# Target Tracking

**Target Tracking**
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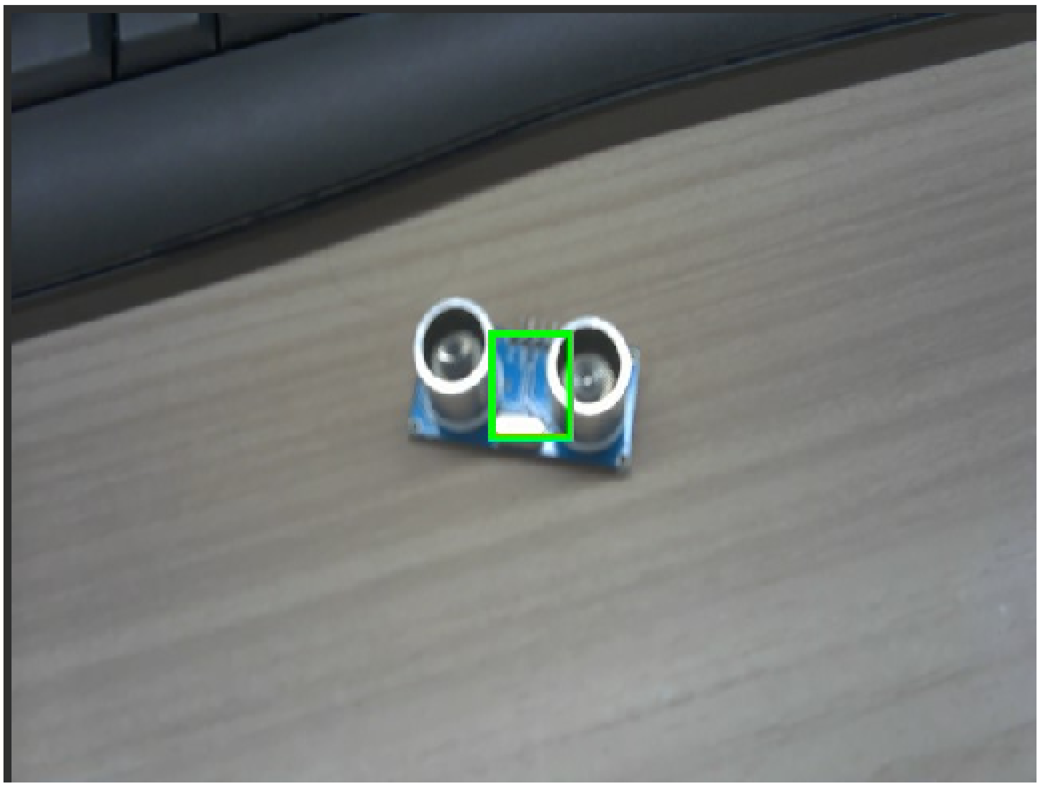
## Routine Experiment Effect

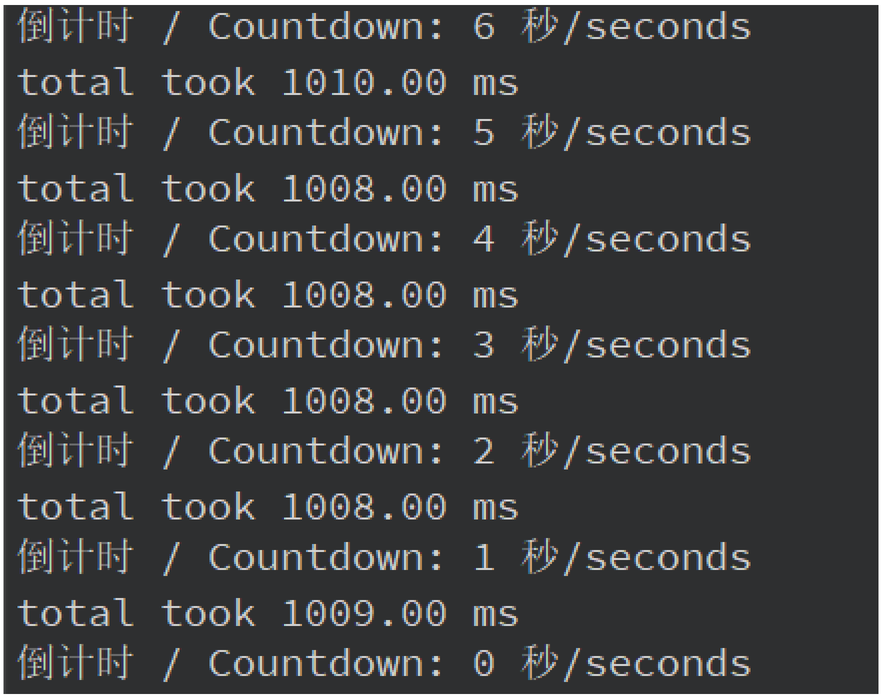
In this section, we will learn how to use K230 to achieve target tracking.

