//Variable data

Variables:

A=acceleration

M=meridian

W=angular velocity

Subscripts:

gyro=gyroscope reading

mag=magnetometer reading

acc =accelerometer reading

x, y, z =sensor frames

X, Y, Z=NED frame

b=bias

//initialize

Aacc,x+= get\_data\_from\_acc();

Aacc,y += get\_data\_from\_acc();

Aacc,z += get\_data\_from\_acc();

Mmag,x+= get\_data\_from\_mag();

Mmag,y += get\_data\_from\_mag();

Mmag,z += get\_data\_from\_mag();

Wgyro,x+= get\_data\_from\_gyro(); ReadData()

Wgyro,y += get\_data\_from\_gyro();

Wgyro,z+= get\_data\_from\_gyro();

Wgyro,b,x += get\_data\_from\_gyro();

Wgyro,b,y+= get\_data\_from\_gyro();

Wgyro,b,z+= get\_data\_from\_gyro();

If(Wgyro,b>biasMax)Set\_gyro\_bias=0; //check for x,y,z axis

ϴX= roll angle= arctan(Aacc,y/Aacc,z);

ϴy =pitch angle =arctan(-Aacc,x/sqrt(Aacc,y2+Aacc,z2));

MX=Mmag,x\*cos(ϴY)+Mmag,z\*sin(ϴy); GetAngles()

MY=Mmag,x\*sin(ϴX)\*sin(ϴY)+Mmag,y\*cos(ϴX)-Mmag,z\*sin(ϴX)\*cos(ϴY);

ϴz=arctan(MY/MX);

Pacc,x+=0;

Pacc,y+=0;

Pacc,z+=0;

… do the same to all mag, gyro and GyroBias readings.

Roll+=ϴX

Pitch+=ϴY

Yaw+ = ϴZ

Proll+=0

Ppitch+=0

Pyaw+=0

START :

Predict:

Aacc, x- = Aacc,x+

Pacc,x-=Pacc,x++Qacc,x

Aacc, y- = Aacc,y+

Pacc,y-=Pacc,y++Qacc,x

Aacc, z- = Aacc,z+

Pacc,z-=Pacc,z++Qacc,x

… Do same to all Mag and Gyro and GyroBias readings…

Roll-=Wgyro,x\*t-Wgyro,x,b;

Pitch-=….’’…..//with y

Yaw-=..’’…//with z

Proll-=Proll++Qroll;

…repeat for yaw and pitch…

Update:

ReadData();

¥acc,x=Aacc,x+ - Aacc,x-;

...repeat for all three axis and for mag, gyro and GyroBias readings…

Kacc,x=Pacc,x-(Racc,x+Pacc,x-)-1

Aacc,x+=Aacc,x-+Kacc,x\*¥acc,x

Pacc,x+=(1-Kacc,x)Pacc,x-

…repeat the same for all three axis and for gyro, mag and GyroBias readings…

GetAngles();

¥roll = ϴx – Roll-;

Kroll=Proll-(Rroll + Proll- );

Roll+=Roll- + Kroll\*¥roll;

Proll+=(1-Kroll)Proll-;

…repeat the same for Yaw and Pitch…

// Roll+, … are the required angles.

GOTO START;