SURVEILLANCE UAV

Gulshan Kumar Dubey
Department of EIE, Galgotias College of Engineering and Technology Greater Noida, Uttar Pradesh, India
gulshan.dubey@gmail.com

Raunak Agrawal
Department of EIE, Galgotias College of Engineering and Technology Greater Noida, Uttar Pradesh, India
rau.ag0301@gmail.com

Shalini Asija
Department of EIE, Galgotias College of Engineering and Technology Greater Noida, Uttar Pradesh, India
asijashalini08@gmail.com

Sharad Sharma
Department of EIE, Galgotias College of Engineering and Technology Greater Noida, Uttar Pradesh, India
sharad2390@gmail.com

Varun Tyagi
Department of EIE, Galgotias College of Engineering and Technology Greater Noida, Uttar Pradesh, India
tyagivarun27@gmail.com

Abstract— **The aim of this paper is to present a micro-controller based remote controlled Unmanned Aerial Vehicle (UAV) which could be used for surveillance by providing real-time images/video. There are many utterly risky jobs which may cost precious lives. Such dangerous job could be done using small UAVs as it can be radio operated, self powered. The presented work is a combination of hardware and software. In hardware section, the main circuit consists of RF receiver - transmitter, motor driver and a camera. The software section includes the pre programmed flight plans based on input codes from remote control. The real time images/video and audio signals can be send and action can be taken accordingly. A proposal based on study, to develop a authority for regulations of UAVs flight is also presented.**

Keywords — UAVs, Brushless DC motors, AT89c51 Microcontroller, HT12D Decoder IC, L293D motor driver, Camera

I. INTRODUCTION

The earliest attempt at a powered unmanned aerial vehicle was A. M. Low's "Aerial Target" of 1916. A number of remote-controlled airplane advances followed, including the Hewitt-Sperry Automatic Airplane, during and after World War I. More were made in the technology rush during World War II. Germany also produced and used various UAV aircraft during the course of WWII.

The birth of U.S. UAVs began in 1959 when United States Air Force officers, concerned about losing pilots over hostile territory, began planning for the use of unmanned flights. This plan became intensified when Francis Gary Power and his secret U-2 were shot down over the Soviet Union in 1960. Within days, the highly classified UAV program was launched [7].

Since then the growth of technology and changing political scenarios has led to development of several UAV technologies. So, this kind of aerial vehicles are being used for tactical surveillance [4], domestic policing, remote sensing, armed attacks etc[7]. Such UAVs, being unmanned, are used to carry out surveillance missions in regions where manned missions are not possible due to hostile conditions [3].

Unmanned aerial vehicles (UAVs) are crafts capable of flight without an onboard pilot[3]. This UAV can be controlled remotely by an operator on ground. Such aircraft have already been implemented by the military for reconnaissance flights [9]. Further use for UAVs by the military, specifically as tools for search and rescue operations, warrant continued development of UAV technology. Many times army personnel need to venture into the enemy territory for tactical surveillance [2] [7]. This is an utterly risky job, it may cost precious lives. Such dangerous job could be done using small UAVs or spy robot [5].

This drone is radio operated, self powered. Wireless camera [1] [5] will send real time video signals which could be seen on a remote monitor and action can be taken accordingly. Being small in size, will not be tracked by enemy on his radar [5] if used for spying. It can silently enter into territory to be examined and send all the information through its tiny camera[9][10].

II. REGULATIONS

Aviation authorities around the world are integrating unmanned aircraft into civilian airspace, and each jurisdiction has its own rules and regulations.

A. Canada

Before allowance to operate UAVs in Canada, Special Flight Operations Certificate (SFOC) needs to be obtained. Once

ISBN: 9788175157538

granted, the UAV will be subject to the rules set by Transport Canada. Depending on situation and intended use of the system, different rules will apply. Restrictions may include locations, time of day, and other operating and safety parameters.

B. United States

In order to operate UAVs in USA, Certificate of Authorization (COA) needs to be acquired through the Federal Aviation Administration (FAA). Currently, these certificates are only granted to federal, state, and local government agencies, and restrict flying to specified areas.

