**Plus AI-Mapping and Localization:**

1. Given a point and a polygon, how can I determine if this point is outside the polygon or inside?

Answer:

*Given two adjacent vertex I and j on the polygon, we can compute the cross of the vector formed by ij and the vector formed by i and point. If the cross is negative, then the point is outside the polygon.*

1. Given a query matrix with integer, how can I compute the summation of number given a top-left start point and bottom right end point rectangle in O(1)?

Answer:

*By dynamic programming, we can first compute all summation whose top-left is origin and buttom-right is any index. Thus, when we need to compute any rectangle, we only need to compute dp[y\_end][x\_end] – dp[y\_end][x\_start-1] – dp[y\_start-1][x\_end] + dp[y\_start-1][x\_start-1]*

1. Given a curve plane, how can you find the curve part?

Answer:

*By computing all normal vector of each point on the plane, the curve part must include varied of different normal vector, while the flat plane will only include one kind of normal vector*

1. Talking about the overall pipeline of auto-mapping and auto-labeling.

Answer:

*First, we can use structure from motion to create the sparse mapping by multi-view. Or we can also use 3D reconstruction model like NeRF to reconstruct the dense mapping. After we have the 3D map, given 2D label from each camera and the camera pose, we can just project the 3D map to each camera and get the label by voting since there are multi-view and we cannot decide the label by only one view. After we have the 3D label, then we can just use label to grouping each point on the map. By union data structure, we can make the leader of each group belonging to one kinds of label. After we can have different group based on different labels type, we can use poly-fitting to find the boundary between different group.*

1. What do you expect to learn from this position?

Answer:

Since my career goal is to promote the application of pure vision for autonomous driving, this position must be my first priority since you only depends on camera multi-view to construct the map instead of lidar. Hence, I expect to learn a lots from the brilliant engineer in your team for more potential of pure-vision technique. Also, I am excited to contribute my knowledge about vision-learning like my experience of PETR to the team.

**Lattitude AI-Calibration engineer:**

1. What is the major part of the camera intrinsic matrix?

Answer:

*Focal length, the center of camera optical coordinate frame, and the scaling ratio from pixel to meter.*

1. Could you explain about the fundamental matrix and essential matrix?

Answer:

*Fundamental matrix depends on the camera intrinsic matrix and extrinsic matrix, while essential matrix only include camera extrinsic matrix. By multiplying the essential matrix to a pixel point in one camera, the result will be the epi-polar line on the another view, which will pass through the epipole and the corresponding matching point on another view. If the matching point is pixel, then using fundamental matrix, if the 3D point at camera coordinate system, then using essential matrix.*

1. What is the difference between smart-pointer and normal pointer?

Answer:

Smart pointer and release the memory automatically after the program ends.

1. What is the difference between struct and class in C++?

Answer:

*In struct, there is no member function, while class can have multiple member function include construction and deconstruction. Also, the member in struct is default as public, while the member is class is default private.*

1. What is the difference between reference and pointer?

Answer:

For reference, it is not an object since it depends on other variable, while pointer is an object that points to a real address.

1. Will the private member in a class change if it is from a reference in construction?

Answer:

No, since construction is only calling at the beginning of creating the class object. Any change for the reference and even pointer will not influence the result only when you set the private member as the pointer.