Project 2022-2023 Image Analysis and Computer Vision

Visual motion analysis

of a player's fingers

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Results

The process for the Calibration is the following:

A. **Rectification of the Horizontal Façade**
   hor_rectification()
   includes functions:
   1. **vanishing_points()**
   2. **affine()**
   3. **metric()**
   4. **ratio()**

First, I select a frame from the video and for this frame I run rectification(frame).

I find the vanishing points, vertical and orthogonal, and line at the infinity. Then I run the functions to build the rectification matrices and rectify image. Following the rectification, I run the last function ratio() to determine the ratio of the horizontal façade. The results are the following

```
Horizontal Vanishing points:

vo1 =

   1.0e+03 *

    1.5291
   -0.2399
    0.0010


vo2 =

       -2361
        -616
           1

Vertical Vanishing point:
   1.0e+03 *

    0.6603
    4.6040
    0.0010

Line at the infinity:
   -0.0002    0.0026    1.0000
```

```
Affine matrix:
    1.0000         0   -0.0002
         0    1.0000    0.0026
         0         0    1.0000

Euclidean matrix:
   -0.0734    1.1210         0
    1.1210   -0.3672         0
         0         0    1.0000

Rectification Matrix:
    0.2986    0.9116    0.0002
    0.9116    0.0597   -0.0026
         0         0    1.0000

Horizontal Facade ratio:
    0.8521
```

```
Points after affine and metric rectification:

AA =

  184.1672  263.6828


BB =

  234.1082  253.1212


CC =

  276.6419  262.2095


DD =

  226.7011  272.7712
```

B. Camera Calibration

Calibration() includes IACfunct()

I continue with the calibration process. The results are the following

```
IAC =

   1.0e+06 *

    0.0000         0   -0.0010
         0    0.0000    0.0001
   -0.0010    0.0001    2.0672


aa =

    0.9066


fx =

   1.0175e+03


fy =

  922.5426


K =

   1.0e+03 *

    1.0175         0    1.2124
         0    0.9225   -0.0891
         0         0    0.0010
```

C. Rectification of the Vertical Façade

Ver_rectification()

The result which is useful for the continuation of the exercise is the following:

```
Vertical Rectification matrix:
   -0.9615    0.2750   -0.0007
   -0.3990   -1.3952   -0.0005
   -0.0008   -0.0001    1.0000

Vertical Facade ratio:
    0.1208
```

D. Localization

Localization()

```
cameraPosition =

  699.0089
   42.8109
 -781.9455


cameraRotation =

    0.9976   -0.0691   -0.0014
    0.0691    0.9976   -0.0029
    0.0016    0.0028    1.0000
```