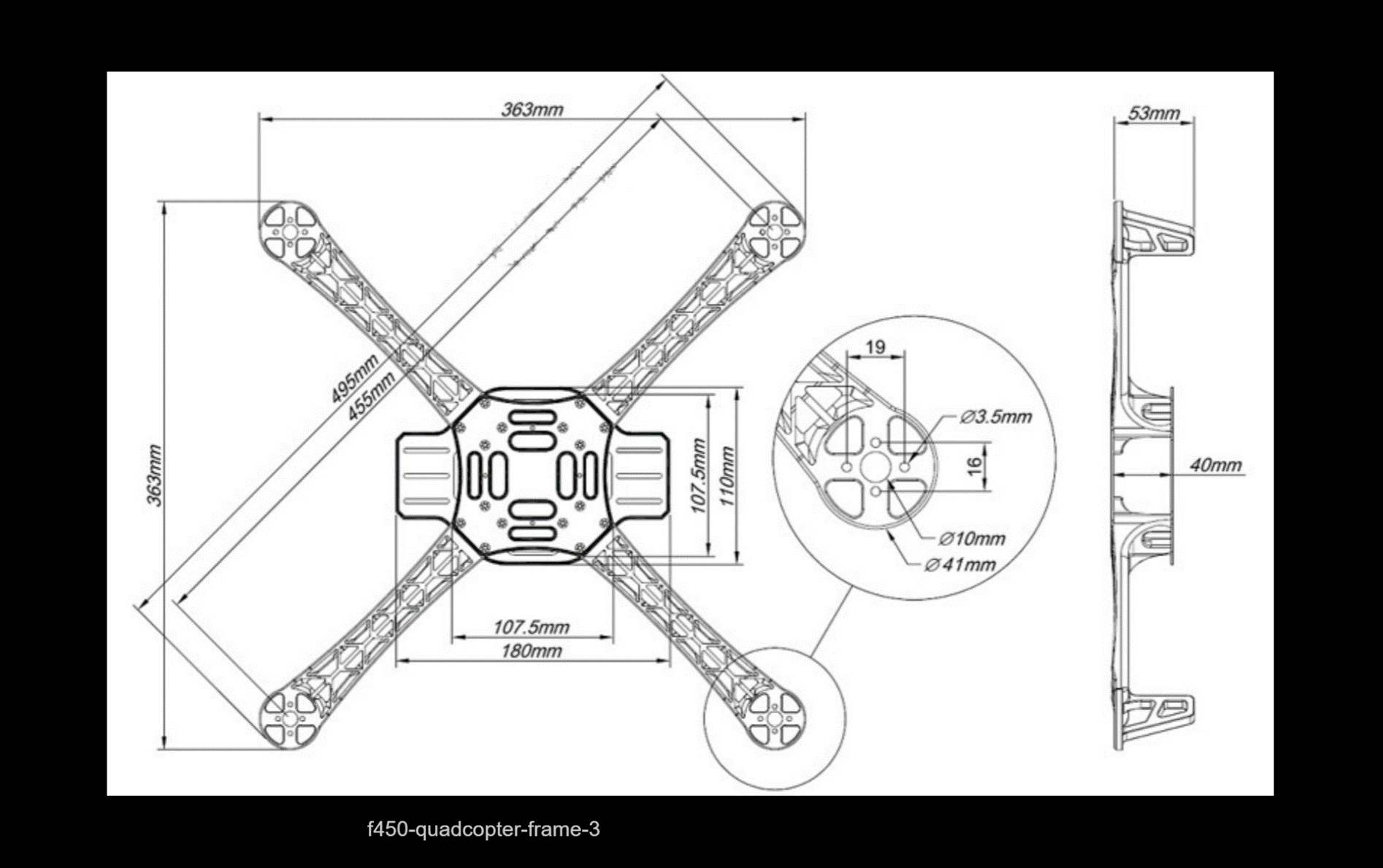




**Mass of Quadrotor** - 1.6kg using default parameters in RotorParams.hpp

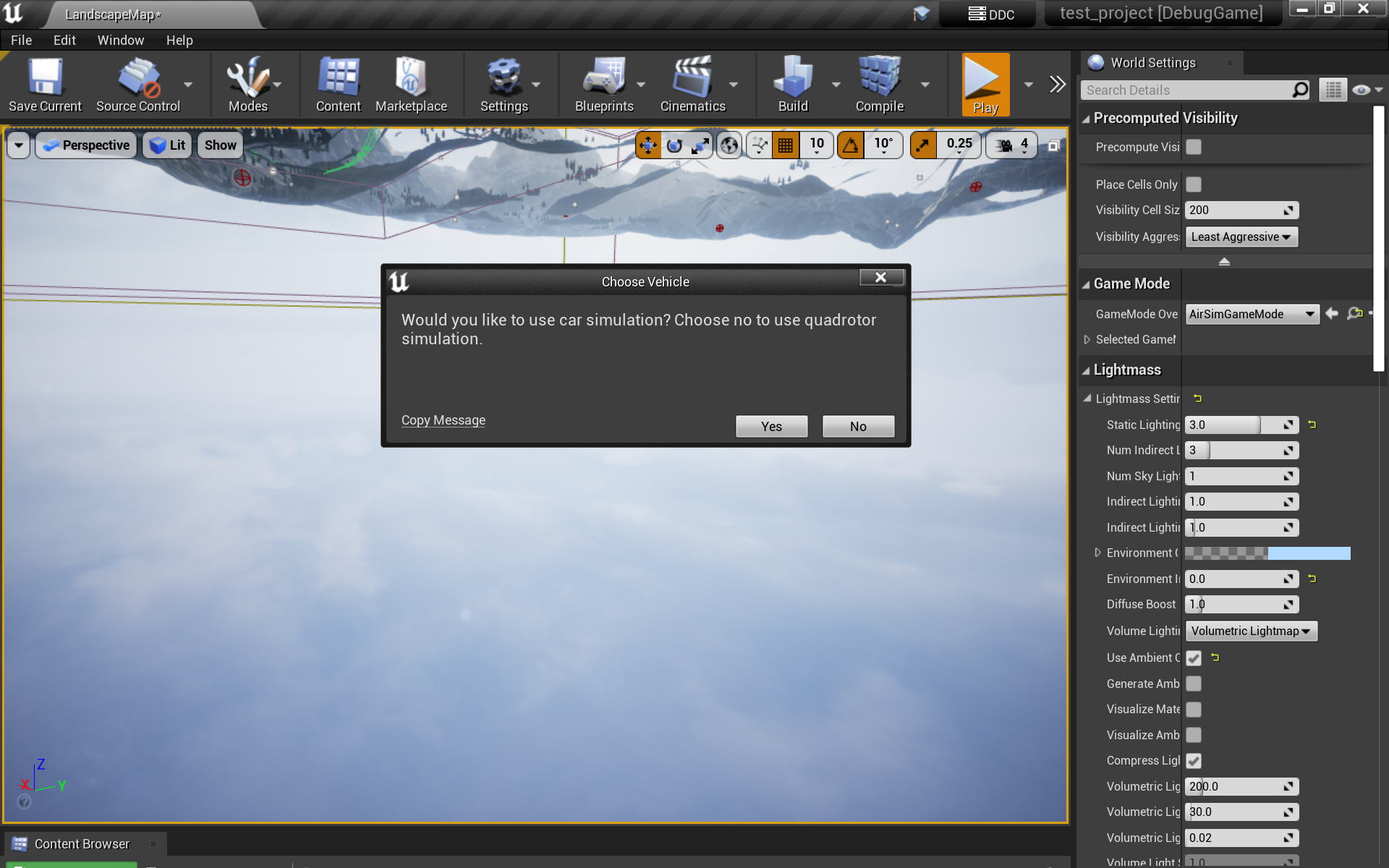