We run the sample program, aim the middle box at the object we want to identify (here we take an ultrasonic module as an example), and wait for about 8 seconds (you can see the output of the serial terminal)

The first 6 to 7 seconds are the learning and waiting process, and the box is green at this time.

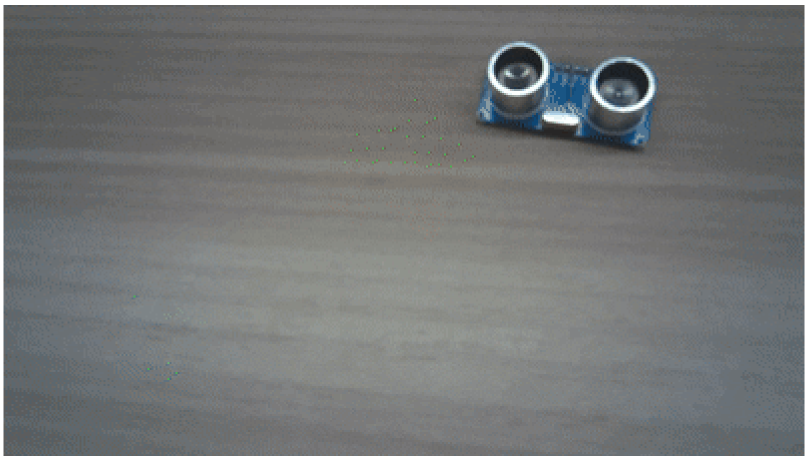


During the waiting phase, the serial terminal will output a countdown:



```
倒计时 / Countdown: 6 秒/seconds
total took 1010.00 ms
倒计时 / Countdown: 5 秒/seconds
total took 1008.00 ms
倒计时 / Countdown: 4 秒/seconds
total took 1008.00 ms
倒计时 / Countdown: 3 秒/seconds
total took 1008.00 ms
倒计时 / Countdown: 2 秒/seconds
total took 1008.00 ms
倒计时 / Countdown: 1 秒/seconds
total took 1009.00 ms
倒计时 / Countdown: 0 秒/seconds
```

When the countdown ends, the box in the middle of the screen will turn red, indicating that K230 has entered the search and tracking stage.



> Note! Please do not move the object to be tracked quickly, otherwise it will not be tracked correctly.

## Code Explanation

### Code structure

Initialization phase:

- Loading tracking templates and live models
- Initialize the tracker
- Set preprocessing parameters
- Initialize the AI2D preprocessor
- Configuring Tracking Thresholds

Main loop phase:

- Image acquisition and preprocessing
- Template reasoning and real-time reasoning
- Tracking algorithm processing

- Results
- Resource Recycling

Exit Processing:

