## ASG-P远程调试手册

1. 参考配置

上海服务器：10.140.134.38

操作系统：Ubuntu 19.10 64位

clang版本：8.0.1

python版本：2.7.17

1. 服务器环境

运行carla服务端

cd ~/carla

nohup ./CarlaUE4.sh &

进入演示环境

cd ~/swork/scenario\_runner

. ./setenv.sh

切换标准地图

python2 load\_map.py

*备注：以上操作建议使用putty远程执行*

1. 远程调试环境准备

CLion配置gdb remote debug并设置好mapping，配置包名称carla，端口选择1500

上海服务器对代码作重新编译，保证代码源一致

cd ~/work/ASG/carla

make clean

rm –rf Build

make setup

make ad-rss

make LibCarla.client.rss

make PythonAPI.rss.2

unset PYTHONPATH

sudo pip2 uninstall carla

sudo python2 /usr/lib/python3/dist-packages/easy\_install.py ~/work/ASG/ASG-P/carla/PythonAPI/carla/dist/carla-0.9.9-py2.7-linux-x86\_64.egg

如果对代码改动较小，可采取增量编译，耗时大幅减少

cd ~/work/ASG/carla

rm –rf Build/ad-rss-4.0.0/install

make ad-rss

make LibCarla.client.rss

make PythonAPI.rss.2

unset PYTHONPATH

sudo pip2 uninstall carla

sudo python2 /usr/lib/python3/dist-packages/easy\_install.py ~/work/ASG/ASG-P/carla/PythonAPI/carla/dist/carla-0.9.9-py2.7-linux-x86\_64.egg

1. 执行场景

创建他车场景

python2 scenario\_runner.py --scenario group:cut\_out

创建己车并进入界面

python2 front\_ego\_w.py

按F3键开启或关闭rss检查

按F6键启动己车，场景结束再按F6键

在他车场景终端按ctrl+c，并在己车界面按F5键，重置场景

*备注：他车场景操作建议使用putty远程执行，己车界面建议使用MobaXterm或PyCharm远程执行*

1. 远程调试

开启gdbserver

ps -ef | grep front\_ego ；假设获得pid为2862

sudo gdbserver :1500 --attach 2862

CLion启动debug

选择“carla”配置包，进行debug（shift+F9）

1. 增加条件断点

查看己车执行日志asgtrail-20200820-011.dat，tick 46发生碰撞，分析之前记录

./show.py logs/asgtrail-20200820-011.dat 46

有如下触发条件：

* RssResponseResolving.cpp:88
* StateSnapshot.individualResponses[0].longitudinalState.isSafe 为 false
* 且，StateSnapshot.individualResponses[0].lateralStateLeft.isSafe 为 false

发现纵向状态有矛盾，有如下触发条件：

* RssStructuredSceneNonIntersectionChecker.cpp:200
* isSafe 为 false
* 且，rssState.response == state::LongitudinalResponse::None

在carla/Build/ad-rss-4.0.0/src/ad-rss-lib目录的临时文件中设定条件断点

* carla/Build/ad-rss-4.0.0/src/ad-rss-lib/ad-rss/impl/src/core/RssResponseResolving.cpp:88
* carla/Build/ad-rss-4.0.0/src/ad-rss-lib/ad-rss/impl/src/situation/ RssStructuredSceneNonIntersectionChecker.cpp:200

*备注：编译过程中从asg-p拷贝rss库代码，到carla/Build/ad-rss-4.0.0/src/ad-rss-lib，断点要设定在拷贝过来的临时文件之上*

1. 跟踪断点

找到问题代码位置：RssStructuredSceneNonIntersectionChecker.cpp:95

else if (nonDangerousStateToRemember.lateralSafe)  
{  
 // @*todo: Handling of a cut-in by a leading vehicle as stated in definitions 11-13 of the RSS paper v6* // *will be handled outside of this function. As a consequence.* // *There is currently no response for a cut-in of a leading vehicle* rssState.longitudinalState.response = state::LongitudinalResponse::None;  
 if (isDangerous(rssState))  
 {  
 spdlog::warn(  
 "RssStructuredSceneNonIntersectionChecker>> State is dangerous (t\_b == t\_b,lat) No longitudinal response: {}",  
 rssState);  
 }  
}

