'Format','hh:mm:ss.SSS')
% StopDurationbyTracker20 = TrackerData_20.TimeStamp(1097)-TrackerData_20.TimeStamp(1029);%
% StopDurationbyTracker(20) = duration(StopDurationbyTracker20,'Format','hh:mm:ss.SSS')
% StopDurationbyTracker31 = TrackerData_31.TimeStamp(1095)-TrackerData_31.TimeStamp(1025);%
% StopDurationbyTracker(31) = duration(StopDurationbyTracker31,'Format','hh:mm:ss.SSS')

% datetime arithmetic buggy
% stop duration in 0.7 sec

% Finding LLS data stop time from correlating frame number
StopTimeByLLSB(1) = Run1width_AfterCompaction.Time(356);
StopTimeByLLSB(10) = Run10width_AfterCompaction.Time(354);
StopTimeByLLSB(15) = Run15width_AfterCompaction.Time(333);
StopTimeByLLSB(20) = Run20width_AfterCompaction.Time(363);
StopTimeByLLSB(31) = Run31width_AfterCompaction.Time(363);

% LLS time is ahead of tracker time

timediff1 = StopTimeByLLSB(1) - StopTimeByTracker(1);
timediff_b(1) = duration(timediff1,'Format','hh:mm:ss.SSS');
timediff2 = StopTimeByLLSB(10) - StopTimeByTracker(10);
timediff_b(2) = duration(timediff2,'Format','hh:mm:ss.SSS');
timediff3 = StopTimeByLLSB(15) - StopTimeByTracker(15);
timediff_b(3) = duration(timediff3,'Format','hh:mm:ss.SSS');
timediff4 = StopTimeByLLSB(20) - StopTimeByTracker(20);
timediff_b(4) = duration(timediff4,'Format','hh:mm:ss.SSS');
timediff5 = StopTimeByLLSB(31) - StopTimeByTracker(31);
timediff_b(5) = duration(timediff5,'Format','hh:mm:ss.SSS');

TrackerLLSTimeDiff = mean(timediff_b);
% tracker time is ahead of tracker time

% figure LLS stops (done for a few runs. correleted frame no from video)
% figure; hold on;
% plot(Run1width_AfterCompaction.TapeWidthAfterCompaction);
% plot(Run2width_AfterCompaction.TapeWidthAfterCompaction+1);
% plot(Run3width_AfterCompaction.TapeWidthAfterCompaction+2);
% plot(Run4width_AfterCompaction.TapeWidthAfterCompaction+3);
% plot(Run5width_AfterCompaction.TapeWidthAfterCompaction+4);
% plot(Run6width_AfterCompaction.TapeWidthAfterCompaction+5);
% plot(Run7width_AfterCompaction.TapeWidthAfterCompaction+6);
% plot(Run8width_AfterCompaction.TapeWidthAfterCompaction+7);
% plot(Run9width_AfterCompaction.TapeWidthAfterCompaction+8);
% plot(Run10width_AfterCompaction.TapeWidthAfterCompaction+9);
% plot(Run11width_AfterCompaction.TapeWidthAfterCompaction+10);
% plot(Run12width_AfterCompaction.TapeWidthAfterCompaction+11);
% plot(Run13width_AfterCompaction.TapeWidthAfterCompaction+12);
% plot(Run14width_AfterCompaction.TapeWidthAfterCompaction+13);
% plot(Run15width_AfterCompaction.TapeWidthAfterCompaction+14);
% plot(Run16width_AfterCompaction.TapeWidthAfterCompaction+15);
% plot(Run17width_AfterCompaction.TapeWidthAfterCompaction+16);
% plot(Run18width_AfterCompaction.TapeWidthAfterCompaction+17);
% plot(Run19width_AfterCompaction.TapeWidthAfterCompaction+18);
% plot(Run20width_AfterCompaction.TapeWidthAfterCompaction+19);
% plot(Run21width_AfterCompaction.TapeWidthAfterCompaction+20);
% plot(Run22width_AfterCompaction.TapeWidthAfterCompaction+21);
% plot(Run23width_AfterCompaction.TapeWidthAfterCompaction+22);
% plot(Run24width_AfterCompaction.TapeWidthAfterCompaction+23);
% plot(Run25width_AfterCompaction.TapeWidthAfterCompaction+24);
```

```
% plot(Run26width_AfterCompaction.TapeWidthAfterCompaction+25);
% plot(Run27width_AfterCompaction.TapeWidthAfterCompaction+26);
% plot(Run28width_AfterCompaction.TapeWidthAfterCompaction+27);
% plot(Run29width_AfterCompaction.TapeWidthAfterCompaction+28);
% plot(Run30width_AfterCompaction.TapeWidthAfterCompaction+29);
% plot(Run31width_AfterCompaction.TapeWidthAfterCompaction+30);
```

## Code to correct all LLS time tables to true time using avg calculated

lag

```
close all
manualshift = mean ([+0.075 +0.045 +0.043]);