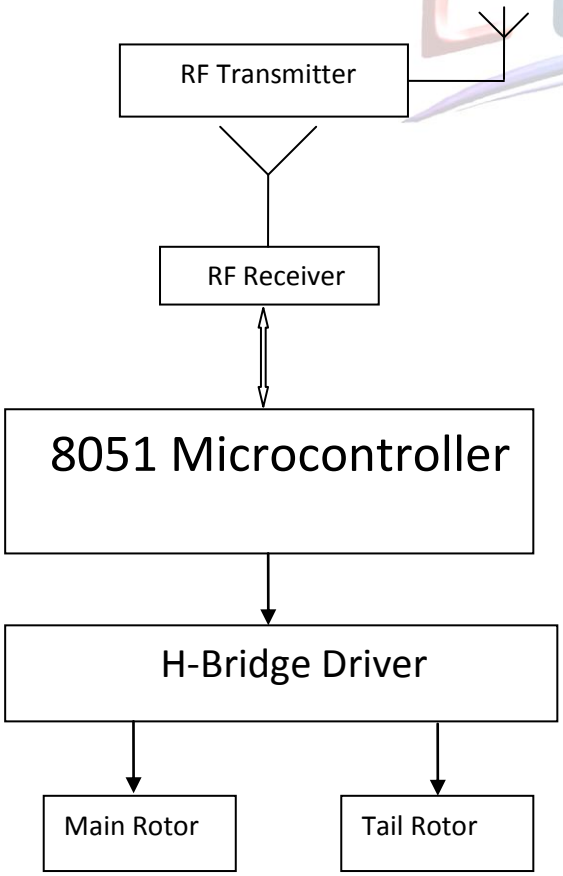
C. United Kingdom

Can fly for leisure without camera. Once a camera is attached, a "Permission to fly" needs to be applied to the CAA.

D. Australia

CASA provides guidance to controllers and manufacturers of UAVs in the operation and construction of UAVs and the means to safely and legally operate UAV systems. Operator and Controller Certification is needed.

III. FUNCTIONAL BLOCK DIAGRAM



- The whole setup is based on microcontroller AT89C51 (8051 family). The assembly includes a motor driver IC-L293D to drive two motors, one for main rotor and the other for tail rotor. A transmitter transmits control signals which are received by the receiver circuit housed in the main assembly. A wireless camera would be mounted over a motor shaft for surveillance purposes.
- Microcontroller is responsible for executing all the commands received from the receiver and also generating pulses for the speed control. The H-bridge receives these pulses and drives both motors, providing bidirectional drive currents.

IV. MAJOR COMPONENTS

The main circuit assembly consists of microcontroller AT89c51. Microcontroller is responsible for executing all the commands received from the transmitter and also generating pulses for the speed control. IC-L293D motor driver IC which drives two motors: Main motor and Tail motor. A crystal oscillator is used to generate clock pulses and a 12 Volt power supply is used.

Major components of main circuit assembly

12V Power Supply, AT89c51 Microcontroller, RF Receiver, HT12D Decoder IC, L293D motor driver, Camera circuit

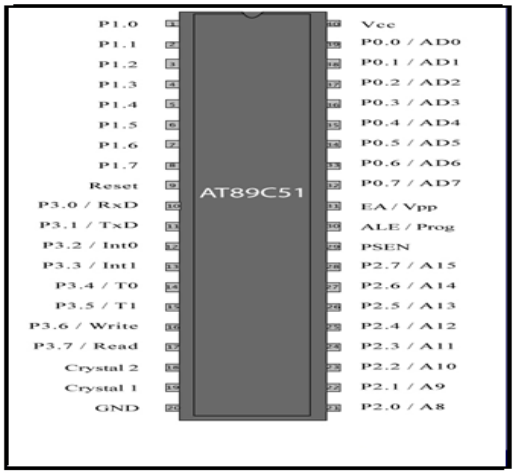
AT89C51 Microcontroller

The AT89C51 is a low-power, high-performance CMOS 8-bit microcontroller with a flash programmable and erasable read only memory (PEROM).

The AT89C51 provides the following standard features:

- 4K Bytes of Reprogrammable Flash Memory
- Endurance: 1,000 Write/Erase Cycles
- Fully Static Operation: 0 Hz to 24 MHz
- 128 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-bit Timer/Counters
- A full duplex serial port
- On-chip oscillator and clock circuitry.

ISBN: 9788175157538



HT12E Encoder

Encoder IC is used to encode the control signals generated by remote control for transmission using an RF Transmitter.

Main features

- Operating voltage
- 2.4V~12V for the HT12E
- Low power and high noise immunity CMOS Technology
- Low standby current: 0.1_A (typ.) at VDD=5V
- Minimum transmission word- Four words for the HT12E
- Built-in oscillator needs only 5% resistor
- Data code has positive polarity
- Minimal external components
- HT12E: 18-pin DIP/20-pin SOP package

HT12D Decoder

Decoder IC is used to decode the signals received using the RF receiver so that they can be useful by the microcontroller.