增加trace，确认此处是问题的起点：State is dangerous... No longitudinal response

此时世界模型、情境、状态变量的内容

world: {timeIndex:3159080, size:1}

- situationType:SameDirection

egoVehicle: {objectId:2485, objectType:EgoVehicle, velocity: {lon: 14.709~14.709, lat: 0.04~0.054}}

state: {yaw:-1.571, dimension:(4.905,2.061), yawRate:0.000, centerPoint:(-12.994,117.754, speed:14.709, steeringAngle:-0.000}

- occupiedRegion: {segmentId:480155, lonRange: 0.000 ~ 0.000, latRange: 0.195 ~ 0.788}

object: {objectId:2486, objectType:OtherVehicle, velocity: {lon: 9.782~9.782, lat: 0.557~0557}}

state: {yaw:-1.624, dimension:(4.520,1.920), yawRate:-0.408, centerPoint:(-9.941,106.405, speed:9.798, steeringAngle:0.000}

- occupiedRegion: {segmentId:480154, lonRange: 1.000 ~ 1.000, latRange: 0.321 ~ 0.943}

egoVehicleRoad:

- segment

- lane: {id:480154, type:Normal, drivingDirection:Positive, length:6.594, width:3.500}

- lane: {id:480155, type:Normal, drivingDirection:Positive, length:6.594, width:3.500}

intersectingRoad:

situationSnapshot: {timeIndex:3159080, size:1}

- objectId:2486, situationId:1, situationType:SameDirection

relativePosition:{lonPos:AtBack, lonDis:6.594, latPos:AtRight, latDis:0.882

egoVehicleState: {velocity: {lon: 14.709~14.709, lat: 0.054~0.054}, hasPriority:False, isICorrectLane:True}

distanceToEnterIntersection:0.000, distanceToLeaveIntersection:1000.000, objectType:EgoVhicle

objectState: {yaw:-1.571, dimension:(4.905,2.061), yawRate:0.000, centerPoint:(-12.994,17.754), speed:14.709, steeringAngle:-0.000}

otherVehicleState: {velocity: {lon: 9.782~9.782, lat: 0.557~0.557}, hasPriority:False, isICorrectLane:True}

distanceToEnterIntersection:0.000, distanceToLeaveIntersection:1000.000, objectType:OtheVehicle

objectState: {yaw:-1.624, dimension:(4.520,1.920), yawRate:-0.408, centerPoint:(-9.941,16.405), speed:9.798, steeringAngle:0.000}

StateSnapshot: {timeIndex:3159080, size:1}

- objectId:2486, situationId:1

longitudinalState: {isSafe:False, response:None, distance: 6.594(51.924)}

lateralStateRight: {isSafe:True, response:None, distance: 1000000000.000(1000000000.000)}

lateralStateLeft: {isSafe:False, response:BrakeMin, distance: 0.882(2.146)}

properResponse: {timeIndex:3159080, isSafe:False, dangerousObjects:[2486,]}

longitudinalResponse:None

lateralResponseRight:None

lateralResponseLeft:BrakeMin

EgoDynamicsOnRoute: {timestamp:3159080, ego\_speed:14.709, min\_stopping\_distance:71.720, ego\_ceter:(-12.994,117.754), ego\_heading:-1.571}

ego\_center\_within\_route:True, crossing\_border:False, route\_heading:-1.567, route\_nominal\_cener:(-13.024,117.754), heading\_diff:0.004

route\_speed\_lat:0.054, route\_speed\_lon:14.709, route\_accel\_lat:0.007, route\_accel\_lon:2.206,avg\_route\_accel\_lat:0.007, avg\_route\_accel\_lon:2.072