LLSAData = Run31width;
LLSBData = Run31width_AfterCompaction;

for i = 1:height(LLSAData)
    LLSAData.Time(i) = LLSAData.Time(i) - TrackerLLSTimeDiff + seconds(manualshift);
    LSBData.Time(i) = LSBData.Time(i) - TrackerLLSTimeDiff + seconds(manualshift);
end

LLSAData_Truetime_31 = LLSAData;
LLSBData_Truetime_31 = LSBData;

save LLSAData_Truetime_31.mat LLSAData_Truetime_31;
save LSBData_Truetime_31.mat LSBData_Truetime_31;

clear LLSAData LSBData;

%_31

% % manual time alignment check
% figure;hold on;
% plot(LLSAData_Truetime_1.Time,LLSAData_Truetime_1.TapeWidth1 + 923.8);
% plot(LSBData_Truetime_1.Time,LSBData_Truetime_1.TapeWidthAfterCompaction + 923.8);
% plot(TrackerData_1p2.TimeStamp,TrackerData_1p2.X_mm);
```

## Getting constant velocity portions of the 31 runs tracker data

start and end indices are from Z plots time from start to plateau start and to plateau end will be calculated stored in one data structure

```
clear tdiff tdiff1

% run 1p2 473 521 944 973 1043 1153
tdiff(1,1) = duration(TrackerData_1p2.TimeStamp(521)-TrackerData_1p2.TimeStamp(473), 'Format', 'hh:mm:ss.SSS');
tdiff(2,1) = duration(TrackerData_1p2.TimeStamp(944)-TrackerData_1p2.TimeStamp(521), 'Format', 'hh:mm:ss.SSS');
tdiff(3,1) = duration(TrackerData_1p2.TimeStamp(973)-TrackerData_1p2.TimeStamp(944), 'Format', 'hh:mm:ss.SSS');
tdiff(4,1) = duration(TrackerData_1p2.TimeStamp(1043)-TrackerData_1p2.TimeStamp(973), 'Format', 'hh:mm:ss.SSS');
tdiff(5,1) = duration(TrackerData_1p2.TimeStamp(1153)-TrackerData_1p2.TimeStamp(1043), 'Format', 'hh:mm:ss.SSS');

% run15 576 626 1049 1078 1147 1261
tdiff(1,2) = duration(TrackerData_15.TimeStamp(626)-TrackerData_15.TimeStamp(576), 'Format', 'hh:mm:ss.SSS');
tdiff(2,2) = duration(TrackerData_15.TimeStamp(1049)-TrackerData_15.TimeStamp(626), 'Format', 'hh:mm:ss.SSS');
tdiff(3,2) = duration(TrackerData_15.TimeStamp(1078)-TrackerData_15.TimeStamp(1049), 'Format', 'hh:mm:ss.SSS');
tdiff(4,2) = duration(TrackerData_15.TimeStamp(1147)-TrackerData_15.TimeStamp(1078), 'Format', 'hh:mm:ss.SSS');
tdiff(5,2) = duration(TrackerData_15.TimeStamp(1261)-TrackerData_15.TimeStamp(1147), 'Format', 'hh:mm:ss.SSS');

% run31 520 579 995 1025 1095 1208
tdiff(1,3) = duration(TrackerData_31.TimeStamp(579)-TrackerData_31.TimeStamp(520), 'Format', 'hh:mm:ss.SSS');
tdiff(2,3) = duration(TrackerData_31.TimeStamp(995)-TrackerData_31.TimeStamp(579), 'Format', 'hh:mm:ss.SSS');
tdiff(3,3) = duration(TrackerData_31.TimeStamp(1025)-TrackerData_31.TimeStamp(995), 'Format', 'hh:mm:ss.SSS');
tdiff(4,3) = duration(TrackerData_31.TimeStamp(1095)-TrackerData_31.TimeStamp(1025), 'Format', 'hh:mm:ss.SSS');
tdiff(5,3) = duration(TrackerData_31.TimeStamp(1208)-TrackerData_31.TimeStamp(1095), 'Format', 'hh:mm:ss.SSS');

% This is the duration of various phases (avged)
tdiff;
tdiff = mean(tdiff,2);

% to correct the mistake in timestamps in crucial stamps
% diff between adjacent points to cululative diff from start point
tdiff1(1) = tdiff(1);
tdiff1(2) = tdiff(1) + tdiff(2);
tdiff1(3) = tdiff(1) + tdiff(2) + tdiff(3);
tdiff1(4) = tdiff(1) + tdiff(2) + tdiff(3) + tdiff(4);
tdiff1(5) = tdiff(5);

tdiff = tdiff1;
```

## Getting timestamps for layup end (not run end)

```
for i = 1 : 31;
flag = 0;
clear RunX
RunX = Data(i).Tracker.X_mm_;
for j = 1 : length(RunX)
    if RunX(j) >= 1000 && flag == 0;
        Run1mEndIndex(i) = j;
        Run1mEndTime(i) = Data(i).Tracker.TimeStamp(j);
        flag = 1;
    end
end
end
```

Undefined function 'Data' for input arguments of type 'double'.  
Error in Four\_sensors\_data\_fusion (line 561)  
RunX = Data(i).Tracker.X\_mm\_;

## Getting timestamps for phases of layup for all 31 runs (tracker time/true time)