Main features

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- Low standby current
- Capable of decoding 12 bits of information
- Received codes are checked 3 times
- HT12D: 8 address bits and 4 data bits
- Built-in oscillator needs only 5% resistor
- Valid transmission indicator
- Easy interface with an RF or an infrared transmission medium
- Minimal external components
- 18-pin DIP, 20-pin SOP package

L293D Motor Driver

The L293D is used to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. It is used drive the dc motors employed in the UAV.

Main features

- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Thermal Shutdown
- High-Noise-Immunity Inputs
- Output Current 600 mA for L293D
- Peak Output Current 1.2 A for L293D

Camera

The camera [4] is employed on the unit to transmit live video/image feed back to the receiving monitor or a computer [4].

Working

The remote control houses the transmitter-encoder assembly. The transmitter and receiver operate in RF Range. The encoder IC HT12E encodes the control signals from remote controller, which are in the form of a bit-stream into a compressed code. Then the transmitter transmits this control code at RF frequency of 315MHz. This RF signal is received by the receiver operating at same frequency and housed in the main assembly. The receiver provides digital pulses to the decoder IC HT12D which decodes the signal into its actual form which is transmitted to the controller.

UART is used to receive codes at 1200 baud rate. The microcontroller AT89C51 operating at 12MHz then generates PWM pulses for speed control of the motor. The H-bridge or motor driver IC L293D receives these pulses and drives both motors, providing bidirectional drive currents enabling the motors to run in both directions.

ISBN: 9788175157538

While in flight the camera continuously provides video/image feed back to the receiving monitor or a computer. For video transmission 5.5 MHz RF frequency is used. These video signals are first amplitude modulated, multiplexed and then transmitted. At the receiving end demodulation is performed and video is obtained which is displayed on the monitor.

V. CONCLUSION

Surveillance is increasingly becoming one of the most important subjects when it comes to security. In this work, a portable, economically viable alternative to manual surveillance that can find application in both civilian and military sectors is designed. The speed, portability and low cost of a microcontroller is utilized to develop a unit that can act as a multipurpose surveillance platform. Further, this UAV could be used for domestic policing, remote sensing, armed attacks etc.

VI. REFERENCES

[1] *Mann, Steve. "Privacy Issues of Wearable Cameras versus Surveillance Cameras", Volume 1, Issue 1. 1995 Newsweek.*

[2] *Belsie, Laurent. "New Era of Electronic Snooping" Christian Science Monitor, Volume 2, Isuue 3. May 1995.*

[3] LIU Chang-an, LI Wei-ji, WANG He-ping. "Path Planning for *Reconnaissance UAV", Volume 1, Issue 2. Aeronautical Institute, Northwestern Polytechnic University, Xi'an, China. 2002-04.*

[4] *Liang Liu. "Localization-Oriented Coverage in Wireless Camera Sensor Networks". Wireless Communications, IEEE Transactions, Volume 10, Issue 2, February 2011*

[5] *Weibel, Roland E.; Hansman, R. John "Safety Considerations for* Operation of Different Classes of UAVs", Volume 5, Issue 3. 2004-09-20.

[6] *Jonathan M Teich, Michael M Wagner, Colin F Mackenzie, Brig Gen Klaus O Schafer. "The Role of Informatics in Preparedness for Bioterrorism and Disaster", Volume 2 Issue 1. J Am Med Inform Assoc 2002.*

[7] *Ashish Tanwer, Muzahid Hussain, Parminder Reel "Deployable Low Cost Outdoor Aerial Surveillance System", Vol 1, No 1 (2010)*

[8] *Ciprian Racicia, Nicolae Jula, Constantin Balan, Cosmin Adminicai, "Embedded Real-Time Video Encryption Module on UAV Surveillance Systems", Issue 5, Volume 7, May 2008*

[9] *Holsapple, Raymond; Schumacher, Corey J.; Hansen, J.; Girard, Anouck Renée, "Cooperative defensive surveillance using Unmanned Aerial Vehicles", Issue 5, Volume 3, June 2009*

[10] *Sadiye Guler ; Timothy Cole ; Jay Silverstein ; Ian Pushee ; Scott Fairgrieve, "Border security and surveillance system with smart cameras", Issue 10, Volume 7, Independent Component Analyses, Wavelets, Neural Networks, Biosystems, and Nanoengineering VIII, Orlando, Florida, April 05, 2010*

[11] *J. Jayaraman, "Exploiting Indigenous Technologies for Unmanned Air Vehicle Surveillance System" Vol 51. No 3 , Aeronautical Development Establishment, Bangalore, JULY 2001*

ISBN: 9788175157538