3.Overall inspection

3.1. Introduction

MediaPipe is an open source data stream processing machine learning application development framework developed by Google. It is a graph-based data processing pipeline for building and using multiple forms of data sources, such as video, audio, sensor data, and any time series data. MediaPipe is cross-platform and can run on embedded platforms (Raspberry Pi, etc.), mobile devices (iOS and Android), workstations and servers, and supports mobile GPU acceleration. MediaPipe provides cross-platform, customizable ML solutions for real-time and streaming media.

The core framework of MediaPipe is implemented in C++ and provides support for languages such as Java and Objective C. The main concepts of MediaPipe include Packet, Stream, Calculator, Graph and Subgraph.

MediaPipe Features:

- End-to-end acceleration: Built-in fast ML inference and processing accelerates even on commodity hardware.
- Build once, deploy anywhere: Unified solution for Android, iOS, desktop/cloud, web and IoT.
- Ready-to-use solutions: cutting-edge ML solutions that showcase the full capabilities of the framework.
- Free and open source: frameworks and solutions under Apache2.0, fully extensible and customizable.

3.2. Overall detection

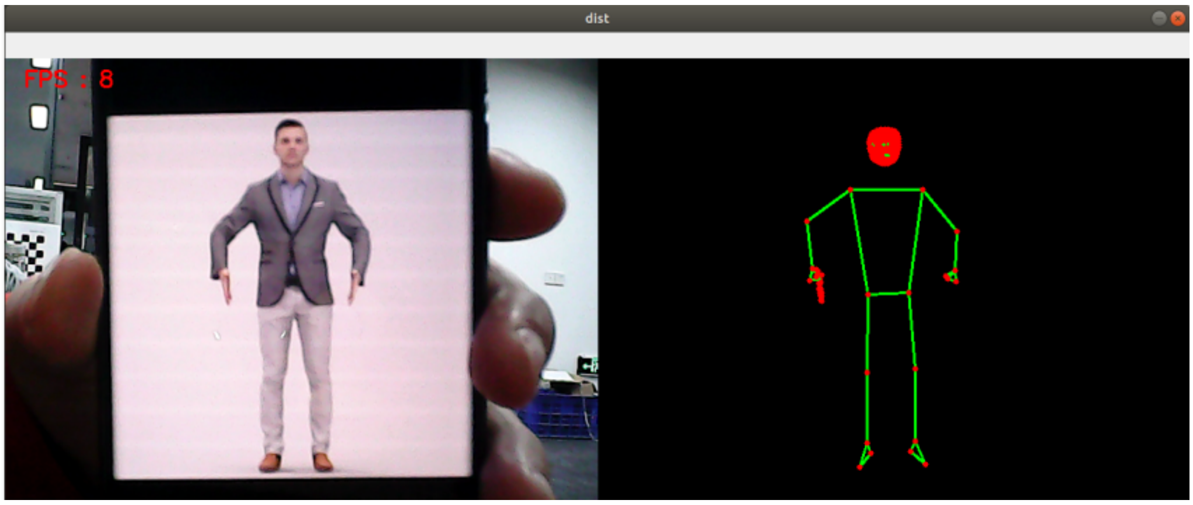
Combined with the contents of the previous two sections, this routine implements the function of detecting both palms and human bodies.

3.2.1. Start

Note: Before running this case, please make sure that the [/dev/video0] device has been successfully mounted into the docker container, otherwise the camera will not be opened.

Enter the docker container and execute:

```
ros2 run yahboomcar_mediapipe 03_Holistic
```



To view the point cloud data and node topic communication diagram, please refer to the [Hand Detection] case course.

