Apriltag tag code recognition

1. Introduction

Apriltag is a coded tag commonly used in machine vision. It has high recognition rate and reliability and can be used for various tasks including augmented reality, robotics and camera calibration.

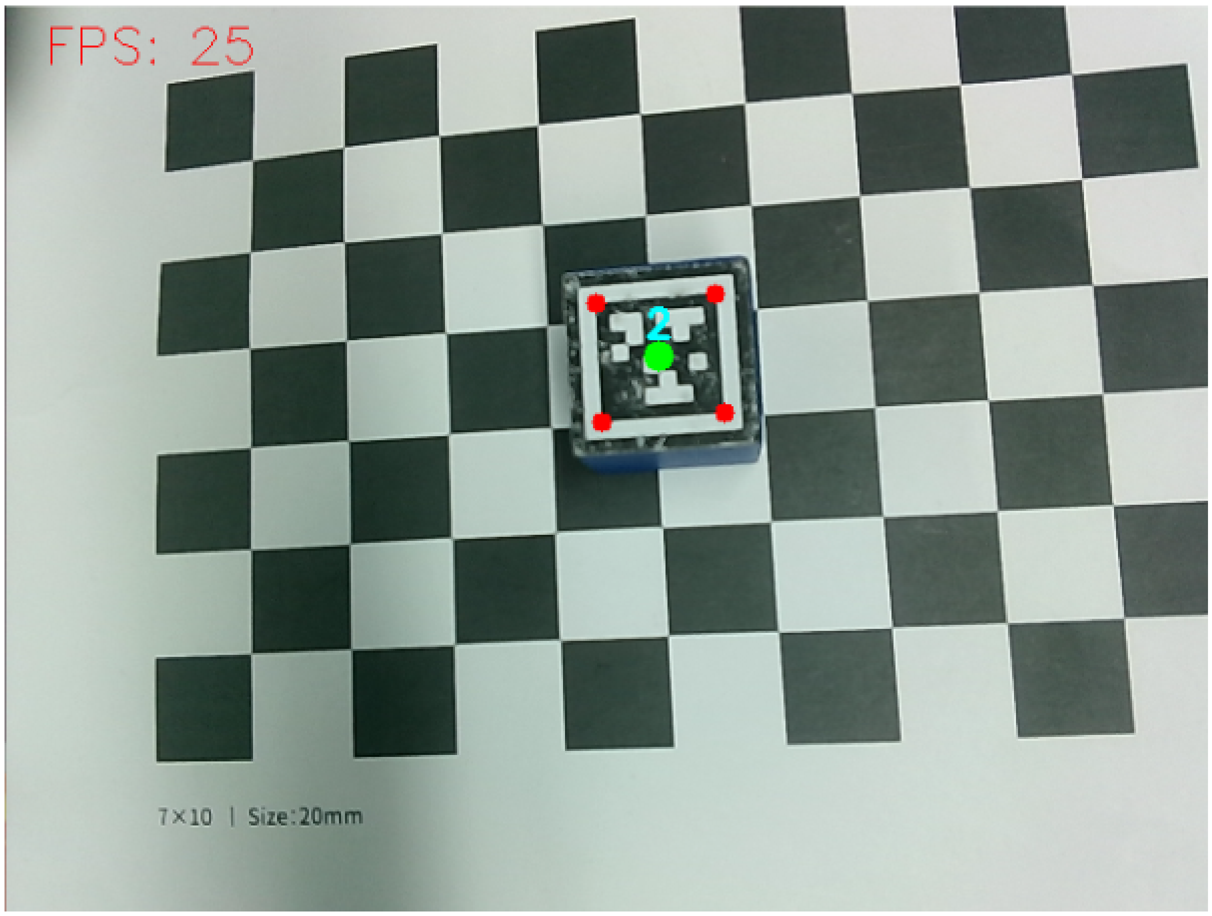
2. Start

2.1 Preparation

The Apriltag label code uses the TAG36H11 format. The relevant label code is already provided at the factory and affixed to the building blocks. You need to take out the building blocks and place them under the camera screen for identification.

2.2 Program description

After the program is started, the camera captures the image and puts the label code into the camera screen. The system will recognize and frame the four vertices of the label code and display the ID number of the label code.



2.3 Start program

- Input following command to start the program

```
roscore
rosrun jetcobot_apriltag apriltag_identify.py
```

2.4 About code

Code path：~/jetcobot_ws/src/jetcobot_apriltag/scripts/apriltag_identify.py

```
#!/usr/bin/env python3
# encoding: utf-8
import cv2 as cv
import time
from dt_apriltags import Detector
from jetcobot_utils.vutils import draw_tags
import logging
import jetcobot_utils.logger_config as logger_config

class ApriltagIdentify:
    def __init__(self):
        logger_config.setup_logger()
        self.image = None
        self.at_detector = Detector(searchpath=['apriltags'],
                                    families='tag36h11',
                                    nthreads=8,
                                    quad_decimate=2.0,
                                    quad_sigma=0.0,
                                    refine_edges=1,
                                    decode_sharpening=0.25,
                                    debug=0)

    def getApriltagPosMsg(self, image):
        self.image = cv.resize(image, (640, 480))
        msg = {}
        try:
            tags = self.at_detector.detect(cv.cvtColor(
                self.image, cv.COLOR_RGB2GRAY), False, None, 0.025)
            tags = sorted(tags, key=lambda tag: tag.tag_id)
            if len(tags) > 0:
                for tag in tags:
                    point_x = tag.center[0]
                    point_y = tag.center[1]
                    (a, b) = (round(((point_x - 320) / 4000), 5),
                            round(((480 - point_y) / 3000) * 0.8+0.15, 5))
                    msg[tag.tag_id] = (a, b)

                self.image = draw_tags(self.image, tags, corners_color=(
                    0, 0, 255), center_color=(0, 255, 0))
        except Exception as e:
            logging.info('getApriltagPosMsg e = {}'.format(e))

        return self.image, msg


    def getSingleApriltagID(self, image):
        self.image = cv.resize(image, (640, 480))
        tagId = ""
        try:
            tags = self.at_detector.detect(cv.cvtColor(
                self.image, cv.COLOR_RGB2GRAY), False, None, 0.025)
            tags = sorted(tags, key=lambda tag: tag.tag_id)
            if len(tags) == 1:
                tagId =str(tags[0].tag_id)
                self.image = draw_tags(self.image, tags, corners_color=(
                    0, 0, 255), center_color=(0, 255, 0))
        except Exception as e:
            logging.info('getSingleApriltagID e = {}'.format(e))

        return self.image, tagId

if __name__ == '__main__':
    capture = cv.VideoCapture(0)
    capture.set(cv.CAP_PROP_FRAME_WIDTH, 640)
    capture.set(cv.CAP_PROP_FRAME_HEIGHT, 480)
    tag_identify = ApriltagIdentify()

    t_start = time.time()
    m_fps = 0
    try:
        while capture.isOpened():
            action = cv.waitKey(10) & 0xFF
            if action == ord('q'): break
            ret, img = capture.read()
            img, data = tag_identify.getApriltagPosMsg(img)

            m_fps = m_fps + 1
            fps = m_fps / (time.time() - t_start)
            if(time.time() - t_start >= 2000):
                t_start = time.time()
                m_fps = fps
            text = "FPS: " + str(int(fps))
            cv.putText(img, text, (20, 30), cv.FONT_HERSHEY_SIMPLEX, 0.9, (0, 0,
255), 1)
            cv.imshow('img', img)
    except:
        pass
    capture.release()
    cv.destroyAllWindows()
```