**Dimension of Quadrotor**

**Link to client function**

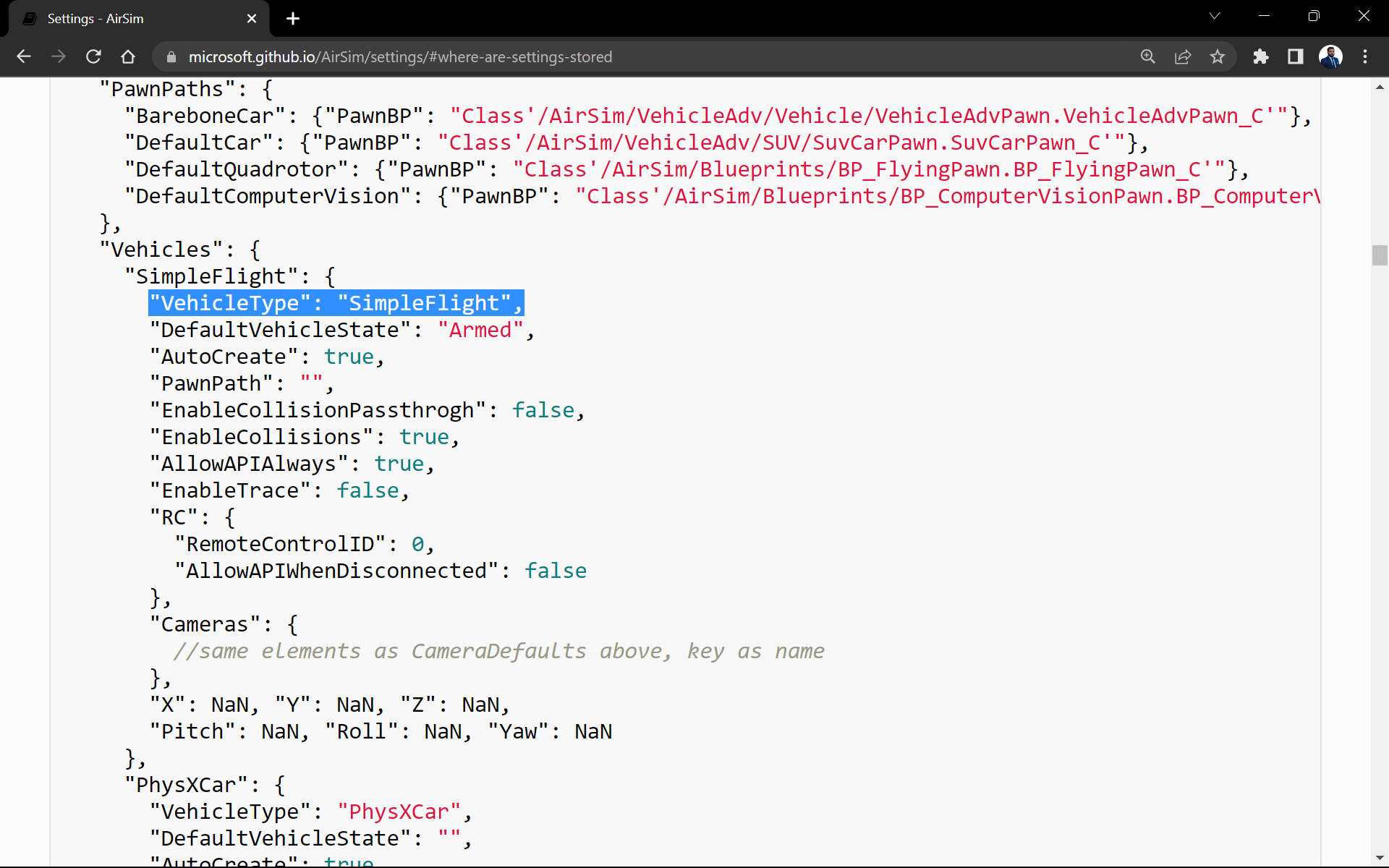
D:\Unreal Projects\test\_project\Plugins\AirSim\Source\AirLib\src\vehicles\multirotor\api