3.2.2.Source code

Source code location:

```
/root/yahboomcar_ros2_ws/yahboomcar_ws/src/yahboomcar_mediapipe/yahboomcar_media
pipe/03_Holistic.py
```

```
#!/usr/bin/env python3
# encoding: utf-8
#import ros lib
import rclpy
from rclpy.node import Node
from geometry_msgs.msg import Point
import mediapipe as mp
#import define msg
from yahboomcar_msgs.msg import PointArray
#import commom lib
import cv2 as cv
import numpy as np
import time
print("import done")



class Holistic(Node):
    def __init__(self, name,staticMode=False, landmarks=True, detectionCon=0.5,
trackingCon=0.5):
        super().__init__(name)
        self.mpHolistic = mp.solutions.holistic
        self.mpFaceMesh = mp.solutions.face_mesh
        self.mpHands = mp.solutions.hands
        self.mpPose = mp.solutions.pose
        self.mpDraw = mp.solutions.drawing_utils
        self.mpholistic = self.mpHolistic.Holistic(
```

```python
            static_image_mode=staticMode,
            smooth_landmarks=landmarks,
            min_detection_confidence=detectionCon,
            min_tracking_confidence=trackingCon)
        self.pub_point =
self.create_publisher(PointArray,'/mediapipe/points',1000)
        self.lmDrawSpec = mp.solutions.drawing_utils.DrawingSpec(color=(0, 0,
255), thickness=-1, circle_radius=3)
        self.drawSpec = mp.solutions.drawing_utils.DrawingSpec(color=(0, 255,
0), thickness=2, circle_radius=2)

    def findHolistic(self, frame, draw=True):
        pointArray = PointArray()
        img = np.zeros(frame.shape, np.uint8)
        img_RGB = cv.cvtColor(frame, cv.COLOR_BGR2RGB)
        self.results = self.mpholistic.process(img_RGB)
        if self.results.face_landmarks:
            if draw: self.mpDraw.draw_landmarks(frame,
self.results.face_landmarks, self.mpFaceMesh.FACEMESH_CONTOURS, self.lmDrawSpec,
self.drawSpec)
            self.mpDraw.draw_landmarks(img, self.results.face_landmarks,
self.mpFaceMesh.FACEMESH_CONTOURS, self.lmDrawSpec, self.drawSpec)
            for id, lm in enumerate(self.results.face_landmarks.landmark):
                point = Point()
                point.x, point.y, point.z = lm.x, lm.y, lm.z
                pointArray.points.append(point)
        if self.results.pose_landmarks:
            if draw: self.mpDraw.draw_landmarks(frame,
self.results.pose_landmarks, self.mpPose.POSE_CONNECTIONS, self.lmDrawSpec,
self.drawSpec)
            self.mpDraw.draw_landmarks(img, self.results.pose_landmarks,
self.mpPose.POSE_CONNECTIONS, self.lmDrawSpec, self.drawSpec)
            for id, lm in enumerate(self.results.pose_landmarks.landmark):
                point = Point()
                point.x, point.y, point.z = lm.x, lm.y, lm.z
                pointArray.points.append(point)
        if self.results.left_hand_landmarks:
            if draw: self.mpDraw.draw_landmarks(frame,
self.results.left_hand_landmarks, self.mpHands.HAND_CONNECTIONS,
self.lmDrawSpec, self.drawSpec)
            self.mpDraw.draw_landmarks(img, self.results.left_hand_landmarks,
self.mpHands.HAND_CONNECTIONS, self.lmDrawSpec, self.drawSpec)
            for id, lm in enumerate(self.results.left_hand_landmarks.landmark):
                point = Point()
                point.x, point.y, point.z = lm.x, lm.y, lm.z
                pointArray.points.append(point)
        if self.results.right_hand_landmarks:
            if draw: self.mpDraw.draw_landmarks(frame,
self.results.right_hand_landmarks, self.mpHands.HAND_CONNECTIONS,
self.lmDrawSpec, self.drawSpec)
            self.mpDraw.draw_landmarks(img, self.results.right_hand_landmarks,
self.mpHands.HAND_CONNECTIONS, self.lmDrawSpec, self.drawSpec)
            for id, lm in enumerate(self.results.right_hand_landmarks.landmark):
                point = Point()
                point.x, point.y, point.z = lm.x, lm.y, lm.z
                pointArray.points.append(point)
        self.pub_point.publish(pointArray)
        return frame, img

    def frame_combine(slef,frame, src):
        if len(frame.shape) == 3:
            frameH, frameW = frame.shape[:2]
            srcH, srcW = src.shape[:2]
            dst = np.zeros((max(frameH, srcH), frameW + srcW, 3), np.uint8)
            dst[:, :frameW] = frame[:, :]
            dst[:, frameW:] = src[:, :]
        else:
            src = cv.cvtColor(src, cv.COLOR_BGR2GRAY)
            frameH, frameW = frame.shape[:2]
            imgH, imgW = src.shape[:2]
            dst = np.zeros((frameH, frameW + imgW), np.uint8)
            dst[:, :frameW] = frame[:, :]
            dst[:, frameW:] = src[:, :]
        return dst


def main():
    print("start it")
    rclpy.init()
    capture = cv.VideoCapture(0)
    capture.set(6, cv.VideoWriter.fourcc('M', 'J', 'P', 'G'))
    capture.set(cv.CAP_PROP_FRAME_WIDTH, 640)
    capture.set(cv.CAP_PROP_FRAME_HEIGHT, 480)
    print("capture get FPS : ", capture.get(cv.CAP_PROP_FPS))
    pTime = cTime = 0
    holistic = Holistic('holistic')
    while capture.isOpened():
        ret, frame = capture.read()
        # frame = cv.flip(frame, 1)
        frame, img = holistic.findHolistic(frame,draw=False)
        if cv.waitKey(1) & 0xFF == ord('q'): break
        cTime = time.time()
        fps = 1 / (cTime - pTime)
        pTime = cTime
        text = "FPS : " + str(int(fps))
        cv.putText(frame, text, (20, 30), cv.FONT_HERSHEY_SIMPLEX, 0.8, (0, 0,
255), 2)
        dist = holistic.frame_combine(frame, img)
        cv.imshow('dist', dist)
        # cv.imshow('frame', frame)
        # cv.imshow('img', img)
    capture.release()
    cv.destroyAllWindows()
```