Lab2 – RTK_GPS

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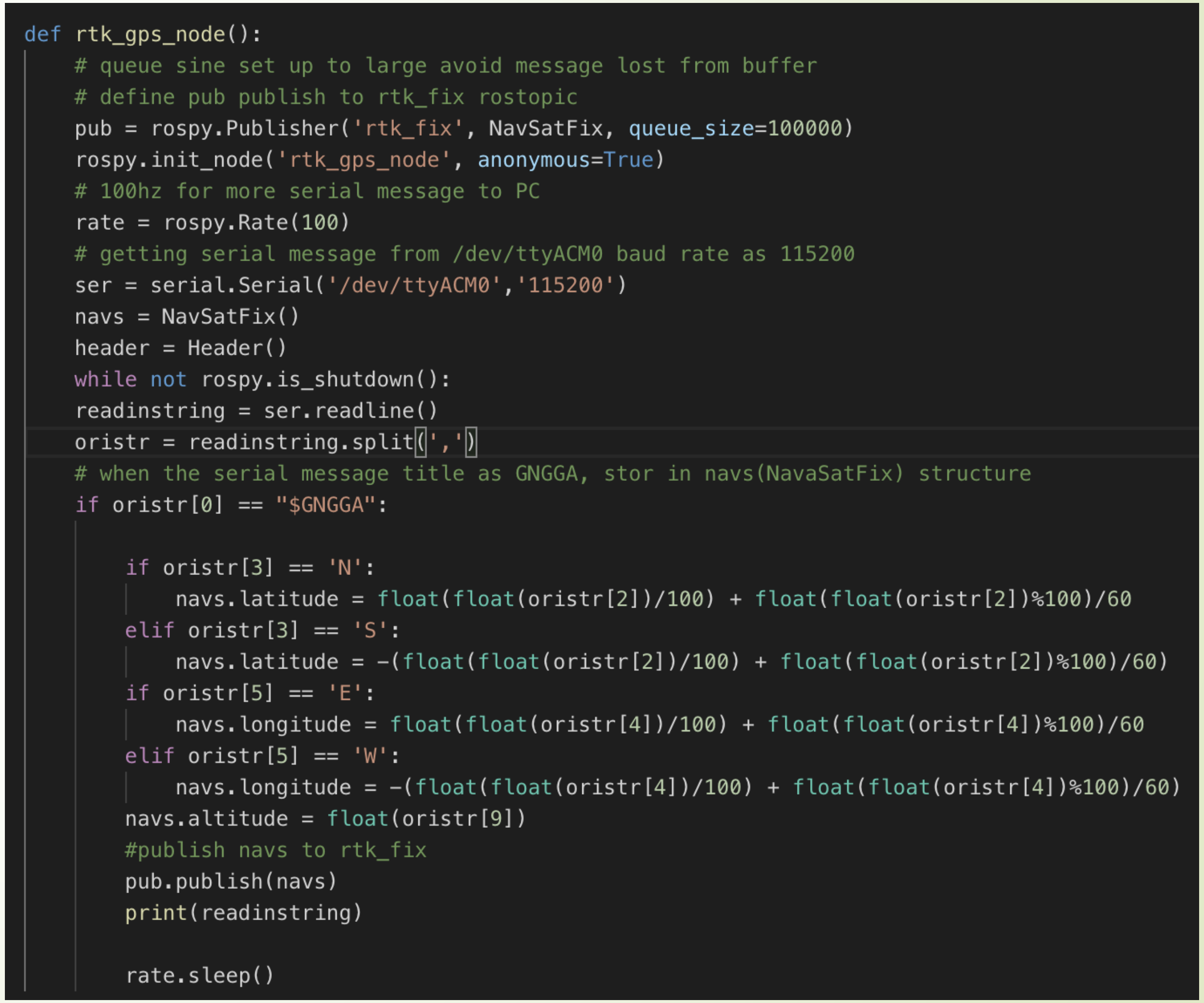
Rtk_gps_node.py :
Reading serial message from port