```
% plot(TrackerData_1p2.X_mm_(473:1153),velocity(473:1153));
i = 1;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_1p2.TimeStamp(473)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_1p2.TimeStamp(1153)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_2.X_mm_(979:1661),velocity(979:1661));
i = 2;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_2.TimeStamp(979)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_2.TimeStamp(1661)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_3.X_mm_(1277:1961),velocity(1277:1961));
i = 3;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_3.TimeStamp(1277)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_3.TimeStamp(1961)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_4.X_mm_(941:1625),velocity(941:1625));
i = 4;
```

```

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_4.TimeStamp(941)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_4.TimeStamp(1625)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_5.X_mm_(704:1390),velocity(704:1390));
i = 5;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_5.TimeStamp(704)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_5.TimeStamp(1390)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_6.X_mm_(732:1419),velocity(732:1419));
i = 6;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_6.TimeStamp(732)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_6.TimeStamp(1419)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_7.X_mm_(612:1298),velocity(612:1298));
i = 7;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_7.TimeStamp(612)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_7.TimeStamp(1298)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_8.X_mm_(711:1396),velocity(711:1396));
i = 8;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_8.TimeStamp(711)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_8.TimeStamp(1396)

```

```

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_9.X_mm_(952:1636),velocity(952:1636));
i = 9;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_9.TimeStamp(952)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_9.TimeStamp(1636)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_10.X_mm_(737:1418),velocity(737:1418));
i = 10;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_10.TimeStamp(737)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_10.TimeStamp(1418)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_11.X_mm_(809:1494),velocity(809:1494));
i = 11;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_11.TimeStamp(809)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_11.TimeStamp(1494)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_12.X_mm_(977:1660),velocity(977:1660));
i = 12;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_12.TimeStamp(977)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_12.TimeStamp(1660)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_13.X_mm_(724:1410),velocity(724:1410));
i = 13;

```

```

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_13.TimeStamp(724)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_13.TimeStamp(1410)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_14.X_mm_(600:1287),velocity(600:1287));
i = 14;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_14.TimeStamp(600)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_14.TimeStamp(1287)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_15.X_mm_(576:1261),velocity(576:1261));
i = 15;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_15.TimeStamp(576)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_15.TimeStamp(1261)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_16.X_mm_(593:1279),velocity(593:1279));
i = 16;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_16.TimeStamp(593)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_16.TimeStamp(1279)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_17.X_mm_(590:1275),velocity(590:1275));
i = 17;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_17.TimeStamp(590)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_17.TimeStamp(1275)

```

```

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_18.X_mm_(609:1293),velocity(609:1293));
i = 18;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_18.TimeStamp(609)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_18.TimeStamp(1293)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_19.X_mm_(449:1132),velocity(449:1132));
i = 19;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_19.TimeStamp(449)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_19.TimeStamp(1132)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_20.X_mm_(526:1209),velocity(526:1209));
i = 20;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_20.TimeStamp(526)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_20.TimeStamp(1209)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_21.X_mm_(539:1222),velocity(539:1222));
i = 21;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_21.TimeStamp(539)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_21.TimeStamp(1222)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_22.X_mm_(506:1189),velocity(506:1189));
i = 22;

```

```

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_22.TimeStamp(506)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_22.TimeStamp(1189)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_23.X_mm_(499:1184),velocity(499:1184));
i = 23;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_23.TimeStamp(499)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_23.TimeStamp(1184)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_24.X_mm_(657:1341),velocity(657:1341));
i = 24;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_24.TimeStamp(657)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_24.TimeStamp(1341)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_25.X_mm_(532:1218),velocity(532:1218));
i = 25;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_25.TimeStamp(532)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_25.TimeStamp(1218)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_26.X_mm_(512:1199),velocity(512:1199));
i = 26;

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_26.TimeStamp(512)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_26.TimeStamp(1199)

```

```

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_27.X_mm_(712:1394),velocity(712:1394));
i = 27;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_27.TimeStamp(712)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStartTime = RunStart + tdiff(3)
CutOffEndTime = RunStart + tdiff(4)
RunEnd = TrackerData_27.TimeStamp(1394)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_28.X_mm_(531:1217),velocity(531:1217));
i = 28;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_28.TimeStamp(531)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStartTime = RunStart + tdiff(3)
CutOffEndTime = RunStart + tdiff(4)
RunEnd = TrackerData_28.TimeStamp(1217)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_29.X_mm_(521:1207),velocity(521:1207));
i = 29;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_29.TimeStamp(521)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStartTime = RunStart + tdiff(3)
CutOffEndTime = RunStart + tdiff(4)
RunEnd = TrackerData_29.TimeStamp(1207)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_30.X_mm_(476:1162),velocity(476:1162));
i = 30;

clear RunStart PlatueauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_30.TimeStamp(476)
PlatueauStart = RunStart + tdiff(1)
PlatueauEnd = RunStart + tdiff(2)
CutOffStartTime = RunStart + tdiff(3)
CutOffEndTime = RunStart + tdiff(4)
RunEnd = TrackerData_30.TimeStamp(1162)

