Vision Based Closed Loop Tracking using Micro Air Vehicle

Niranjan R[1], Gana Spandhana L[2], Sneha S[3], Champaka K M[4] ,Mr. Venkateshappa[5]
[1234]*Department of Electronics and Communication Engineering,*
M S Engineering College, Bangalore.
[5]*Associate Professor,Department of Electronics and Communication Engineering*
M S Engineering College, Bangalore.

Abstract-

The design and implementation of lightweight portable multispectral imaging system for deployment on Micro air vehicle is presented. The mobile camera is used to capture the images/video recording.

The images are stored in native generate format. We are using Wireless Wi-Fi transmission between mobile camera and laptop. The code of this process is implemented in the Matrix Laboratory(MATLAB) and developed algorithm is very simple.

Keywords: *Micro air vehicle for photography, Schematic mission in 2015 AHS in MAV.*

I. INTRODUCTION

Various different techniques are being used in imaging systems for improving camera pixel accuracy. For technology-oriented multispectral imaging systems, the red-green-blue (RGB) and near infrared (NIR) scanners were initially developed specifically for space-based explorations and subsequently for aerial imaging. With remarkable advances in the field of digital camera technology, there has been a rapid return to simple camera systems in various applications such as environmental observations, agriculture, security, defence systems and so on. This is particularly driven by recent progress in small drone technology. The traditional spectral imaging techniques involve time-sequential scanning of either a spatial or a spectral dimension combined with snapshot imaging of the other two dimensions. These methods are exemplified through the push-broom scan by one-dimensional spectral imager across the required field of view, use of tunable spectral filtering or of imaging Fourier transform spectrometry. The applications of these traditional time-sequential methodologies are restricted to domains where an extended recording time is acceptable, viz. in microscopy, remote sensing and in biomedical imaging. Recently several snapshot multispectral imaging approaches have been developed. Some of these snapshot procedures use fibber optics to reformat a two dimensional image into a one-dimensional array and then, employ a conventional one-dimensional imaging spectrometer to obtain spectral information. The computed topographic imaging spectrometer (CTIS) utilizes a diffractive optical element to disperse the image at the detector and finally reconstructs the spectral data cube. The image-replicating imaging spectrometer (IRIS) applies a Lyot filter to spectrally de-multiplex an image onto a single conventional detector array. The snapshot hyper spectral imaging Fourier transform (SHIFT) spectrometer makes use of bi-refrigerant polarization optics to obtain images at different spectrum. Another newly developed snapshot hyper spectral imaging method uses an image slicer to spectrally redirect the image to different locations in the de

II. BLOCK DIAGRAM

The elements in the MAV flight control system, because the MAV airframe dynamic modes such as Dutch Rolland the short period longitudinal mode, it will occur at higher frequencies compared with larger vehicles, the MAV will need some means of augmenting the natural stability of the air frame. So in addition to the MAV should have the capability to fly itself to preprogramed way points selected by the operator. To capture the images with HD clarity by using Mobile camera.

Practical Limitations

Although there are currently no true MAVs (i.e., truly micro scaled flyers) in existence, DARPA has attempted a program to develop even smaller Nano Air Vehicles (NAVs) with a wingspan of 7.5 centimeters. However, no NAVs meeting DARPA's original program specification were forthcoming until 2009 when AeroVironment demonstrated a controlled hovering of DARPA's flapping-wing NAV. Beyond the difficulties in developing MAVs, few designs adequately address control issues. The MAVs' small size makes teleoperation impractical because a ground station pilot cannot see it beyond 100 meters. An onboard camera allowing the ground pilot to stabilize and navigate the craft was first demonstrated in the Aerovironment Black Widow, but truly micro air vehicles cannot carry onboard transmitters powerful enough to allow for teleoperation. For this reason, some researchers have focused on fully autonomous MAV flight. One such device, which has been designed from its inception as a fully autonomous MAV, is the biologically-inspired Entomopter originally developed at the Georgia Institute of Technology under a DARPA contract by Robert C. Michelson. Given that MAVs can be controlled by

autonomous means, significant test and evaluation issues continue to exist.

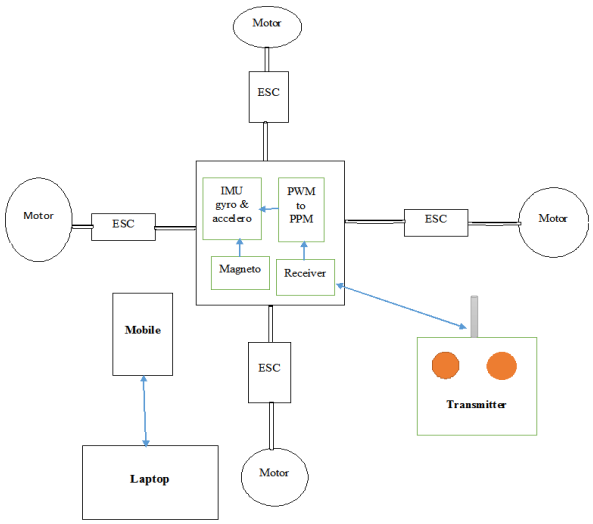

Fig 1.1: Block Diagram of the Drone System

III. METHODS AND METHODOLOGIES

- Basically the project is an aerial Micro air vehicle to capture the images requested by the admin and sends back to the laptop.
- The project is mainly consisting of a Flying MAV controlled by RF enabled Joystick fitted with mobile camera to capture the images.
- The laptop is installed with MATLAB and image processing code to send the instruction to MAV for capturing image and it receive the captured image by MAV.
- Joystick is used to control MAV in any direction. The instruction to capture the image will be sent by a wireless laptop enabled with Wi-Fi Hotspot.
- The system is a closed loop to send and receive images or data using RF Technology.