- Getting message from rov
- Queue size – setting large size avoid message lost when serial comes frequency more large then rospy rate
- Publish serial message to rtk_fix rostopic
- The comes up serial message have 15 different GPS form type, theory renewing rate should be more 15*5=75. Thus the coming message would publish to rostopic immesdiatly

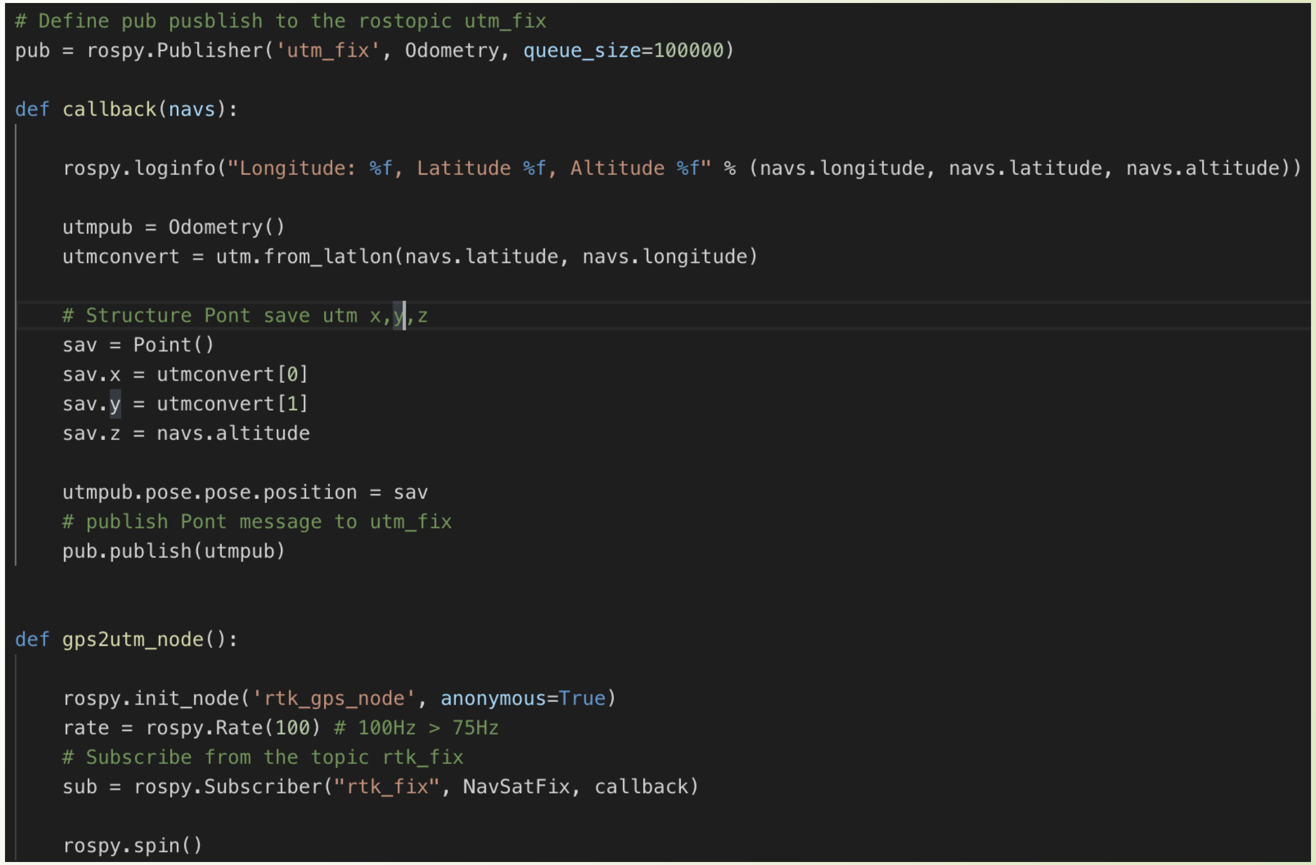


```python
def rtk_gps_node():
    # queue sine set up to large avoid message lost from buffer
    # define pub publish to rtk_fix rostopic
    pub = rospy.Publisher('rtk_fix', NavSatFix, queue_size=100000)
    rospy.init_node('rtk_gps_node', anonymous=True)
    # 100hz for more serial message to PC
    rate = rospy.Rate(100)
    # getting serial message from /dev/ttyACM0 baud rate as 115200
    ser = serial.Serial('/dev/ttyACM0','115200')
    navs = NavSatFix()
    header = Header()
    while not rospy.is_shutdown():
    readinstring = ser.readline()
    oristr = readinstring.split(',')
    # when the serial message title as GNGGA, stor in navs(NavaSatFix) structure
    if oristr[0] == "$GNGGA":

        if oristr[3] == 'N':
            navs.latitude = float(float(oristr[2])/100) + float(float(oristr[2])%100)/60
        elif oristr[3] == 'S':
            navs.latitude = -(float(float(oristr[2])/100) + float(float(oristr[2])%100)/60)
        if oristr[5] == 'E':
            navs.longitude = float(float(oristr[4])/100) + float(float(oristr[4])%100)/60
        elif oristr[5] == 'W':
            navs.longitude = -(float(float(oristr[4])/100) + float(float(oristr[4])%100)/60)
        navs.altitude = float(oristr[9])
        #publish navs to rtk_fix
        pub.publish(navs)
        print(readinstring)

        rate.sleep()
```