RunStartTime(i) = RunStart;
PlatueauStartTime(i) = PlatueauStart;
PlatueauEndTime(i) = PlatueauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_31.X_mm_(520:1208),velocity(520:1208));
i = 31;

```

```

clear RunStart PlateauStart PlateauEnd CutOffStart CutOffEnd RunEnd
RunStart = TrackerData_31.TimeStamp(520)
PlateauStart = RunStart + tdiff(1)
PlateauEnd = RunStart + tdiff(2)
CutOffStart = RunStart + tdiff(3)
CutOffEnd = RunStart + tdiff(4)
RunEnd = TrackerData_31.TimeStamp(1208)

RunStartTime(i) = RunStart;
PlateauStartTime(i) = PlateauStart;
PlateauEndTime(i) = PlateauEnd;
CutOffStartTime(i) = CutOffStart;
CutOffEndTime(i) = CutOffEnd;
RunEndTime(i) = RunEnd;

% plot(TrackerData_1p2.X_mm_(473:1153),velocity(473:1153));
%
% plot(TrackerData_2.X_mm_(979:1661),velocity(979:1661));
%
% plot(TrackerData_3.X_mm_(1277:1961),velocity(1277:1961));
%
% plot(TrackerData_4.X_mm_(941:1625),velocity(941:1625));
%
% plot(TrackerData_5.X_mm_(704:1390),velocity(704:1390));
%
% plot(TrackerData_6.X_mm_(732:1419),velocity(732:1419));
%
% plot(TrackerData_7.X_mm_(612:1298),velocity(612:1298));
%
% plot(TrackerData_8.X_mm_(711:1396),velocity(711:1396));
%
% plot(TrackerData_9.X_mm_(952:1636),velocity(952:1636));
%
% plot(TrackerData_10.X_mm_(737:1418),velocity(737:1418));
%
% plot(TrackerData_11.X_mm_(809:1494),velocity(809:1494));
%
% plot(TrackerData_12.X_mm_(977:1660),velocity(977:1660));
%
% plot(TrackerData_13.X_mm_(724:1410),velocity(724:1410));
%
% plot(TrackerData_14.X_mm_(600:1287),velocity(600:1287));
%
% plot(TrackerData_15.X_mm_(576:1261),velocity(576:1261));
%
% plot(TrackerData_16.X_mm_(593:1279),velocity(593:1279));
%
% plot(TrackerData_17.X_mm_(590:1275),velocity(590:1275));
%
% plot(TrackerData_18.X_mm_(609:1293),velocity(609:1293));
%
% plot(TrackerData_19.X_mm_(449:1132),velocity(449:1132));
%
% plot(TrackerData_20.X_mm_(526:1209),velocity(526:1209));
%
% plot(TrackerData_21.X_mm_(539:1222),velocity(539:1222));
%
% plot(TrackerData_22.X_mm_(506:1189),velocity(506:1189));
%
% plot(TrackerData_23.X_mm_(499:1184),velocity(499:1184));
%
% plot(TrackerData_24.X_mm_(657:1341),velocity(657:1341));
%
% plot(TrackerData_25.X_mm_(532:1218),velocity(532:1218));
%
% plot(TrackerData_26.X_mm_(512:1199),velocity(512:1199));
%
% plot(TrackerData_27.X_mm_(712:1394),velocity(712:1394));
%
% plot(TrackerData_28.X_mm_(531:1217),velocity(531:1217));
%
% plot(TrackerData_29.X_mm_(521:1207),velocity(521:1207));
%
% plot(TrackerData_30.X_mm_(476:1162),velocity(476:1162));
%
% plot(TrackerData_31.X_mm_(520:1208),velocity(520:1208));

```

---

#### Saving all timestamps in one data structure

---

```

RunCrucialTimeStamps = table(RunStartTime',PlatueauStartTime',PlatueauEndTime',CutOffStartTime',CutOffEndTime',Run1mEndTime',RunEndTime');
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var1","RunStartTime");
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var2","PlatueauStartTime");
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var3","PlatueauEndTime");
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var4","CutOffStartTime");
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var5","CutOffEndTime");
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var6","Run1mEndTime");
RunCrucialTimeStamps = renamevars(RunCrucialTimeStamps,"Var7","RunEndTime");
save RunCrucialTimeStamps.mat RunCrucialTimeStamps;

```

**sanity check of crucial time stamps data (this is where a mistake was made - diff vs cumulative diff now corrected.)**

```

figure;hold on;
plot(RunCrucialTimeStamps.PlatueauStartTime - RunCrucialTimeStamps.RunStartTime)
plot(RunCrucialTimeStamps.PlatueauEndTime - RunCrucialTimeStamps.PlatueauStartTime)
plot(RunCrucialTimeStamps.CutOffStartTime - RunCrucialTimeStamps.PlatueauEndTime)
plot(RunCrucialTimeStamps.CutOffEndTime - RunCrucialTimeStamps.CutOffStartTime)
plot(RunCrucialTimeStamps.RunEndTime - RunCrucialTimeStamps.CutOffEndTime)
hold off;

```

### Normalising tracker Y co-ordinate

