

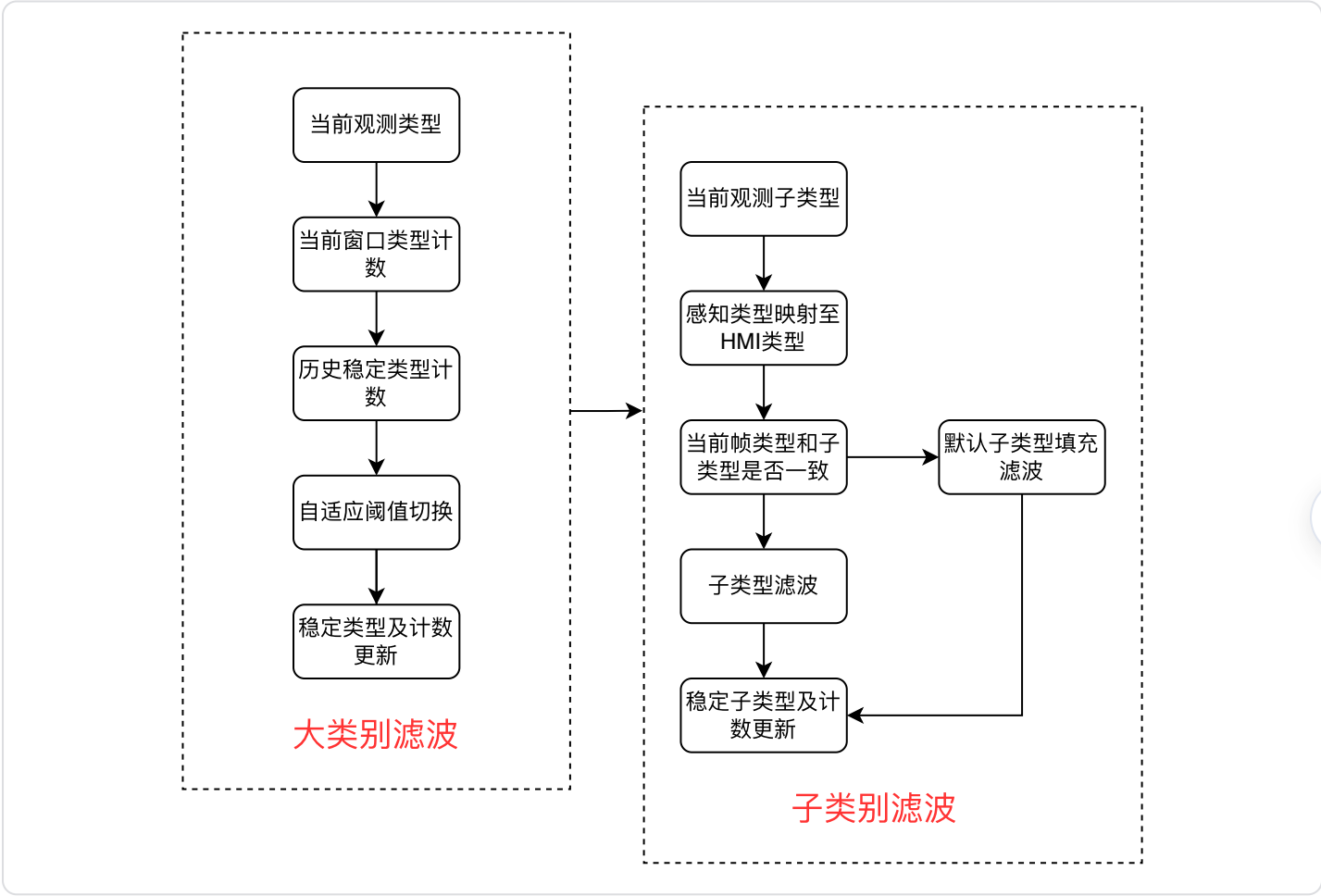
优化方案

1. 类别滤波算法

采用多帧投票+自适应阈值的算法对类别进行滤波，以期获取稳定的障碍物类型输出，降低类别跳变的次数。

算法流程图如下，分为两个部分：

- 首先进行大类型的滤波，维护一个大类型的滑动窗口，每次来一帧新的观测都进行窗口内的类型统计，当窗口内最大类型计数大于某个阈值时则进行类型的切换并更新相应计数，最终输出稳定帧类型至子类别滤波模块。
- 子类别滤波模块类似大类别滤波方式，其先将当前帧类型映射到HMI渲染所需的类型，然后依据当前帧的类型观测调用相应的子类型滤波器，其原理和大类别一样，最终输出稳定的子类型给下游HMI渲染使用。