**How is the default Multirotor model is selected and what are its parameters?**

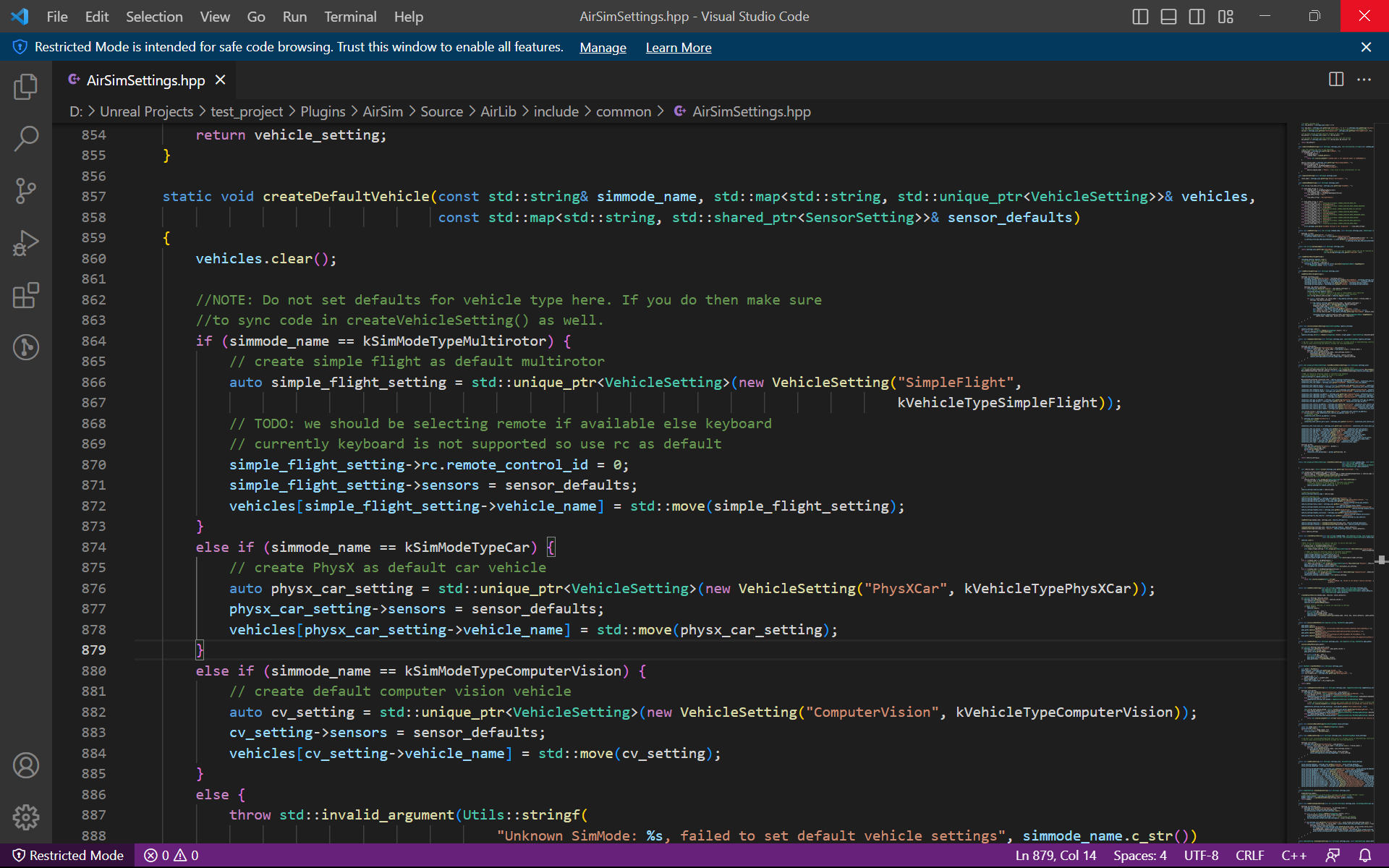
1. Launch the visual studio project -> when unreal engine pops up, Select Game Mode as ‘AirSimGameMode’.
2. Hit the play button. By default, the SimMode is “ ”. Which lead to a pop up to choose vehicle type.

