

```

import numpy as np
import cv2
from matplotlib import pyplot as plt

def extract_points(img, number=25, thickness=10):
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

    corners = cv2.goodFeaturesToTrack(gray, number, 0.01, 10)
    corners = np.int0(corners)

    for i in corners:
        x, y = i.ravel()
        cv2.circle(img, (x, y), thickness, 255, -1)

    return img, corners

def map_points(img, corners1, corners2, accuracy=30, thickness=10):
    new_img = img.copy()
    counter = 0
    for i in corners1:
        min_dist = accuracy**2
        best_j = None
        flag = False
        for j in corners2:
            dist = (i[0][0]-j[0][0])**2 + (i[0][1]-j[0][1])**2
            # print(dist)

            if dist <= min_dist:
                min_dist = dist
                best_j = j[0]
                flag=True

        if flag:
            new_img = cv2.line(new_img, tuple(i[0]), tuple(best_j), (0, 255, 255), thickn
            counter += 1

    return new_img, counter

```

### Вращение объекта при неподвижной камере

```

img1 = cv2.imread('Mosfilm1.png')
img1 = img1[450:2000, 1000:2750]

img2 = cv2.imread('Mosfilm2.png')
img2 = img2[450:2000, 1000:2750]

img_points1, corners1 = extract_points(img1)
img_points2, corners2 = extract_points(img2)

moving_img, counter = map_points(img2, corners1, corners2)

```

```

fig, axes = plt.subplots(1, 3)

axes[0].imshow(img_points1)
axes[0].set_title('First image')

axes[1].imshow(img_points2)
axes[1].set_title('Second image')

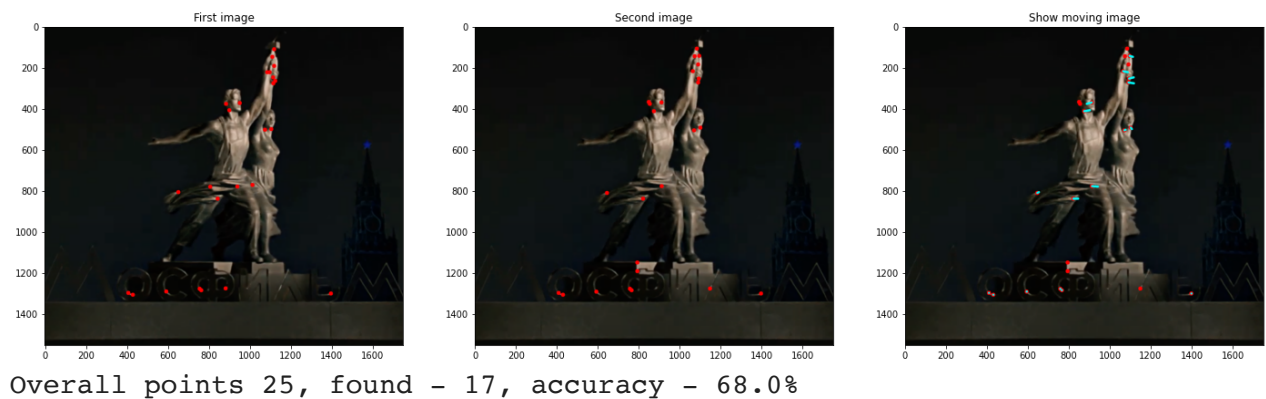
axes[2].imshow(moving_img)
axes[2].set_title('Show moving image')

fig.set_figwidth(24)
fig.set_figheight(12)

plt.show()

print(f'Overall points 25, found - {counter}, accuracy - {counter/min(len(corners1)

```



### Движение строго вправо в студийных условиях

```

img1 = cv2.imread('left.png')
img2 = cv2.imread('right.png')

img_points1, corners1 = extract_points(img1, thickness=5)
img_points2, corners2 = extract_points(img2, thickness=5)

moving_img, counter = map_points(img2, corners1, corners2, thickness=2)

fig, axes = plt.subplots(1, 3)