- Abnormality Check
- Resource Cleanup

## Code Analysis

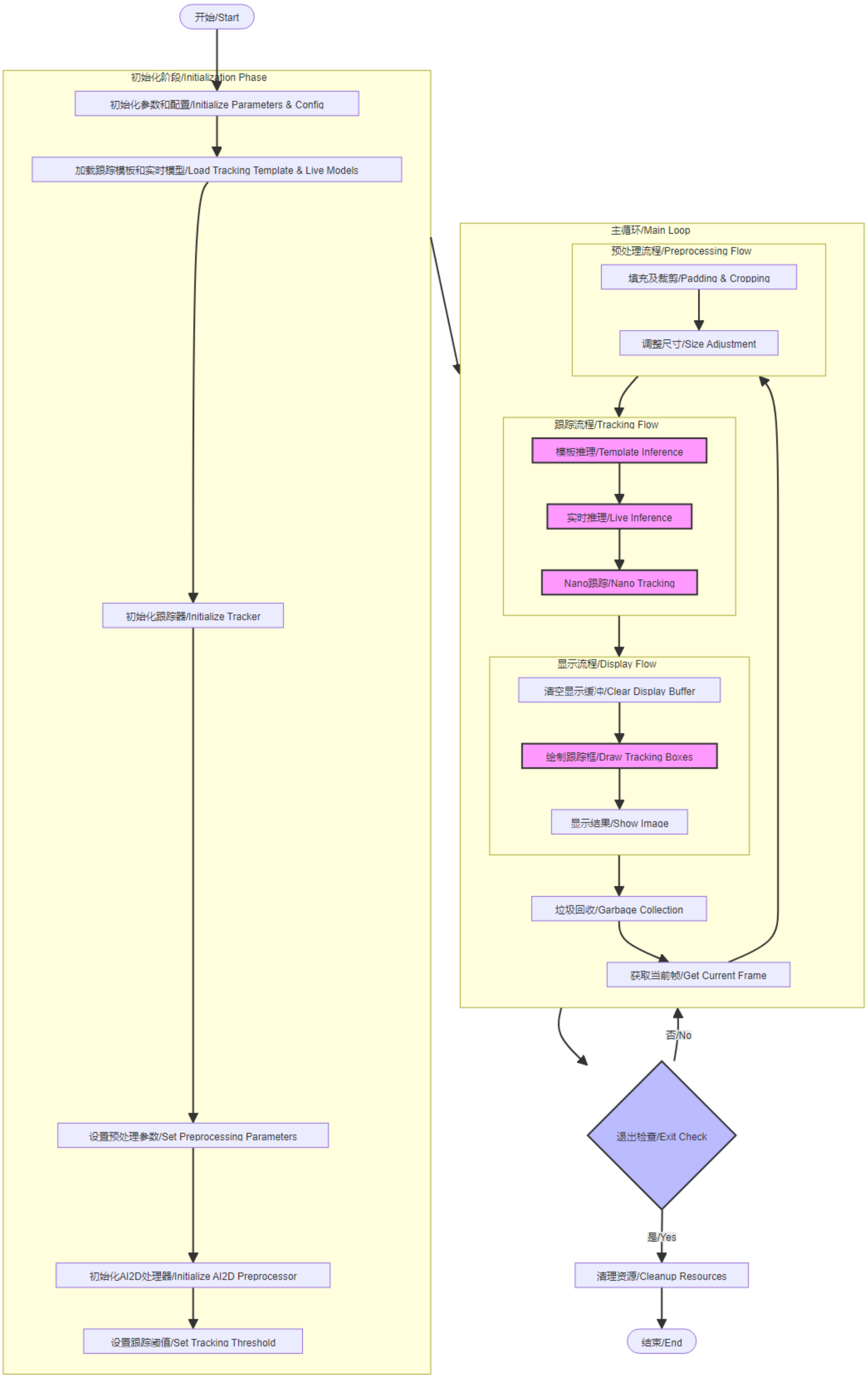
For the complete code, please refer to the file [Source Code/09.Scene/06.licence_det.py]