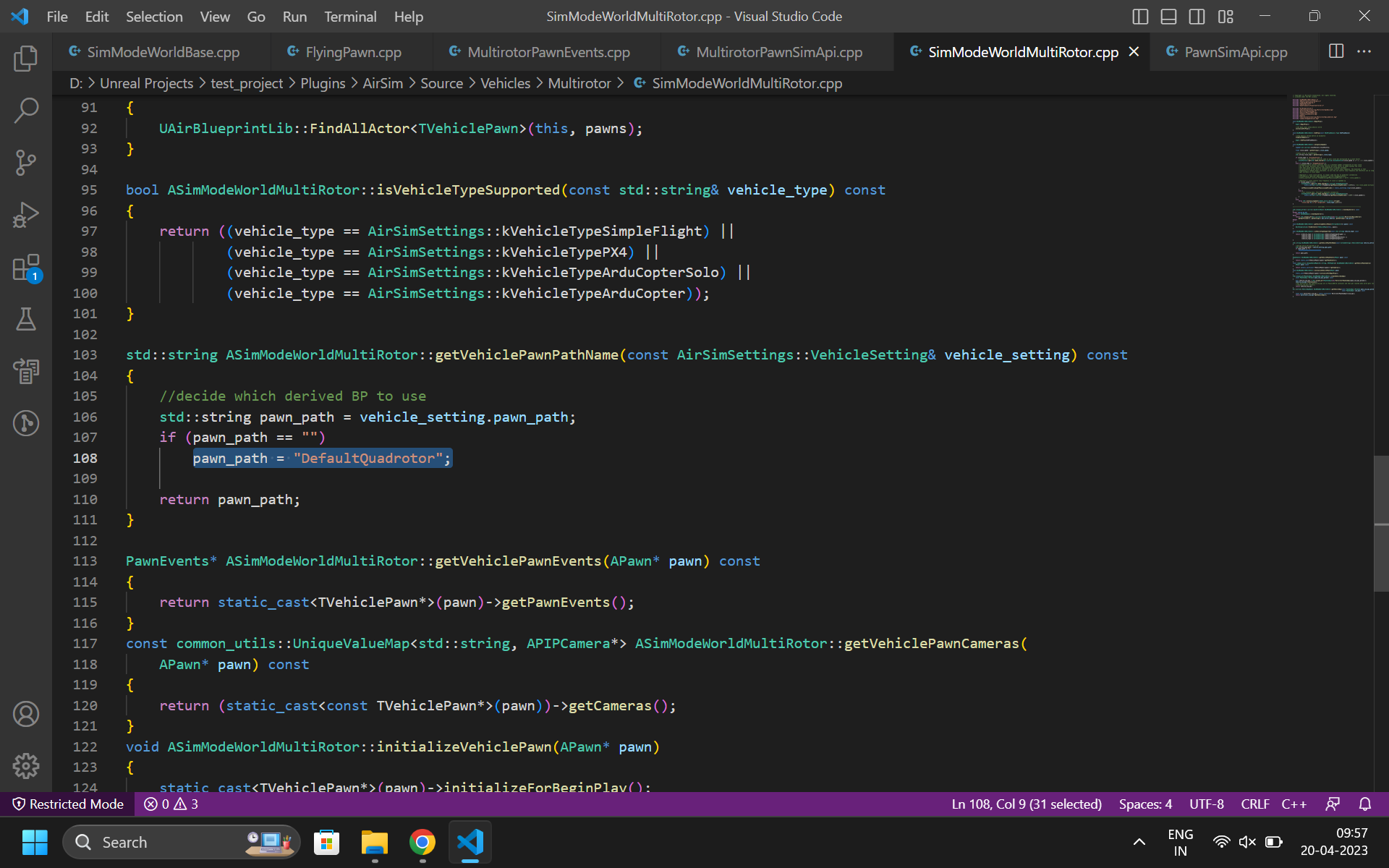


1. The first thing that executes when we start simulation is settings.json file. This file has all the default value to the constraints like vehicle type, clock speed, wind etc. **The default vehicle type is ‘SimpleFlight’**.

