Vepley AI model details

Model details

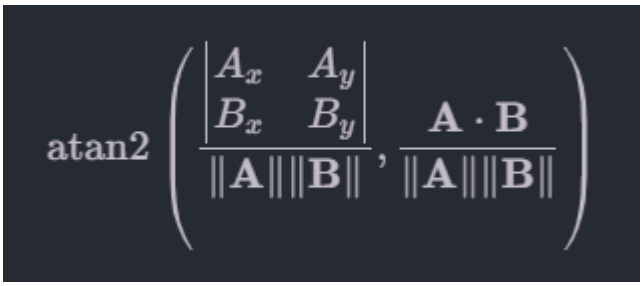
Input

X: The angle of the joint in the frame. Calculated by the following formula:

```
np.math.atan2(np.linalg.det([landmark1, landmark2]), np.dot(landmark1, landmark2))
```

Which is the angle between the two vectors.

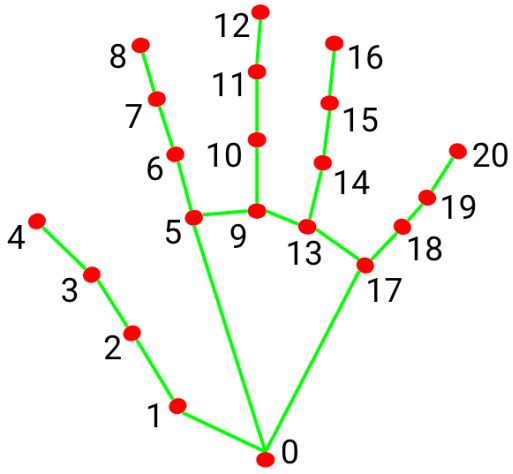
$$\mathrm{atan2}\left(\frac{\begin{vmatrix} A_x & A_y \ B_x & B_y \end{vmatrix}}{\lVert\mathbf{A}\rVert\lVert\mathbf{B}\rVert}, \frac{\mathbf{A}\cdot\mathbf{B}}{\lVert\mathbf{A}\rVert\lVert\mathbf{B}\rVert}\right)$$



We calculate the following angles:

```
PARSE_LANDMARKS_JOINTS = [
    [0, 1], [1, 2], [2, 3], [3, 4], # thumb
    [0, 5],[5, 6], [6, 7], [7, 8], # index finger
    [5, 9],[9,10],[10, 11], [11, 12],# middle finger
    [9, 13],[13, 14],[14, 15],[15, 16], # ring finger
    [13, 17],  [17, 18], [18, 19], [19,20]   # little finger
]
```

With the number above is the index of the joint in the frame.



0. WRIST
1. THUMB_CMC
2. THUMB_MCP
3. THUMB_IP
4. THUMB_TIP
5. INDEX_FINGER_MCP
6. INDEX_FINGER_PIP
7. INDEX_FINGER_DIP
8. INDEX_FINGER_TIP
9. MIDDLE_FINGER_MCP
10. MIDDLE_FINGER_PIP
11. MIDDLE_FINGER_DIP
12. MIDDLE_FINGER_TIP
13. RING_FINGER_MCP
14. RING_FINGER_PIP
15. RING_FINGER_DIP
16. RING_FINGER_TIP
17. PINKY_MCP
18. PINKY_PIP
19. PINKY_DIP
20. PINKY_TIP

By calculating the angle between the joints we get the input with 20 features.

Y : the label of the action.

```
Actions = ['Idle',
           'Pickup_item',
           'Use_item',
           'Aim',
           'Shoot'
           ]
```

Model

We use a simple deep neural network with 4 layers.

```
LAYERS = [512, 256, 256, len(Actions)]
```

Then we use the following activation function:

```
ACTIVATION = [ "relu", "relu", "relu", "sigmoid"]
```

The model is trained using keras library with the following parameters:

```
EPOCHS = 100
BATCH_SIZE = 32
```

Output

The output is the probability of the action.

Dataset details

Total of 5 people.

Each frame has 2D coordinates of 21 joints.

Batch 1: VepleyAI_dataset_Dataset_full_1

- Idle: 800
- Pickup_item: 798
- Use_item: 798
- Aim: 798
- Shoot: 800
- total: 3994

Batch 2: VepleyAI_dataset_Dataset_full_2

- Idle: 800
- Pickup_item: 798
- Use_item: 800
- Aim: 798
- Shoot: 798
- total: 3994

Batch 3: VepleyAI_dataset_Dataset_full_3

- Idle: 798
- Pickup_item: 798
- Use_item: 800
- Aim: 798
- Shoot: 800
- total: 3994

Batch 4: VepleyAI_dataset_Dataset_full_4

- Idle: 800
- Pickup_item: 800
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3994

Batch 5: VepleyAI_dataset_Dataset_full_5

- Idle: 798
- Pickup_item: 798
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3990

Batch 6: VepleyAI_dataset_Dataset_full_6

- Idle: 796
- Pickup_item: 798
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3988

Batch 7: VepleyAI_dataset_Dataset_full_7

- Idle: 800
- Pickup_item: 800
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3994

Batch 8: VepleyAI_dataset_Dataset_full_8

- Idle: 798
- Pickup_item: 798
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3990

Batch 9: VepleyAI_dataset_Dataset_full_9

- Idle: 798
- Pickup_item: 798
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3990

Batch 10: VepleyAI_dataset_DS_01

- Idle: 798
- Pickup_item: 798
- Use_item: 798
- Aim: 798
- Shoot: 798
- total: 3990

Batch 11: VepleyAI_dataset_DS_02

- Idle: 798
- Pickup_item: 798
- Use_item: 800

- Aim: 800
- Shoot: 800
- total: 3996