```

% Pass 1 - Y 125
% Pass 2 - Y 137.5
% Pass 3 - Y 150
% Pass 4 - Y 162.5
% Pass 5 - Y 175
% Pass 6 - Y 187.5
% Pass 7 - Y 200
% Pass 8 - Y 212.5
% Pass 9 - Y 225
% Pass 10 - Y 237.5
% Pass 11 - Y 250
% Pass 12 - Y 262.5
% Pass 13 - Y 275
% Pass 14 - Y 287.5
% Pass 15 - Y 300
% Pass 16 - Y 312.5
% Pass 17 - Y 325
% Pass 18 - Y 337.5
% Pass 19 - Y 350
% Pass 20 - Y 362.5
% Pass 21 - Y 375
% Pass 22 - Y 387.5
% Pass 23 - Y 400
% Pass 24 - Y 412.55
% Pass 25 - Y 425
% Pass 26 - Y 437.5
% Pass 27 - Y 450
% Pass 28 - Y 462.5
% Pass 29 - Y 475
% Pass 30 - Y 487.5
% Pass 31 - Y 500

TrackerData_1.Y_normalised = TrackerData_1.Y_mm_ - 125;
TrackerData_1p2.Y_normalised = TrackerData_1p2.Y_mm_ - 125;
TrackerData_2.Y_normalised = TrackerData_2.Y_mm_ - 137.5;
TrackerData_3.Y_normalised = TrackerData_3.Y_mm_ - 150;
TrackerData_4.Y_normalised = TrackerData_4.Y_mm_ - 162.5;
TrackerData_5.Y_normalised = TrackerData_5.Y_mm_ - 175;
TrackerData_6.Y_normalised = TrackerData_6.Y_mm_ - 187.5;
TrackerData_7.Y_normalised = TrackerData_7.Y_mm_ - 200;
TrackerData_8.Y_normalised = TrackerData_8.Y_mm_ - 212.5;
TrackerData_9.Y_normalised = TrackerData_9.Y_mm_ - 225;
TrackerData_10.Y_normalised = TrackerData_10.Y_mm_ - 237.5;
TrackerData_11.Y_normalised = TrackerData_11.Y_mm_ - 250;
TrackerData_12.Y_normalised = TrackerData_12.Y_mm_ - 262.5;
TrackerData_13.Y_normalised = TrackerData_13.Y_mm_ - 275;
TrackerData_14.Y_normalised = TrackerData_14.Y_mm_ - 287.5;
TrackerData_15.Y_normalised = TrackerData_15.Y_mm_ - 300;
TrackerData_16.Y_normalised = TrackerData_16.Y_mm_ - 312.5;
TrackerData_17.Y_normalised = TrackerData_17.Y_mm_ - 325;
TrackerData_18.Y_normalised = TrackerData_18.Y_mm_ - 337.5;
TrackerData_19.Y_normalised = TrackerData_19.Y_mm_ - 350;
TrackerData_20.Y_normalised = TrackerData_20.Y_mm_ - 362.5;
TrackerData_21.Y_normalised = TrackerData_21.Y_mm_ - 375;
TrackerData_22.Y_normalised = TrackerData_22.Y_mm_ - 387.5;
TrackerData_23.Y_normalised = TrackerData_23.Y_mm_ - 400;

```

```

TrackerData_24.Y_normalised = TrackerData_24.Y_mm_ - 412.55;
TrackerData_25.Y_normalised = TrackerData_25.Y_mm_ - 425;
TrackerData_26.Y_normalised = TrackerData_26.Y_mm_ - 437.5;
TrackerData_27.Y_normalised = TrackerData_27.Y_mm_ - 450;
TrackerData_28.Y_normalised = TrackerData_28.Y_mm_ - 462.5;
TrackerData_29.Y_normalised = TrackerData_29.Y_mm_ - 475;
TrackerData_30.Y_normalised = TrackerData_30.Y_mm_ - 487.5;
TrackerData_31.Y_normalised = TrackerData_31.Y_mm_ - 500;
%

```

## Getting better data structures amenable to functions without dynamic naming

why didn't I do this earlier....Arghh....