Learning & Tracking Section

```
 def run(self, input_np):
        """
        运行追踪算法 / Run tracking algorithm

        Args:
            input_np: 输入图像 / Input image

        Returns:
            追踪结果 / Tracking results
        """
        nowtime = time.ticks_ms()//1000
        # 初始化阶段：获取模板特征 / Initialization phase: get template features
        if (self.enter_init and nowtime <= self.endtime):
            print("倒计时 / Countdown: " + str(self.endtime - nowtime) + "
秒/seconds")
            self.crop_output = self.track_crop.run(input_np)
            time.sleep(1)
            return self.draw_mean
        # 追踪阶段：对当前帧进行特征提取和追踪 / Tracking phase: feature extraction and
tracking for current frame
        else:
            self.track_src.config_preprocess(self.center_xy_wh)
            self.src_output = self.track_src.run(input_np)
            det = self.tracker.run(self.crop_output, self.src_output,
self.center_xy_wh)
            return det

    def draw_result(self, pl, box):
        """
        绘制追踪结果 / Draw tracking results

        Args:
            pl: Pipeline对象 / Pipeline object
            box: 追踪框坐标 / Tracking box coordinates
        """
        pl.osd_img.clear()
        # 初始化阶段绘制 / Drawing during initialization phase
        if self.enter_init:
            pl.osd_img.draw_rectangle(box[0], box[1], box[2], box[3], color=
(255, 0, 255, 0), thickness=4)
            if (time.ticks_ms()//1000 > self.endtime):
                self.enter_init = False
        # 追踪阶段绘制 / Drawing during tracking phase
        else:
            self.track_boxes = box[0]
            self.center_xy_wh = box[1]

            # 检查追踪框是否有效 / Check if tracking box is valid
            track_bool = True
            if (len(self.track_boxes) != 0):
                # 确保追踪框在图像范围内 / Ensure tracking box is within image
bounds
                track_bool = (self.track_boxes[0] > 10 and
                            self.track_boxes[1] > 10 and
                            self.track_boxes[0] + self.track_boxes[2] <
self.rgb888p_size[0] - 10 and
                            self.track_boxes[1] + self.track_boxes[3] <
self.rgb888p_size[1] - 10)
            else:
                track_bool = False

            # 检查目标大小是否合适 / Check if target size is appropriate
            if (len(self.center_xy_wh) != 0):
                track_bool = track_bool and self.center_xy_wh[2] *
self.center_xy_wh[3] < 40000
            else:
                track_bool = False

            if (track_bool):
                # 更新临时存储并绘制有效的追踪框 / Update temporary storage and draw
valid tracking box
                self.center_xy_wh_tmp = self.center_xy_wh
                self.track_boxes_tmp = self.track_boxes
                x1 = int(float(self.track_boxes[0]) * self.display_size[0] /
self.rgb888p_size[0])
                y1 = int(float(self.track_boxes[1]) * self.display_size[1] /
self.rgb888p_size[1])
                w = int(float(self.track_boxes[2]) * self.display_size[0] /
self.rgb888p_size[0])
                h = int(float(self.track_boxes[3]) * self.display_size[1] /
self.rgb888p_size[1])
                pl.osd_img.draw_rectangle(x1, y1, w, h, color=(255, 255, 0, 0),
thickness=4)
            else:
                # 使用上一帧的有效追踪框并显示警告 / Use previous valid tracking box
and show warnings
                self.center_xy_wh = self.center_xy_wh_tmp
                self.track_boxes = self.track_boxes_tmp
                x1 = int(float(self.track_boxes[0]) * self.display_size[0] /
self.rgb888p_size[0])
                y1 = int(float(self.track_boxes[1]) * self.display_size[1] /
self.rgb888p_size[1])
                w = int(float(self.track_boxes[2]) * self.display_size[0] /
self.rgb888p_size[0])
                h = int(float(self.track_boxes[3]) * self.display_size[1] /
self.rgb888p_size[1])
                pl.osd_img.draw_rectangle(x1, y1, w, h, color=(255, 255, 0, 0),
thickness=4)
                pl.osd_img.draw_string_advanced(x1, y1-50, 32, "请远离摄像头，保持跟
踪物体大小基本一致! / Please move away from camera, keep target size consistent!",
color=(255, 255, 0, 0))
```

```
                pl.osd_img.draw_string_advanced(x1, y1-100, 32, "请靠近中心! / 
Please move closer to center!", color=(255, 255, 0, 0))
```

## flow chart


开始/Start
初始化阶段/Initialization Phase
初始化参数和配置/Initialize Parameters & Config
加载跟踪模板和实时模型/Load Tracking Template & Live Models
初始化跟踪器/Initialize Tracker
设置预处理参数/Set Preprocessing Parameters
初始化AI2D处理器/Initialize AI2D Preprocessor
设置跟踪阈值/Set Tracking Threshold
主循环/Main Loop
预处理流程/Preprocessing Flow
填充及裁剪/Padding & Cropping
调整尺寸/Size Adjustment
跟踪流程/Tracking Flow
模板推理/Template Inference
实时推理/Live Inference
Nano跟踪/Nano Tracking
显示流程/Display Flow
清空显示缓冲/Clear Display Buffer
绘制跟踪框/Draw Tracking Boxes
显示结果/Show Image
垃圾回收/Garbage Collection
获取当前帧/Get Current Frame
否/No
退出检查/Exit Check
是/Yes
清理资源/Cleanup Resources
结束/End