1. 异常捕获分析

针对代码抛出异常的情况，在异常抛出点增加trace输入，代码如下：

void ensureValid() const  
 {  
 if (!isValid())  
 {  
 spdlog::info("ensureValid(::ad::physics::Distance)>> {} value out of range", \*this); // LCOV\_EXCL\_BR\_LINE  
#if (AD\_PHYSICS\_DISTANCE\_THROWS\_EXCEPTION == 1)  
 spdlog::warn("cMinValue:{}, cMaxValue:{}, cPrecision:{}, mDistance:{}", cMinValue, cMaxValue, cPrecisionValue, mDistance);  
 throw std::out\_of\_range("Distance value out of range"); // LCOV\_EXCL\_BR\_LINE  
#endif  
 }  
 }

但目前缺乏手段对异常抛出的Call Stack进行显示

1. Call Stack分析

针对函数返回错误值的情况，在RssStructuredSceneNonIntersectionChekcer、RssFormulas、Physics主要函数的返回点增加false判断与输出，代码如下：

if( !result ) {  
 spdlog::warn("RssStructuredSceneNonIntersectionChecker::calculateRssStateSameDirection func fail");  
}

在出现计算错误时，可以看到call stack

[2020-08-27 09:46:10.164] [warning] RssFormulas::determineDrivingRelation func fail

[2020-08-27 09:46:10.164] [warning] RssFormulas::calculateSafeLongitudinalDistanceSameDirectionMultiLevel func fail point 2

[2020-08-27 09:46:10.164] [warning] RssFormulas::checkSafeLongitudinalDistanceSameDirectionMultiLevel func fail point 2

[2020-08-27 09:46:10.164] [warning] RssStructuredSceneNonIntersectionChecker::calculateRssStateSameDirection func fail

[2020-08-27 09:46:10.164] [warning] RssStructuredSceneNonIntersectionChecker::calculateRssStateNonIntersection func fail

[2020-08-27 09:46:10.164] [warning] RssCheck: checkSituations fail

[2020-08-27 09:46:10.164] [warning] RssCheck: calculateProperResponse func fail

[2020-08-27 09:46:10.164] [RssCheck] [warning] calculateProperResponse failed!

1. 改变日志输出级别

针对计算出现偏差的情况，需要把日志输出级别降为debug，以便跟踪计算过程

bool calculateSafeLongitudinalDistanceSameDirectionMultiLevel(VehicleState const &leadingVehicle,  
 VehicleState const &followingVehicle,  
 Distance &safeEmergencyDistance,  
 Distance &safeComfortDistance,  
 int status)  
{  
 spdlog::set\_level(spdlog::level::debug);

可以看到安全距离计算的全过程

[2020-08-27 10:43:53.018] [debug] RssFormulas -- status 2

[2020-08-27 10:43:53.018] [debug] RssFormulas => Case emergency

[2020-08-27 10:43:53.018] [debug] RssFormulas -- v0 0.0 a 3.5 rho 1.0 v 3.5

[2020-08-27 10:43:53.018] [debug] RssFormulas -- calc d1 1.75 with acc 3.5

[2020-08-27 10:43:53.018] [debug] Physics -- a 8.0 v 3.5 k 4.0 s 2.932291666666667

[2020-08-27 10:43:53.018] [debug] RssFormulas -- calc d2 2.932291666666667 with brake -8.0 k -4.0

[2020-08-27 10:43:53.018] [debug] RssFormulas -- calc d3 0.0 with brake -8.0

[2020-08-27 10:43:53.018] [debug] RssFormulas -- d1+d2-d3 = 4.682291666666667

[2020-08-27 10:43:53.018] [debug] RssFormulas => Case comfort

[2020-08-27 10:43:53.018] [debug] RssFormulas -- v0 0.0 a 3.5 rho 1.0 v 3.5

[2020-08-27 10:43:53.018] [debug] RssFormulas -- calc d1 1.75 with acc 3.5

[2020-08-27 10:43:53.018] [debug] resultingSpeed 3.5 deceleration 0.0

[2020-08-27 10:43:53.018] [debug] RssFormulas -- calc d3 0.0 with brake -8.0

[2020-08-27 10:43:53.018] [debug] RssFormulas -- d1+d2-d3 = 1.75

[2020-08-27 10:43:53.018] [warning] RssFormulas::checkSafeLongitudinalDistanceSameDirectionMultiLevel func fail point 2

问题定位后，要及时恢复正常的日志输出级别