```

Data(1).Camera = CameraData_Truetime_1;
Data(2).Camera = CameraData_Truetime_2;
Data(3).Camera = CameraData_Truetime_3;
Data(4).Camera = CameraData_Truetime_4;
Data(5).Camera = CameraData_Truetime_5;
Data(6).Camera = CameraData_Truetime_6;
Data(7).Camera = CameraData_Truetime_7;
Data(8).Camera = CameraData_Truetime_8;
Data(9).Camera = CameraData_Truetime_9;
Data(10).Camera = CameraData_Truetime_10;
Data(11).Camera = CameraData_Truetime_11;
Data(12).Camera = CameraData_Truetime_12;
Data(13).Camera = CameraData_Truetime_13;
Data(14).Camera = CameraData_Truetime_14;
Data(15).Camera = CameraData_Truetime_15;
Data(16).Camera = CameraData_Truetime_16;
Data(17).Camera = CameraData_Truetime_17;
Data(18).Camera = CameraData_Truetime_18;
Data(19).Camera = CameraData_Truetime_19;
Data(20).Camera = CameraData_Truetime_20;
Data(21).Camera = CameraData_Truetime_21;
Data(22).Camera = CameraData_Truetime_22;
Data(23).Camera = CameraData_Truetime_23;
Data(24).Camera = CameraData_Truetime_24;
Data(25).Camera = CameraData_Truetime_25;
Data(26).Camera = CameraData_Truetime_26;
Data(27).Camera = CameraData_Truetime_27;
Data(28).Camera = CameraData_Truetime_28;
Data(29).Camera = CameraData_Truetime_29;
Data(30).Camera = CameraData_Truetime_30;
Data(31).Camera = CameraData_Truetime_31;

Data(1).LLS_B = LLSBData_Truetime_1;
Data(2).LLS_B = LLSBData_Truetime_2;
Data(3).LLS_B = LLSBData_Truetime_3;
Data(4).LLS_B = LLSBData_Truetime_4;
Data(5).LLS_B = LLSBData_Truetime_5;
Data(6).LLS_B = LLSBData_Truetime_6;
Data(7).LLS_B = LLSBData_Truetime_7;
Data(8).LLS_B = LLSBData_Truetime_8;
Data(9).LLS_B = LLSBData_Truetime_9;
Data(10).LLS_B = LLSBData_Truetime_10;
Data(11).LLS_B = LLSBData_Truetime_11;
Data(12).LLS_B = LLSBData_Truetime_12;
Data(13).LLS_B = LLSBData_Truetime_13;
Data(14).LLS_B = LLSBData_Truetime_14;
Data(15).LLS_B = LLSBData_Truetime_15;
Data(16).LLS_B = LLSBData_Truetime_16;
Data(17).LLS_B = LLSBData_Truetime_17;
Data(18).LLS_B = LLSBData_Truetime_18;
Data(19).LLS_B = LLSBData_Truetime_19;
Data(20).LLS_B = LLSBData_Truetime_20;
Data(21).LLS_B = LLSBData_Truetime_21;
Data(22).LLS_B = LLSBData_Truetime_22;
Data(23).LLS_B = LLSBData_Truetime_23;
Data(24).LLS_B = LLSBData_Truetime_24;
Data(25).LLS_B = LLSBData_Truetime_25;
Data(26).LLS_B = LLSBData_Truetime_26;
Data(27).LLS_B = LLSBData_Truetime_27;
Data(28).LLS_B = LLSBData_Truetime_28;
Data(29).LLS_B = LLSBData_Truetime_29;
Data(30).LLS_B = LLSBData_Truetime_30;
Data(31).LLS_B = LLSBData_Truetime_31;

Data(1).LLS_A = LLSAData_Truetime_1;
Data(2).LLS_A = LLSAData_Truetime_2;

```

```

Data(3).LLS_A = LLSAData_Truetime_3;
Data(4).LLS_A = LLSAData_Truetime_4;
Data(5).LLS_A = LLSAData_Truetime_5;
Data(6).LLS_A = LLSAData_Truetime_6;
Data(7).LLS_A = LLSAData_Truetime_7;
Data(8).LLS_A = LLSAData_Truetime_8;
Data(9).LLS_A = LLSAData_Truetime_9;
Data(10).LLS_A = LLSAData_Truetime_10;
Data(11).LLS_A = LLSAData_Truetime_11;
Data(12).LLS_A = LLSAData_Truetime_12;
Data(13).LLS_A = LLSAData_Truetime_13;
Data(14).LLS_A = LLSAData_Truetime_14;
Data(15).LLS_A = LLSAData_Truetime_15;
Data(16).LLS_A = LLSAData_Truetime_16;
Data(17).LLS_A = LLSAData_Truetime_17;
Data(18).LLS_A = LLSAData_Truetime_18;
Data(19).LLS_A = LLSAData_Truetime_19;
Data(20).LLS_A = LLSAData_Truetime_20;
Data(21).LLS_A = LLSAData_Truetime_21;
Data(22).LLS_A = LLSAData_Truetime_22;
Data(23).LLS_A = LLSAData_Truetime_23;
Data(24).LLS_A = LLSAData_Truetime_24;
Data(25).LLS_A = LLSAData_Truetime_25;
Data(26).LLS_A = LLSAData_Truetime_26;
Data(27).LLS_A = LLSAData_Truetime_27;
Data(28).LLS_A = LLSAData_Truetime_28;
Data(29).LLS_A = LLSAData_Truetime_29;
Data(30).LLS_A = LLSAData_Truetime_30;
Data(31).LLS_A = LLSAData_Truetime_31;