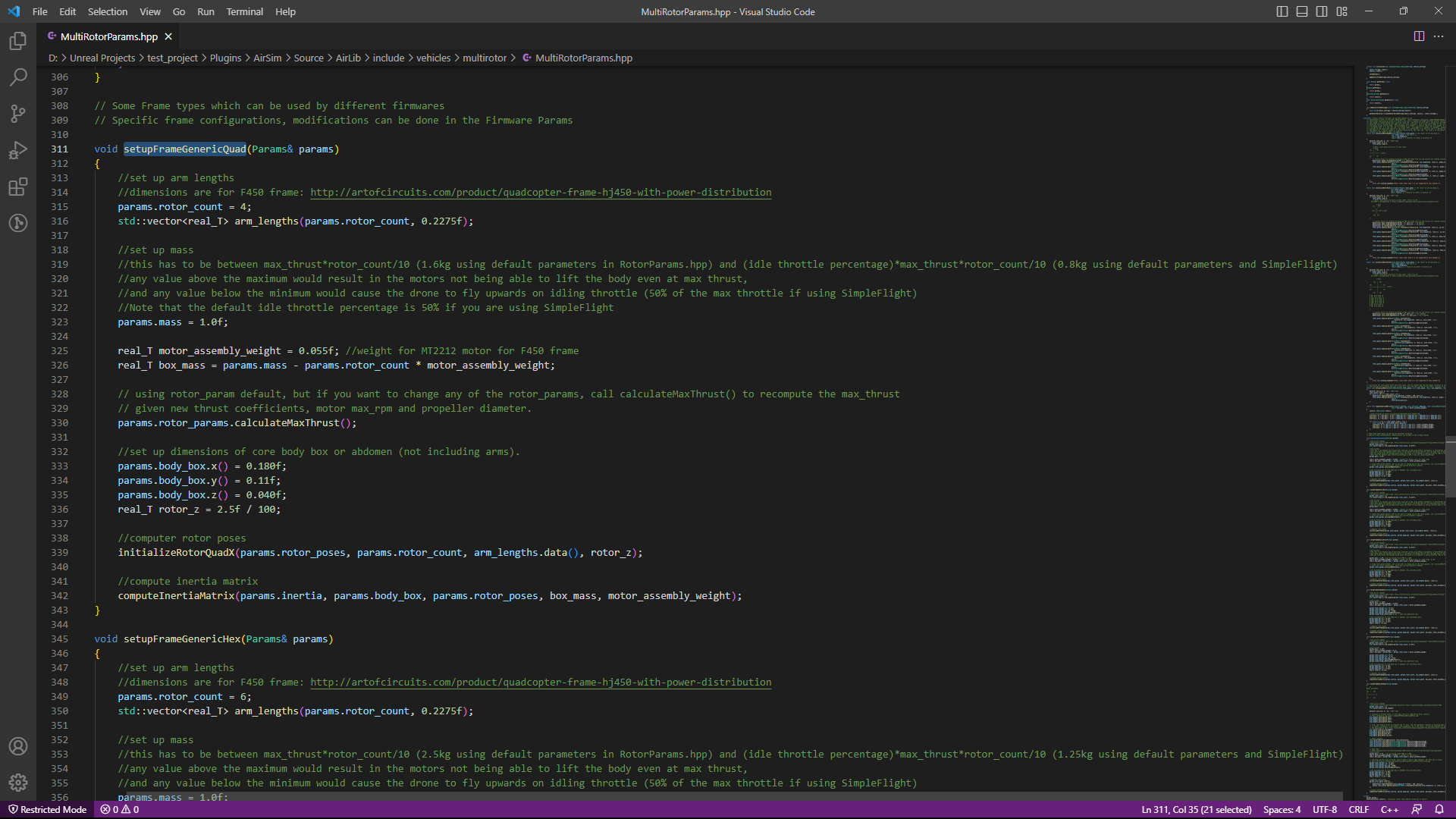


The same can be seen in the plugins folder under sources. Now we know the default vehicle type is SimpleFlight. We can now check the default parameters of the multirotor.