Gps2utm_node.py :

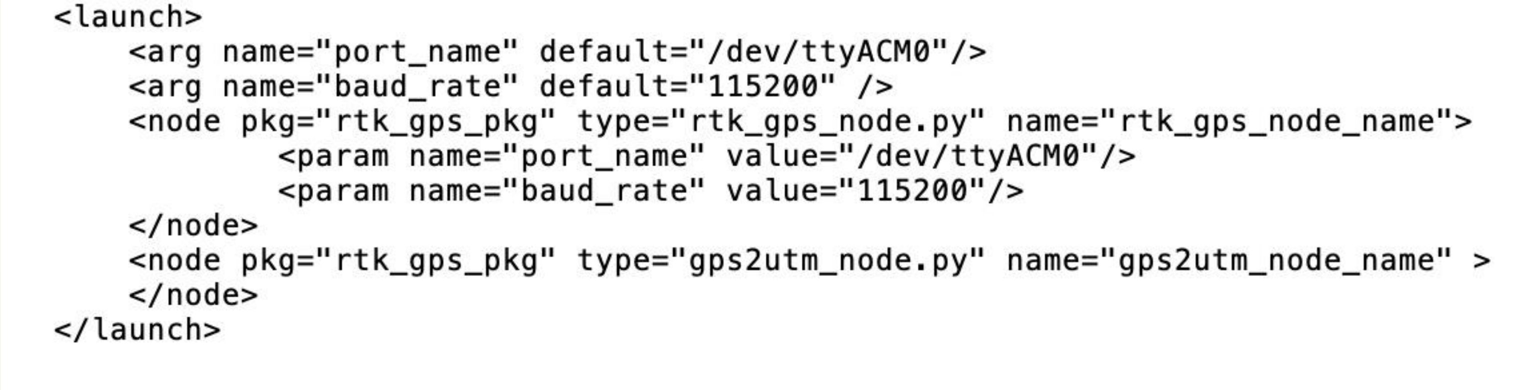
Transfer the LTH message to UTM

- Transfer longitude and latitude message to utm form
- Subscribe from the rostopic rtk_fix and covert to utm form
- Publish the sav Point() to rostopic utm_fix as Odometry structure Pose.Pose.x;y;z



```
# Define pub pusblish to the rostopic utm_fix
pub = rospy.Publisher('utm_fix', Odometry, queue_size=100000)

def callback(navs):

    rospy.loginfo("Longitude: %f, Latitude %f, Altitude %f" % (navs.longitude, navs.latitude, navs.altitude))

    utmpub = Odometry()
    utmconvert = utm.from_latlon(navs.latitude, navs.longitude)

    # Structure Pont save utm x,y,z
    sav = Point()
    sav.x = utmconvert[0]
    sav.y = utmconvert[1]
    sav.z = navs.altitude

    utmpub.pose.pose.position = sav