Data(1).Tracker = TrackerData_1p2;
Data(2).Tracker = TrackerData_2;
Data(3).Tracker = TrackerData_3;
Data(4).Tracker = TrackerData_4;
Data(5).Tracker = TrackerData_5;
Data(6).Tracker = TrackerData_6;
Data(7).Tracker = TrackerData_7;
Data(8).Tracker = TrackerData_8;
Data(9).Tracker = TrackerData_9;
Data(10).Tracker = TrackerData_10;
Data(11).Tracker = TrackerData_11;
Data(12).Tracker = TrackerData_12;
Data(13).Tracker = TrackerData_13;
Data(14).Tracker = TrackerData_14;
Data(15).Tracker = TrackerData_15;
Data(16).Tracker = TrackerData_16;
Data(17).Tracker = TrackerData_17;
Data(18).Tracker = TrackerData_18;
Data(19).Tracker = TrackerData_19;
Data(20).Tracker = TrackerData_20;
Data(21).Tracker = TrackerData_21;
Data(22).Tracker = TrackerData_22;
Data(23).Tracker = TrackerData_23;
Data(24).Tracker = TrackerData_24;
Data(25).Tracker = TrackerData_25;
Data(26).Tracker = TrackerData_26;
Data(27).Tracker = TrackerData_27;
Data(28).Tracker = TrackerData_28;
Data(29).Tracker = TrackerData_29;
Data(30).Tracker = TrackerData_30;
Data(31).Tracker = TrackerData_31;

save Data.mat Data \%trutime

% Same DS with all timetables

DateTimeTables(1).Camera = table2timetable(CameraData_Truetime_1);
DateTimeTables(2).Camera = table2timetable(CameraData_Truetime_2);
DateTimeTables(3).Camera = table2timetable(CameraData_Truetime_3);
DateTimeTables(4).Camera = table2timetable(CameraData_Truetime_4);
DateTimeTables(5).Camera = table2timetable(CameraData_Truetime_5);
DateTimeTables(6).Camera = table2timetable(CameraData_Truetime_6);
DateTimeTables(7).Camera = table2timetable(CameraData_Truetime_7);
DateTimeTables(8).Camera = table2timetable(CameraData_Truetime_8);
DateTimeTables(9).Camera = table2timetable(CameraData_Truetime_9);
DateTimeTables(10).Camera = table2timetable(CameraData_Truetime_10);
DateTimeTables(11).Camera = table2timetable(CameraData_Truetime_11);
DateTimeTables(12).Camera = table2timetable(CameraData_Truetime_12);
DateTimeTables(13).Camera = table2timetable(CameraData_Truetime_13);
DateTimeTables(14).Camera = table2timetable(CameraData_Truetime_14);
DateTimeTables(15).Camera = table2timetable(CameraData_Truetime_15);

```



```

DateTimeTables(1).Tracker = table2timetable(TrackerData_1p2(473:1153,:));
DateTimeTables(2).Tracker = table2timetable(TrackerData_2(979:1661,:));
DateTimeTables(3).Tracker = table2timetable(TrackerData_3(1277:1961,:));
DateTimeTables(4).Tracker = table2timetable(TrackerData_4(941:1625,:));
DateTimeTables(5).Tracker = table2timetable(TrackerData_5(704:1390,:));
DateTimeTables(6).Tracker = table2timetable(TrackerData_6(732:1419,:));
DateTimeTables(7).Tracker = table2timetable(TrackerData_7(612:1298,:));
DateTimeTables(8).Tracker = table2timetable(TrackerData_8(711:1396,:));
DateTimeTables(9).Tracker = table2timetable(TrackerData_9(952:1636,:));
DateTimeTables(10).Tracker = table2timetable(TrackerData_10(737:1418,:));
DateTimeTables(11).Tracker = table2timetable(TrackerData_11(809:1494,:));
DateTimeTables(12).Tracker = table2timetable(TrackerData_12(977:1660,:));
DateTimeTables(13).Tracker = table2timetable(TrackerData_13(724:1410,:));
DateTimeTables(14).Tracker = table2timetable(TrackerData_14(600:1287,:));
DateTimeTables(15).Tracker = table2timetable(TrackerData_15(576:1261,:));
DateTimeTables(16).Tracker = table2timetable(TrackerData_16(593:1279,:));
DateTimeTables(17).Tracker = table2timetable(TrackerData_17(590:1275,:));
DateTimeTables(18).Tracker = table2timetable(TrackerData_18(600:1293,:));
DateTimeTables(19).Tracker = table2timetable(TrackerData_19(449:1132,:));
DateTimeTables(20).Tracker = table2timetable(TrackerData_20(526:1209,:));
DateTimeTables(21).Tracker = table2timetable(TrackerData_21(539:1222,:));
DateTimeTables(22).Tracker = table2timetable(TrackerData_22(506:1189,:));
DateTimeTables(23).Tracker = table2timetable(TrackerData_23(499:1184,:));
DateTimeTables(24).Tracker = table2timetable(TrackerData_24(657:1341,:));
DateTimeTables(25).Tracker = table2timetable(TrackerData_25(532:1218,:));
DateTimeTables(26).Tracker = table2timetable(TrackerData_26(512:1199,:));
DateTimeTables(27).Tracker = table2timetable(TrackerData_27(712:1394,:));
DateTimeTables(28).Tracker = table2timetable(TrackerData_28(531:1217,:));
DateTimeTables(29).Tracker = table2timetable(TrackerData_29(521:1207,:));
DateTimeTables(30).Tracker = table2timetable(TrackerData_30(476:1162,:));
DateTimeTables(31).Tracker = table2timetable(TrackerData_31(520:1208,:));