IV. DISADVANTAGES BY EXISTING DEVICE

- Capturing of images at higher altitudes is difficult.
- If damage occurs in flapping wings, it can't be detected.
- Clarity of the images we won't get in present MAVs.

V. ADVANTAGES

- Economically low cost, less weight, no delay of the capturing images.
- Easy to carry out the device for landscape photography.
- Since RF cameras are replaced by mobile camera therefore cost can be reduced.

VI. PROBLEM STATEMENT

- Project module can be used for recording and capturing images with high clarity.
- Image acquisition and transmission through wireless Laptop enabled with Wi-Fi Hotspot.

VII. CONCLUSION

As per the design specifications, the MAV self-stabilizes using the array of sensors integrated on it. It attains an appropriate lift and provides surveillance of the terrain through the camera mounted on it. The purpose is to take to picture, audio/video transmission from areas which are physically in-accessible by humans, hence for the being beneficial towards military applications.

ACKNOWLEDGMENT

This work is deemed incomplete without acknowledging the various individuals immensely instrumental in us hearing in a great deal of effort, time and valuable guidance. I would like to thank our guide and Associate Professor Mr. Venkateshappa at M S Engineering college, for providing valuable suggestions, relentless support, help and guidance throughout the course of our project.

REFERENCES

[1] Mallesh Babu S, Jayant Kumar a Rathod, Veena S, Lokesh H "Design of speech based ground control station for controlling the micro air vehicle" 5th International conference on advance in computing and communications. (2015)

[2] Shinya Ueda, Hirokazu, Madakoro, Naruhito Sato and Nobuhiro Shimoi "Prototype Develpoment of on -board vision processing MAV for wide-range monocular SLAM" 16th International Conference on Control, Automation and Systems. (ICCAS 2016) october.16-19.2016.

[3] K. Kurotsuchi, M. Tai and H. Takahashi "Vision based autonomous micro air vehicle control for odor source localization" Center for Exploratory Research, Hitachi.Ltd, I-280.

[4] Fabrication of a Flapping wing MAV" International Conference on Mechatronic Science, Electric Engineering and Computer(August.19-22.2011).

[5] Andras L Majdik,Damimo Berdo,Yves Albers Schoenberg,Davide Scaramuzza "MAV Localization and Position Tracking from Textured 3D Cadastral Models" IEEE International Conference on Space Robotics and Automation(ICRA)[May.31-June.7,2014].

[6] Tao Zhang, Chaoying Zhou, Xingwei Zhang, Chao Wang "Design Analysis Optimization and Larry Matthies, Roland Brockers, Yoshiaki Kuwata and Stephan Weiss "Stereo Vision-Based Obstacle Avoidance for MAVs using Disparity Space" IEEE International Conference on Robotics and Automation(ICRA)(May.31-june.7.2014).

[7] Takuma Nakamura, Stephen Havilland, Dmitry Barshefsky, Daniel Magee, Eric N. Johnson "Vision-Based Closed-Loop Tracking Using Micro Air Vehicles" (2016)

[8] John C. Gallagher, Sanjay Boddhu, Eric Matson, Garrison Greenwood "Improvements to Evolutionary Model Consistency Checking for a Flapping-Wing Micro Air Vehicle" (2014).

[9] Colmenares1, R. Kania1, W. Zhang1, and M. Sitti2 "Compliant Wing Design for a Flapping Wing Micro Air Vehicle" IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Congress Center Hamburg. (Sept 28 - Oct 2, 2015).

[10] John C. Gallagher, Sanjay Boddhu, Eric Matson, Garrison Greenwood "Improvements to Evolutionary Model Consistency Checking for a Flapping-Wing Micro Air Vehicle" (2014).

[11] Steven Huybrechts, Steven Griffin "Ultra Lightweight Structures for Deployed Optics" (March 21, 1998).
[12] Annie S. Wu,Alan C. Schultz,Arvin Agah "Evolving Control for Distributed Micro Air Vehicles"' (1999).
[13] Raymond G. Zenick, Jr, Kimberly Kohlhepp "GPS Micro Navigation and Communication System for Clusters of Micro and Nanosatellitesl" (2001).
[14] N.J.S Stacy, D.W. Craig, J. Staromlynska and R.B. Smith "The Global Hawk UAV Australian Deployment: Imaging Radar Sensor Modifications and Employment for Maritime Surveillance" (2002