Some connection between this



The dynamics of quadrotor

D:\Unreal Projects\test\_project\Plugins\AirSim\Source\AirLib\src\vehicles\multirotor\api\MultirotorAPIbase

**Details about Lidar**

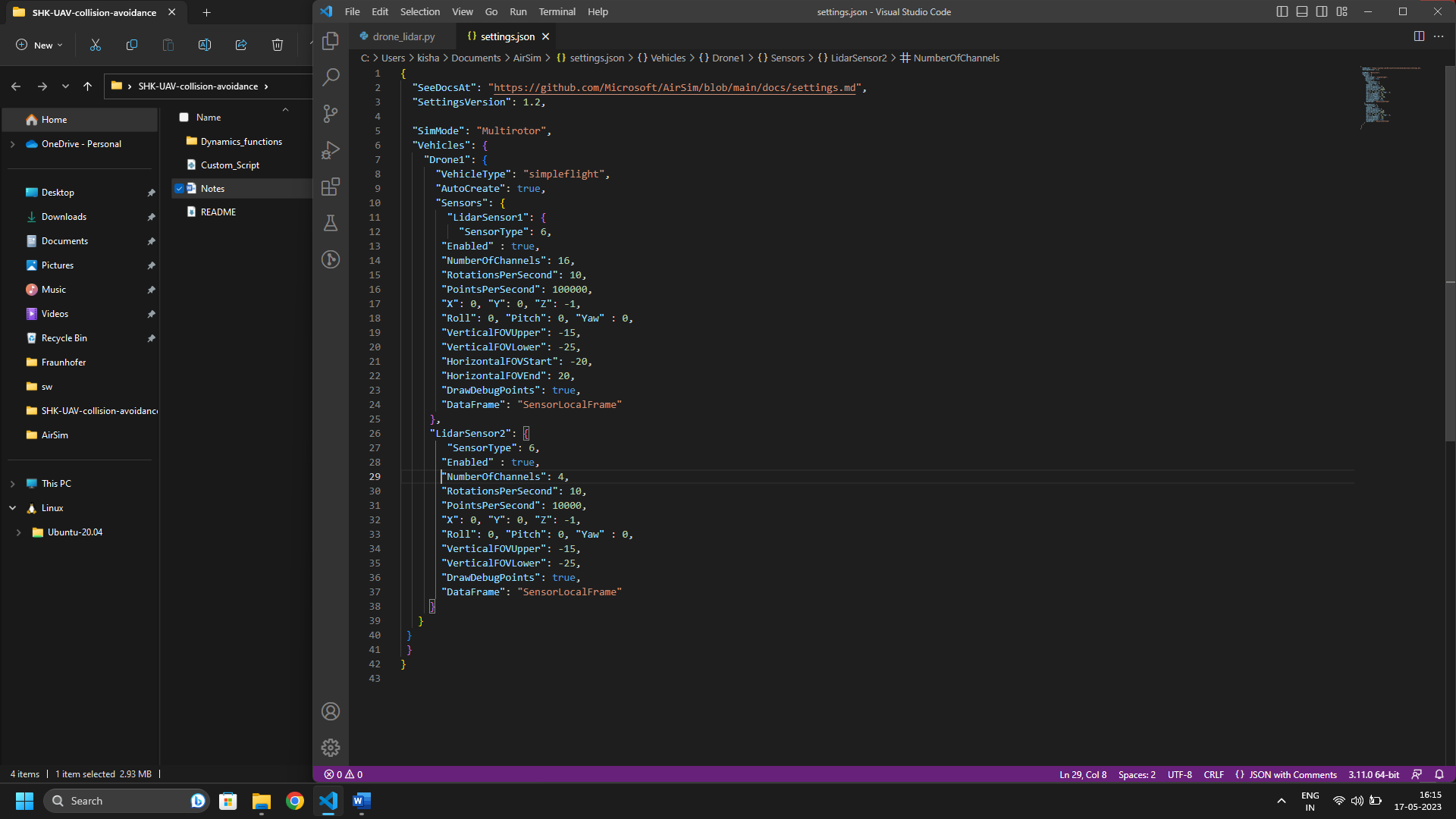
Maximum range – Can be set according to the requirement.

It cannot detect the shape, but can generate point cloud data.

Output data format – x,y and z coordinates of the obstacle and the intensity

**For Lidar setup**

* Go to airsim in my documents folder and add lidar sensor in the setting.json file.



* Then follow the same procedure of drone control using script. And analyse the output data by lidar sensor.

A **quaternion** is a mathematical representation of orientation or rotation in 3D space. It consists of four components: a scalar (w) and three imaginary components (x, y, z). Quaternions are commonly used to represent 3D rotations due to their efficiency, avoidance of gimbal lock, and smooth interpolation capabilities. In AirSim, quaternions are used to represent the orientation of vehicles and objects in the simulated environment.

The scalar component of a quaternion represents the rotation angle or the magnitude of rotation around the axis defined by the imaginary components (x, y, z). It determines the amount of rotation in a given 3D space. The scalar component is responsible for the scale or magnitude of the rotation, while the imaginary components define the direction or axis of rotation. Together, they represent the complete orientation or rotation in 3D space.

In the context of quaternions, the reference point for rotation is typically the origin (0, 0, 0) of the coordinate system. When a quaternion represents a rotation, it describes how an object or coordinate frame rotates relative to this reference point. The quaternion's components (scalar and imaginary) define the rotation angle and axis, respectively, with respect to the reference point.

For example, if you have a quaternion representing a rotation of an object, the object will rotate around its own center relative to the reference point at the origin of the coordinate system. The quaternion captures the transformation needed to rotate the object from its initial orientation to the desired orientation.