    # publish Pont message to utm_fix
    pub.publish(utmpub)


def gps2utm_node():

    rospy.init_node('rtk_gps_node', anonymous=True)
    rate = rospy.Rate(100) # 100Hz > 75Hz
    # Subscribe from the topic rtk_fix
    sub = rospy.Subscriber("rtk_fix", NavSatFix, callback)

    rospy.spin()
```

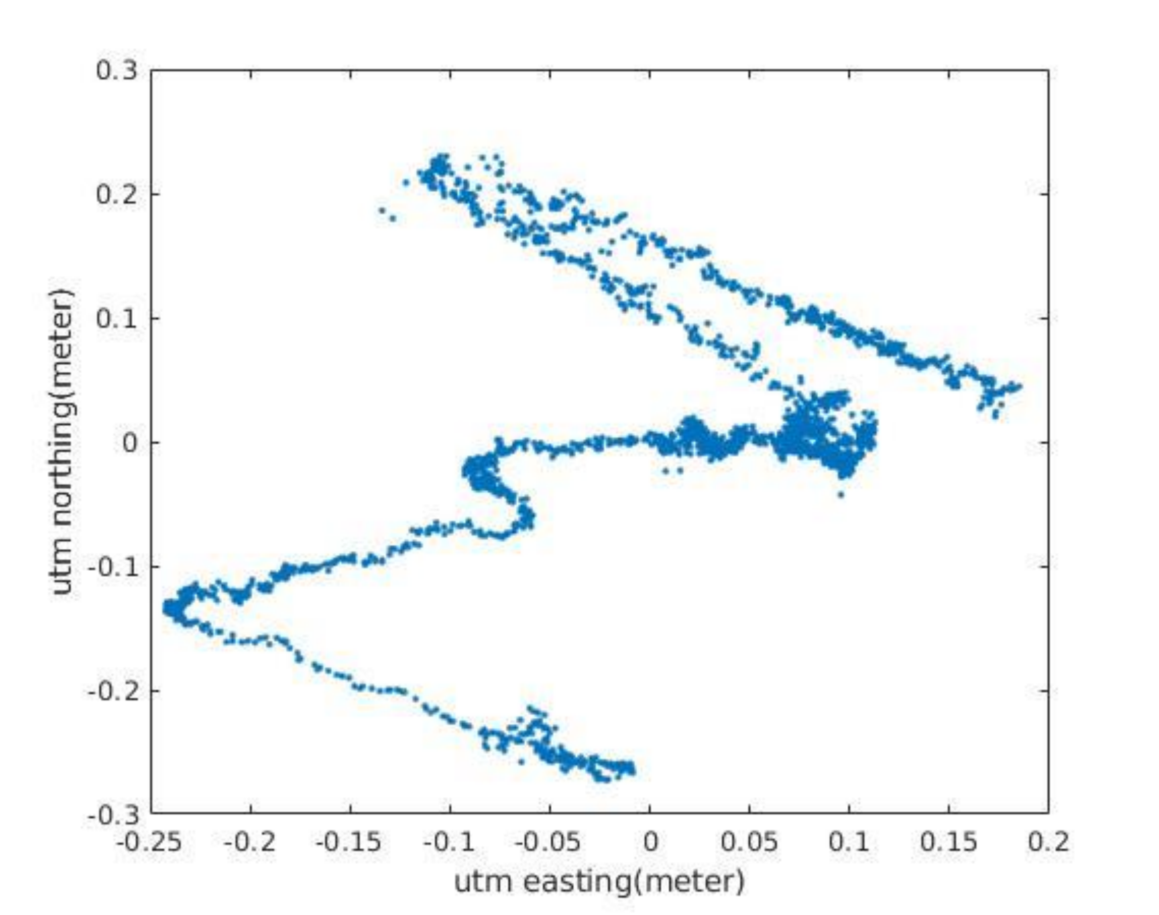
Launch File– launch to nodes



```
<launch>
    <arg name="port_name" default="/dev/ttyACM0"/>
    <arg name="baud_rate" default="115200" />
    <node pkg="rtk_gps_pkg" type="rtk_gps_node.py" name="rtk_gps_node_name">
            <param name="port_name" value="/dev/ttyACM0"/>
            <param name="baud_rate" value="115200"/>
    </node>
    <node pkg="rtk_gps_pkg" type="gps2utm_node.py" name="gps2utm_node_name" >
    </node>
</launch>
```