2. 优化结果

2.1 集度车数据

- 所有范围

优化前 vs 优化后

45 consistency_static for hmt in all occ range
46 consistency items and exception statistics:
47
48 exception_res obj_cnt
49 type_jump_exception 1677

exception_obj_cnt 73
frame_obs_cnt 283344
exception_times_cnt 184
excep_ratio 0.0006

45 consistency_static for hmt in all occ range
46 consistency items and exception statistics:
47
48 exception_res obj_cnt
49 type_jump_exception 1677

exception_obj_cnt 38
frame_obs_cnt 283344
exception_times_cnt 42
excep_ratio 0.0001

1	指标	exception_obj_cnt	exception_times_cnt
2	优化前	73	184
3	优化后	30	42
4	效果	-58.9%	-77.2%

- 近处

优化前 vs 优化后

5 consistency_static for hmt in near occ range
6 consistency items and exception statistics:
7
8 exception_res obj_cnt
9 type_jump_exception 1677

exception_obj_cnt 26
frame_obs_cnt 65799
exception_times_cnt 34
excep_ratio 0.0005

64 consistency_static for hmt in near occ range
65 consistency items and exception statistics:
66
67 exception_res obj_cnt
68 type_jump_exception 1677

exception_obj_cnt 15
frame_obs_cnt 65799
exception_times_cnt 20
excep_ratio 0.0003

1	指标	exception_obj_cnt	exception_times_cnt
2	优化前	26	34
3	优化后	15	20
4	效果	-42.3%	-41.2%

- 远处

1 consistency_static for hmt in far occ range
2 consistency items and exception statistics:
3
4 exception_res obj_cnt
5 type_jump_exception 1677

exception_obj_cnt 68
frame_obs_cnt 218752
exception_times_cnt 158
excep_ratio 0.0007

10 consistency_static for hmt in far occ range
11 consistency items and exception statistics:
12
13 exception_res obj_cnt
14 type_jump_exception 1677

exception_obj_cnt 19
frame_obs_cnt 218752
exception_times_cnt 23
excep_ratio 0.0001

1	指标	exception_obj_cnt	exception_times_cnt
2	优化前	68	158
3	优化后	19	23
4	效果	-72.1%	-85.4%

2.2 极狐车数据

- 所有范围

优化前 vs 优化后

```
#####
5 consistency_static for hml in all occ range
6 consistency items and exception statistics:
7
8 exception_res      obj_cnt      exception_obj_cnt      frame_obs_cnt      exception_times_cnt      excep_ratio
9 type_jump_exception 13668      52      431299      66      0.0002
```

```
#####
5 consistency_static for hml in all occ range
6 consistency items and exception statistics:
7
8 exception_res      obj_cnt      exception_obj_cnt      frame_obs_cnt      exception_times_cnt      excep_ratio
9 type_jump_exception 13668      30      431299      30      0.0001
```

1	指标	exception_obj_cnt	exception_times_cnt
2	优化前	52	66
3	优化后	30	30
4	效果	-42.3%	-54.5%

• 近处

优化前 vs 优化后

```
#####
65 consistency_static for hml in near occ range
66 consistency items and exception statistics:
67
68 exception_res      obj_cnt      exception_obj_cnt      frame_obs_cnt      exception_times_cnt      excep_ratio
69 type_jump_exception 13668      23      284892      30      0.0001
```

```
#####
65 consistency_static for hml in near occ range
66 consistency items and exception statistics:
67
68 exception_res      obj_cnt      exception_obj_cnt      frame_obs_cnt      exception_times_cnt      excep_ratio      infer_excep_times_cnt
69 type_jump_exception 13668      14      284892      14      0.0000
```

1	指标	exception_obj_cnt	exception_times_cnt
2	优化前	23	30
3	优化后	14	14
4	效果	-39.1%	-53.3%

• 远处

```
#####
5 consistency_static for hml in far occ range
6 consistency items and exception statistics:
7
8 exception_res      obj_cnt      exception_obj_cnt      frame_obs_cnt      exception_times_cnt      excep_ratio
9 type_jump_exception 13668      30      157987      36      0.0002
```

```
#####
5 consistency_static for hml in far occ range
6 consistency items and exception statistics:
7
8 exception_res      obj_cnt      exception_obj_cnt      frame_obs_cnt      exception_times_cnt      excep_ratio
9 type_jump_exception 13668      19      157987      19      0.0001
```

1	指标	exception_obj_cnt	exception_times_cnt
2	优化前	30	36
3	优化后	19	19
4	效果	-36.7%	-47.2%

3. 效果视频

HMI视频