It's important to note that quaternions describe rotations in a relative sense, specifying how an object rotates in relation to a reference point, rather than specifying the absolute position or orientation of the object in space.

***Taking reading after takeoff and moving drone to (-10, 10, -10) at 5 m/s***

Reading 1: time\_stamp: 1684333387383779840 number\_of\_points: 1104

**lidar position: <Vector3r>** { 'x\_val': -9.808950424194336, 'y\_val': 9.599539756774902,

'z\_val': -11.126574516296387}

**lidar orientation: <Quaternionr>** { 'w\_val': 0.17462977766990662,

'x\_val': 0.054887011647224426,

'y\_val': -0.041691094636917114,

'z\_val': 0.9822187423706055}

***Again, taking reading after takeoff***

Reading 1: time\_stamp: 1684334195338676992 number\_of\_points: 1104

lidar position: <Vector3r> { 'x\_val': 0.0,

'y\_val': 0.0,

'z\_val': -1.032875418663025}

lidar orientation: <Quaternionr> { 'w\_val': 0.17364642024040222,

'x\_val': 0.0,

'y\_val': 0.0,

'z\_val': 0.984808087348938}

* We can see that reading after take-off have value 0 in terms of x,y axis. So, we can infer that the start position of drone is the origin (0,0,0)

***Reading taken near the wall***

<LidarData> { 'point\_cloud': [ 5.4627180099487305,

-1.2461967468261719,

1.5013360977172852,

5.439950466156006,

-1.183640956878662,

1.4917353391647339,

5.4174699783325195,

-1.1218743324279785,

1.482405662536621,

5.395267486572266,

-1.0608716011047363,

1.4733396768569946,

5.3733320236206055,

-1.0006022453308105,

1.4645304679870605,

5.351654529571533,

-0.9410433769226074,

1.4559721946716309,

5.33114767074585,

-0.8823232650756836,

1.447908878326416,

5.316933631896973,

-0.8251848220825195,

1.4417238235473633,

5.302714824676514,

-0.7685117721557617,

1.4357024431228638,

5.30206298828125,

-0.7141146659851074,

1.4335116147994995,

5.3089704513549805,

-0.6608171463012695,

1.4335116147994995,

5.315340995788574,

-0.6074533462524414,

1.4335116147994995,

5.3211750984191895,

-0.5540275573730469,

1.4335116147994995,

5.326473712921143,

-0.5005459785461426,

1.4335116147994995,

5.3312296867370605,

-0.4470176696777344,

1.4335116147994995,

5.335451602935791,

-0.39344143867492676,

1.4335116147994995,

5.339136123657227,

-0.3398244380950928,

1.4335116147994995,

5.325821399688721,

-0.2852931022644043,

1.4290955066680908,

5.3059892654418945,

-0.2308030128479004,

1.4230799674987793,

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-0.17676472663879395,

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1.4009116888046265,

5.209177017211914,

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4.990245342254639,

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4.826107025146484,

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1.3054451942443848,

4.8126068115234375,

0.7145195007324219,

1.3036693334579468,

4.7989726066589355,

0.7618408203125,

1.3019832372665405,

4.785202503204346,

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4.771292686462402,

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1.3029098510742188,

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1.005853533744812,

1.3727376461029053,

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1.2926393747329712,

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6.113201141357422,

1.3523355722427368,

1.6776279211044312,

5.828351974487305,

1.350875973701477,

1.603100299835205,

5.820765495300293,

1.4108766317367554,

1.6048307418823242,

6.048346042633057,

1.5305256843566895,

1.6717321872711182,

6.026821613311768,

1.5896642208099365,

1.67011296749115,

6.005336761474609,

1.6486940383911133,

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1.6673866510391235,

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1.7664769887924194,

1.6662794351577759,

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1.825253963470459,

1.6653404235839844,

5.919704437255859,

1.8839713335037231,

1.6645710468292236,

5.898350715637207,

1.9426400661468506,

1.6639704704284668,

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2.0012717247009277,

1.6635385751724243,

5.855679512023926,

2.0598793029785156,

1.6632740497589111,

5.834353923797607,

2.1184751987457275,

1.6631765365600586,

5.503986358642578,

-1.944352149963379,

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5.4782233238220215,

-1.873568058013916,

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-1.5778040885925293,

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-1.340078353881836,

1.5160239934921265,

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-1.2763056755065918,

1.5060104131698608,

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-1.2133655548095703,

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-0.9693570137023926,

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-0.9101624488830566,

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1.5335114002227783,

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1.5335114002227783,

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-1.0549440383911133,

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-1.0006027221679688,

1.5329092741012573,

5.351654052734375,

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-0.8821702003479004,

1.5152493715286255,

5.309040546417236,

-0.8239598274230957,

1.5067970752716064,

5.288088321685791,

-0.7663922309875488,

1.4985899925231934,

5.267359733581543,

-0.7094402313232422,

1.4906203746795654,

5.2468485832214355,

-0.6530852317810059,

1.4828847646713257,

5.2265472412109375,

-0.5973055362701416,

1.475376844406128,

5.206448554992676,