```

```

axes[0].imshow(img_points1)
axes[0].set_title('First image')

axes[1].imshow(img_points2)
axes[1].set_title('Second image')

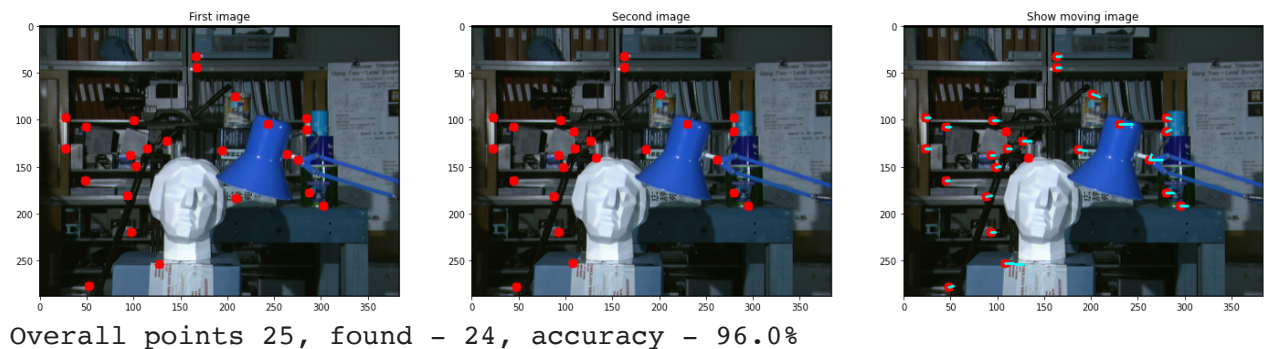
axes[2].imshow(moving_img)
axes[2].set_title('Show moving image')

fig.set_figwidth(24)
fig.set_figheight(12)

plt.show()

print(f'Overall points 25, found - {counter}, accuracy - {counter/25 * 100}%')

```



```

def extract_moving_and_show_result(img1, img2):
    img_points1, corners1 = extract_points(img1)
    img_points2, corners2 = extract_points(img2)

    moving_img, counter = map_points(img2, corners1, corners2, accuracy=100)

    fig, axes = plt.subplots(1, 3)

    axes[0].imshow(img_points1)
    axes[0].set_title('First image')

    axes[1].imshow(img_points2)
    axes[1].set_title('Second image')

    axes[2].imshow(moving_img)
    axes[2].set_title('Show moving image')

    fig.set_figwidth(12)

```

```
fig.set_figheight(6)
```

```
plt.show()
```

```
print(f'Overall points 25, found - {counter}, accuracy - {counter/min(len(corne
```

### Движение по спирали вниз

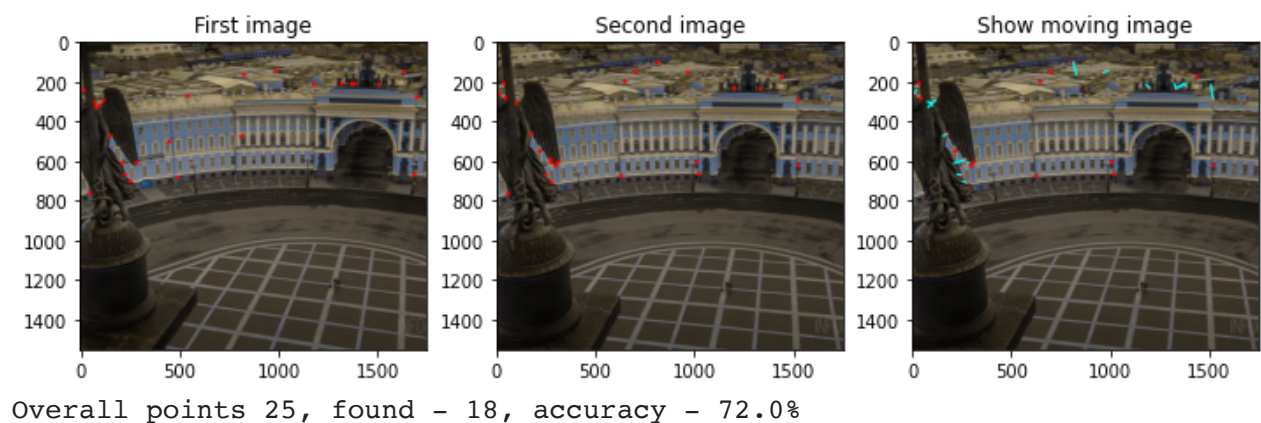
```
img1 = cv2.imread('Dvorts1.png')
```

```
img1 = img1[450:2000, 1000:2750]
```

```
img2 = cv2.imread('Dvorts2.png')
```

```
img2 = img2[450:2000, 1000:2750]
```

```
extract_moving_and_show_result(img1, img2)
```



### Движение вверх

```
img1 = cv2.imread('Adm1.png')
```

```
img1 = img1[450:2000, 1000:2750]
```

```
img2 = cv2.imread('Adm2.png')
```

```
img2 = img2[450:2000, 1000:2750]
```

```
extract_moving_and_show_result(img1, img2)
```

## Отдаление



```
img1 = cv2.imread('Isaak1.png')  
img1 = img1[450:2000, 1000:2750]
```

```
img2 = cv2.imread('Isaak2.png')  
img2 = img2[450:2000, 1000:2750]
```

```
extract_moving_and_show_result(img1, img2)
```