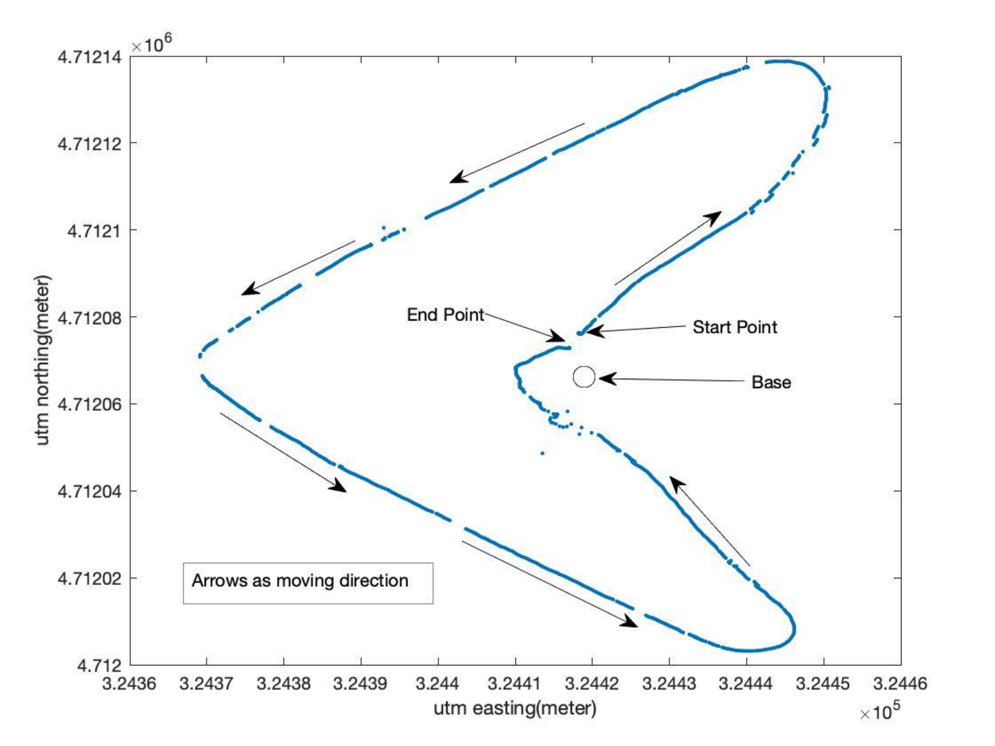
Data from roof of Garage

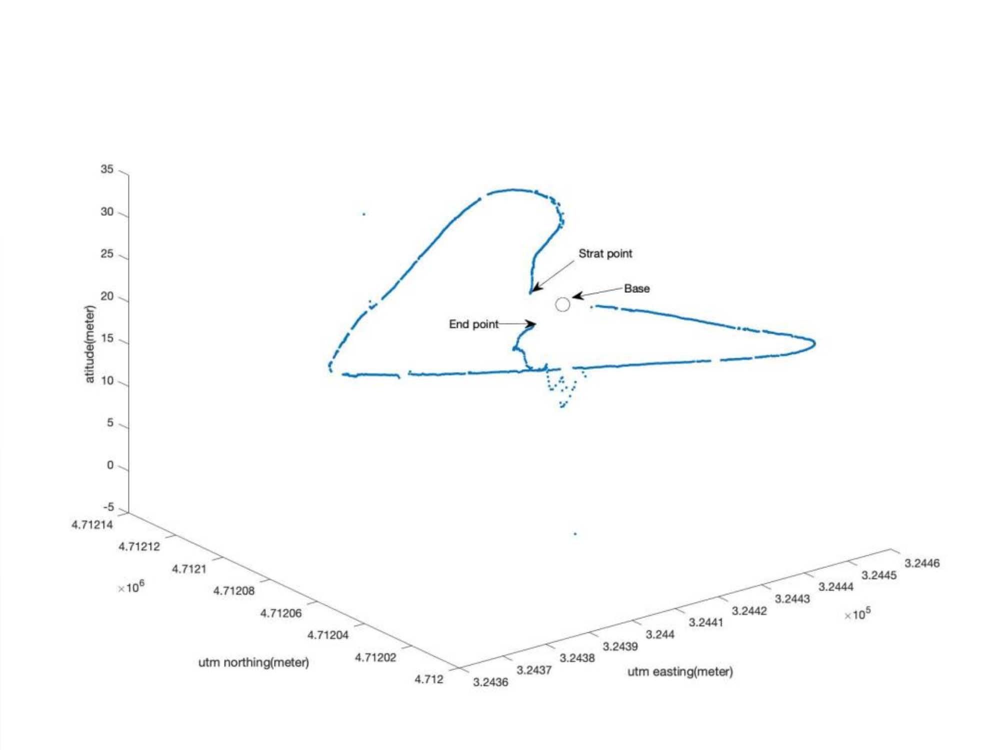
- Stay on the roof of the Columbus garage
- Error on the garage round in 50cm (northing) 40cm (easting),
- Error plot the point in sequence (not randomly), because satellites are also move in sequence
- The value of the x axle is the utm_x – mean(all utm_x) same as axle y