% Adding velocity to the tracker tables
for i = 1:31
    clear temp
    temp = (diff(DataTimeTables(i).Tracker.X_mm_))./(seconds(diff(DataTimeTables(i).Tracker.TimeStamp)));
    temp(height(DataTimeTables(i).Tracker)) = temp((height(DataTimeTables(i).Tracker))-1);% to equalise array lengths
    DataTimeTables(i).Tracker.Velocity = temp;
end

save DateTimeTables.mat DateTimeTables %trutime with timeables and tracker data only for 1-1100mm | TruTime TM C :-)

% tracker = TrackerData_10.TimeStamp(end)-TrackerData_10.TimeStamp(1);
% tracker = duration(tracker,'Format','hh:mm:ss.SSS')
% velocity = diff(TrackerData_10_Traverse.X_mm_)./seconds(diff(TrackerData_10_Traverse.TimeStamp));
% plot(TrackerData_10_Traverse.X_mm_(1:end-1),velocity(1:end));

```

## Creating struct for gap data

```

% Get to storage folder for LLS
cd 'O:\Siddharth Experiment 31 straight lines 26th July\LLS\Straight lines - Traverse\All gaps widths Traverse'

% load all mats.
mat = dir('*.mat');
for q = 1:length(mat)
    load(mat(q).name);
end

MeasuredGapData(1).Gap = TraverseData_Gap_1_2;
MeasuredGapData(2).Gap = TraverseData_Gap_2_3;
MeasuredGapData(3).Gap = TraverseData_Gap_3_4;
MeasuredGapData(4).Gap = TraverseData_Gap_4_5;
MeasuredGapData(5).Gap = TraverseData_Gap_5_6;
MeasuredGapData(6).Gap = TraverseData_Gap_6_7;
MeasuredGapData(7).Gap = TraverseData_Gap_7_8;
MeasuredGapData(8).Gap = TraverseData_Gap_8_9;
MeasuredGapData(9).Gap = TraverseData_Gap_9_10;
MeasuredGapData(10).Gap = TraverseData_Gap_10_11;
MeasuredGapData(11).Gap = TraverseData_Gap_11_12;
MeasuredGapData(12).Gap = TraverseData_Gap_12_13;
MeasuredGapData(13).Gap = TraverseData_Gap_13_14;
MeasuredGapData(14).Gap = TraverseData_Gap_14_15;
MeasuredGapData(15).Gap = TraverseData_Gap_15_16;
MeasuredGapData(16).Gap = TraverseData_Gap_16_17;
MeasuredGapData(17).Gap = TraverseData_Gap_17_18;
MeasuredGapData(18).Gap = TraverseData_Gap_18_19;
MeasuredGapData(19).Gap = TraverseData_Gap_19_20;
MeasuredGapData(20).Gap = TraverseData_Gap_20_21;
MeasuredGapData(21).Gap = TraverseData_Gap_21_22;
MeasuredGapData(22).Gap = TraverseData_Gap_22_23;

```

```

MeasuredGapData(23).Gap = TraverseData_Gap_23_24;
MeasuredGapData(24).Gap = TraverseData_Gap_24_25;
MeasuredGapData(25).Gap = TraverseData_Gap_25_26;
MeasuredGapData(26).Gap = TraverseData_Gap_26_27;
MeasuredGapData(27).Gap = TraverseData_Gap_27_28;
MeasuredGapData(28).Gap = TraverseData_Gap_28_29;
MeasuredGapData(29).Gap = TraverseData_Gap_29_30;
MeasuredGapData(30).Gap = TraverseData_Gap_30_31;

save MeasuredGapData.mat MeasuredGapData

```

---

## Appendix / Code graveyard

---

```

% Joining the four tables for each run

tracker = TrackerData_15.TimeStamp(1207)-TrackerData_15.TimeStamp(586);
tracker = duration(tracker,'Format','hh:mm:ss.SSS')

camera = CameraData_15.TimeStamps(end)-CameraData_15.TimeStamps(1);
camera = duration(camera,'Format','hh:mm:ss.SSS')

LLS = Run15width_AfterCompaction.Time(end)-Run15width_AfterCompaction.Time(1);
LLS = duration(LLS,'Format','hh:mm:ss.SSS')

plot(TrackerData_15.TimeStamp,TrackerData_15.X_mm_)

plot(TraverseData_Gap_15_16.Gap_Rotated)

velocity = diff(TrackerData_30.X_mm_)./seconds(diff(TrackerData_30.TimeStamp))
plot(TrackerData_30.X_mm_(586:1207),velocity(586:1207))

```

---

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