-0.5420832633972168,

1.4680922031402588,

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-0.4873979091644287,

1.4610252380371094,

5.166831016540527,

-0.43323397636413574,

1.4541728496551514,

5.148297309875488,

-0.3796398639678955,

1.4478095769882202,

5.134306907653809,

-0.32678747177124023,

1.442879557609558,

5.120290279388428,

-0.27428269386291504,

1.4380931854248047,

5.106466770172119,

-0.22212

Reading 1: time\_stamp: 1684335753923325184 **number\_of\_points: 1312**

lidar position: <Vector3r> { 'x\_val': 0.0,

'y\_val': 0.0,

'z\_val': -1.4601762294769287}

lidar orientation: <Quaternionr> { 'w\_val': 0.17364642024040222,

'x\_val': 0.0,

'y\_val': 0.0,

'z\_val': 0.984808087348938}

***Reading taken in sky with minimum obstracle around***

<LidarData> { 'point\_cloud': [ 22.823894500732422,

-8.258758544921875,

6.503702163696289,

22.886493682861328,

-8.022371292114258,

6.498246192932129,

22.82727813720703,

-7.744987487792969,

6.459019184112549,

22.728370666503906,

-7.457683563232422,

6.409509658813477,

22.624656677246094,

-7.172727584838867,

6.359622001647949,

22.522533416748047,

-6.892143249511719,

6.311135292053223,

22.421947479248047,

-6.61578369140625,

6.26400899887085,

22.322845458984375,

-6.343498229980469,

6.218207359313965,

22.225170135498047,

-6.075132369995117,

6.1736860275268555,

22.08822250366211,

-5.799898147583008,

6.119150161743164,

21.975326538085938,

-5.534885406494141,

6.072165489196777,

21.88188362121582,

-5.278148651123047,

6.031393051147461,

21.833097457885742,

-5.034841537475586,

6.003702163696289,

21.882572174072266,

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6.003702163696289,

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-4.59521484375,

6.003702163696289,

21.634849548339844,

-4.307010650634766,

5.910796165466309,

21.546724319458008,

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21.633197784423828,

-3.8565597534179688,

5.887984275817871,

23.93699836730957,

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6.503702163696289,

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24.04725456237793,

-3.296506881713867,

6.503702163696289,

21.038692474365234,

-2.669055938720703,

5.682483673095703,

20.957164764404297,

-2.4450607299804688,

5.653542518615723,

21.088077545166016,

-2.2458667755126953,

5.682487964630127,

24.160263061523438,

-2.327852249145508,

6.503702163696289,

24.18242645263672,

-2.085050582885742,

6.503702163696289,

20.166276931762695,

-1.53485107421875,

5.419164657592773,

20.10851287841797,

-1.3274307250976562,

5.399785995483398,

20.050750732421875,

-1.1214580535888672,

5.380978584289551,

19.99298095703125,

-0.9168605804443359,

5.362732410430908,

20.333866119384766,

-0.7278919219970703,

5.451934337615967,

22.398700714111328,

-0.5765829086303711,

6.003702163696289,

22.403358459472656,

-0.35155296325683594,

6.003702163696289,

22.523530960083008,

-0.1271514892578125,

6.035252094268799,

23.30075454711914,

0.1025238037109375,

6.2434797286987305,

23.970481872558594,

0.3462858200073242,

6.423544883728027,

24.214458465576172,

0.5931520462036133,

6.49019193649292,

24.486080169677734,

0.8459978103637695,

6.564939975738525,

69.3609848022461,

3.094287872314453,

18.603700637817383,

69.32640075683594,

3.7908859252929688,

18.603700637817383,

69.28482818603516,

4.487091064453125,

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69.23625946044922,

5.182853698730469,

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69.1181640625,

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69.04864501953125,

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18.603700637817383,

68.97216796875,

7.959959030151367,

18.603700637817383,

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8.652399063110352,

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12.100088119506836,

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18.603700637817383,

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13.471113204956055,

18.603700637817383,

67.9718017578125,

14.154624938964844,

18.603702545166016,

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14.83670425415039,

18.603700637817383,

67.6737289428711,

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18.603702545166016,

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18.603702545166016,

67.1754379272461,

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18.603702545166016,

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18.603702545166016,

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66.61614990234375,

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18.603702545166016,

66.41622161865234,

20.23370361328125,

18.603702545166016,

66.20967864990234,

20.89983558654785,

18.603683471679688,

65.99636840820312,

21.563880920410156,

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22.8853816986084,

18.60369300842285,

65.31666564941406,

23.542675018310547,

18.603683471679688,

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-8.317834854125977,

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22.98847770690918,

-8.058094024658203,

6.831957817077637,

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-7.685396194458008,

6.708563327789307,

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Reading 1: time\_stamp: 1684335938486759424 **number\_of\_points: 1120**

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'z\_val': -2.4303665161132812}

lidar orientation: <Quaternionr> { 'w\_val': 0.17364642024040222,

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