Data from roof of Garage

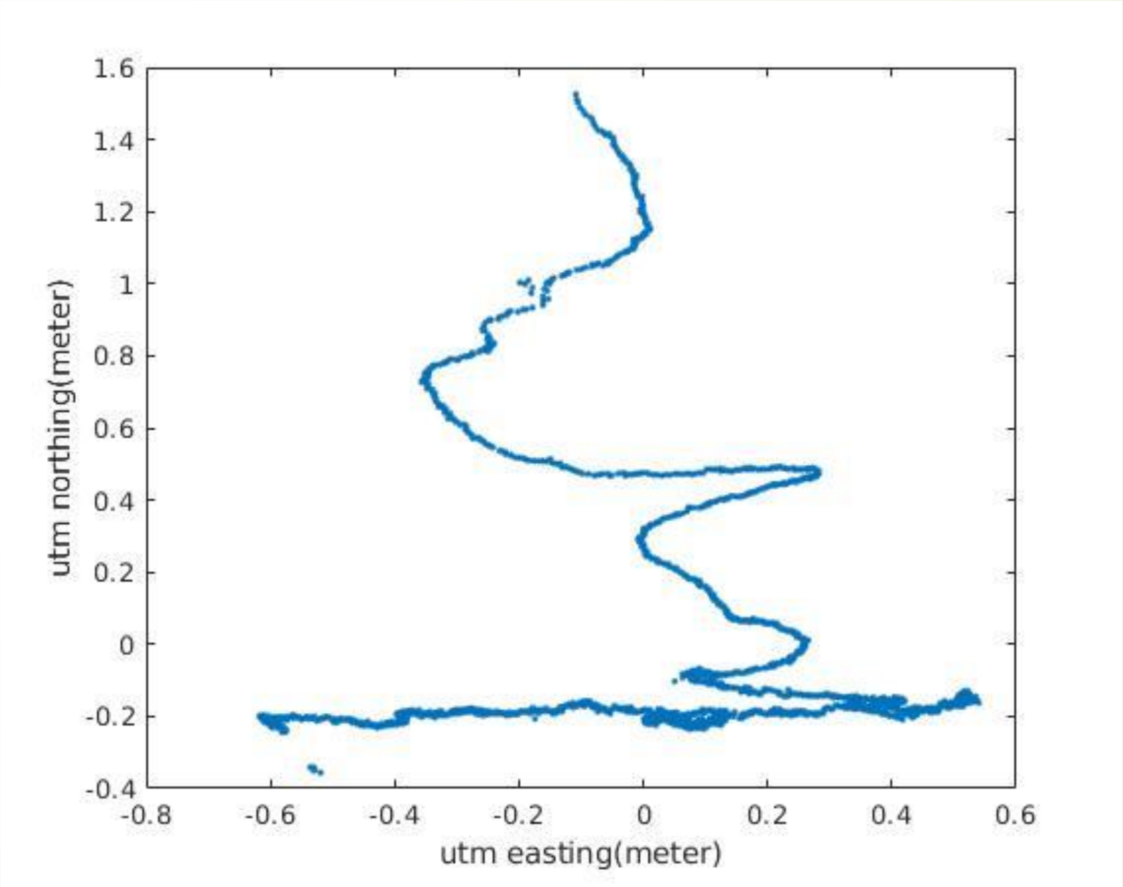
- Moving on roof
- Noise and error seems appear near the base (Possible because the connection between rov and base)
- Other path seem less error than nearing the base position
- In 3D plots we can observe the attitude could be more difficult to measure than utm_x and utm_y





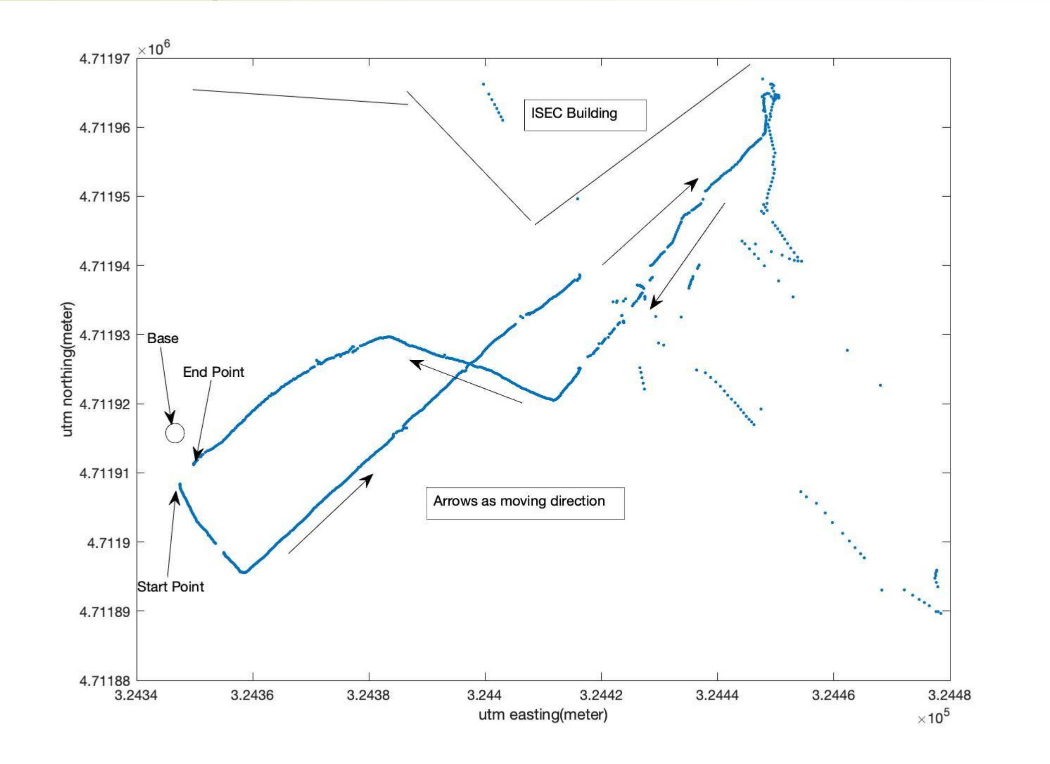
Data beside of ISEC

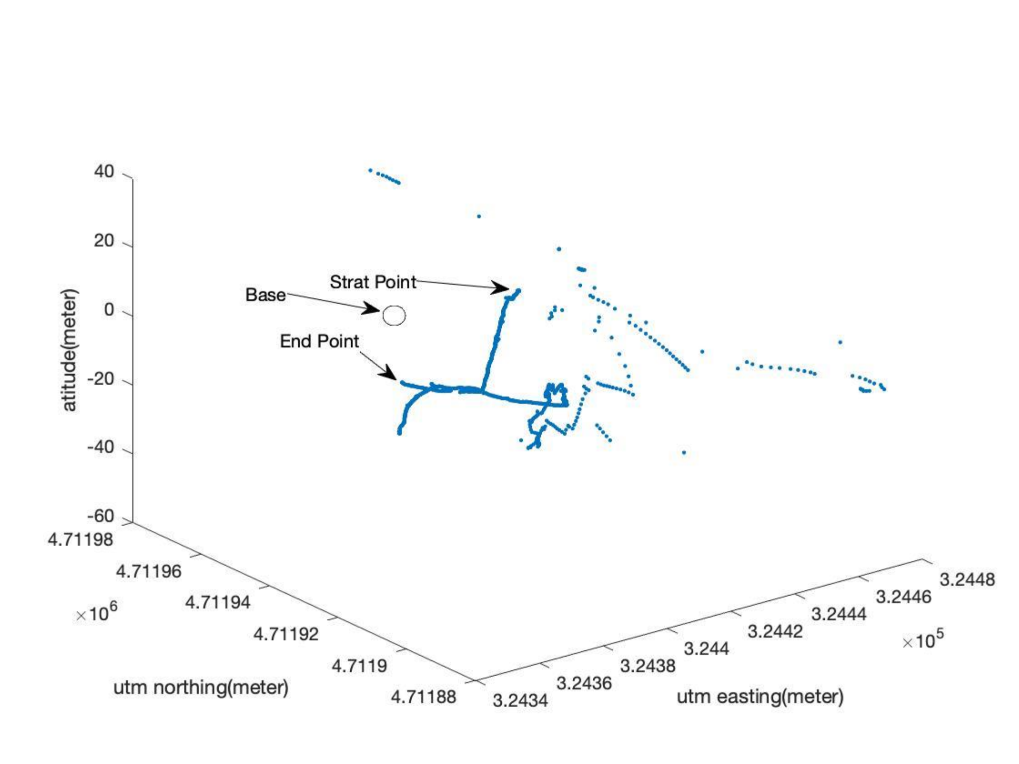
- Stay beside the ISEC building
- The error beside ISEC seems more than open space, round in 1.2m (easting) and 1.6m (northing)
- Same the plots scatter in sequence because the satellite move in linear orbit
- The value of the x axle is the utm_x – mean(all utm_x) same as axle y



Data beside of ISEC

- Moving beside ISEC building
- The shape of the moving route in 2D plots can be observed but not as clear as in open space
- In 3D plots , altitude cold not be measured stables, possible because the building beside
- An point which is worth to discuss is that when passing beside the ISEC building. The signal from the base seems lost, thus the error and the noise appear in large range





Other Analysis

I. Position of the bas choice: We have found some place to set the base, some are more stable than some place

   - The place in open source : ore stable to adjust the average coordinate
   - The place on metal material : Single signal lost frequently (more noise because of Inductance affection?)

II. Cover and signal noise

   - The rtk gps is easily to be blocked from receiving data from satellites
   - We data we gathered in first time have a lot lost message because the signal of GNGGA could be block by our hands. Than we fixed it by placing the aerial above our height.