Multitasking quad copter with hand gesture technology

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Abstract

The implementation of this quad copter leads several applications that demonstrate the usefulness, viability and flexibility of the system. This technology provides us with the freedom of interacting with the digital world using hand gestures

Keywords: quad copter, hand gesture, basic sixth sense

INTRODUCTION

Recently, strong efforts have been carried out to develop intelligent and natural interfaces between users and computer based systems based on human gestures. Gestures provide an intuitive interface to both human and computer. Thus, such gesture-based interfaces can not only substitute the common interface devices, but can also be exploited to extend their functionality. Whenever we interact with the physical world we interact with various objects. Another thing come with object is the gesture whatever we do moment in physical world that is replicated into digital world. All The military use of unmanned aerial vehicles (UAVs) has grown because of their ability to operate in dangerous locations while keeping their human operators at a safe distance. The larger UAVs also provide a reliable long duration, cost effective, platform for reconnaissance as well as weapons. They have grown to become an indispensable tool for the military. The question we proposed for our project was whether small UAVs also had utility in military and commercial/industrial applications just by using hand gestures. Smaller UAVs, on the order of a couple feet to a meter in size, should be able to handle military tactical operations as well as the emerging commercial and industrial applications and our work is attempting to validate this assumption. Our team Quad copter prototype is a very limited version of what could be created in a production facility using more advanced technology A Gesture Controlled robot is a kind of robot which can be controlled by hand gestures and not the old fashioned way by using buttons. The user just needs to wear a small transmitting device on his hand which includes a sensor which is an accelerometer in our case. Movement of the hand in a specific direction will transmit a command to the robot which will then move in a specific direction. The transmitting device includes a Comparator IC for assigning proper levels to the input voltages from the accelerometer and an Encoder IC which is used to encode the four bit data and then it will be transmitted by an RF Transmitter module.

SYSTEM MODEL

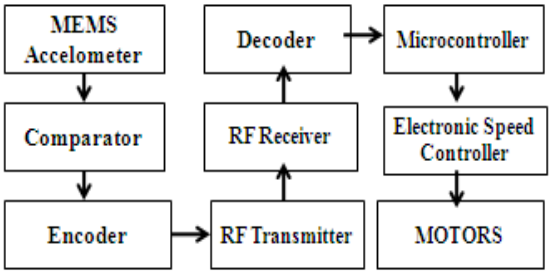


Fig1.system block diagram

We are dividing this work into two part

1. Wearable side
2. Control side

Wearable side consist of following components

1. MEMS Accelometer
2. Comparator
3. Encoder
4. RF Transmitter

Control side consist of following component

1. RF Receiver
2. Decoder
3. Microconroller
4. Electronic Speed controller
5. Quad copter motors

Here we are using MEMS accelometer which will convert physical moments into electrical signal. Output of the MEMS is given to the comparator. Comparator will compare the given signal, accordingly it will generate the output now it is having four outputs that means it is converted into digital form .encoder will convert it into the coded form and here we are converting that four bit data into serial form .that is given to the RF transmitter. RF transmitter will transmit the data towards RF receiver then it is decoded by decoder and we will get original data. Microcontroller having input of decoders output. We are giving the output of Microcontroller to ESC. ESC will control the motor speed of quad copter

PREVIOUS WORK

Quad copter is a flying vehicle with six degrees of freedom which uses four rotors to push air downwards and to create a thrust force for keeping the quad copter on the air. The pilot or flight control unit will control the orientation and tile of the multi copter by reading the data from the sensors. Gyro, accelerometer, magnetometer or GPS can be used to sense the tile, orientation and position of the vehicle. In the quad copter, flight controller unit (FCU) is the heart of its control system. The (FCU) will control the different motors speeds with its different PWM outputs. The FCU will control the vehicle in the air by taking information from sensors such as barometer, magnetometer, accelerometer, gyro and GPS. Sometime radio remote control is used to control the vehicle. In the actual world the radio remote control is similar to ground control station and the FCU is similar to a pilot. Even when the information from the

ground station is cutoff, the FCU can decide himself how the vehicle should be controlled. So we can say that is UAV. Overview of quad copter control is described in this paper. In the basic control system of a quad copter, a FCU, sensors and a radio remote control are included [1].

PROPOSED METHODOLOGY

In this paper we are using MEMS accelometer which will convert the physical moments into the electrical signal. An accelerometer is an electromechanical device that measures acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic - caused by moving or vibrating the accelerometer. The vast majority is based on piezoelectric crystals, but they are too big and too clumsy. People tried to develop something smaller, that could increase applicability and started searching in the field of microelectronics. Scientist developed MEMS (micro electromechanical systems) accelerometers. There are many different ways to make an accelerometer. Some accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which cause a voltage to be generated. Another way to do it is by sensing changes in capacitance [2]. Capacitive interfaces have several attractive features. In most micromachining technologies no or minimal additional processing is needed. Capacitors can operate both as sensors and actuators. They have excellent sensitivity and the transduction mechanism is intrinsically insensitive to temperature. Capacitive sensing is independent of the base material and relies on the variation of capacitance when the geometry of a capacitor is changing. According to peizo electric effect as capacitance changes output voltage also changes

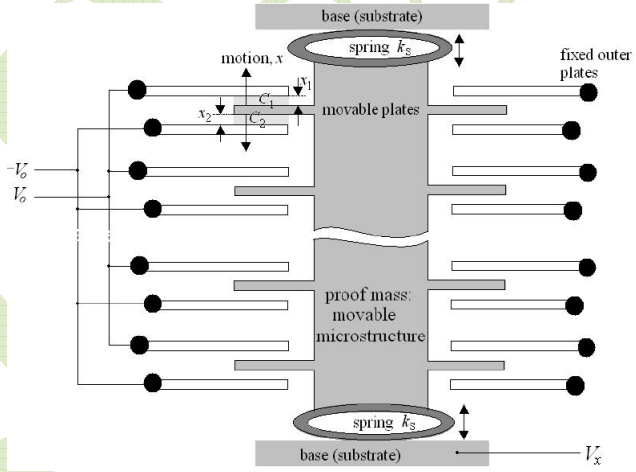


Fig 2.MEMS Accelometer

MEMS Accelometer will convert the physical moment in electrical form and that is given by

$$V_x = V_0 \frac{C_2 - C_1}{C_2 + C_1} = \frac{x}{d} V_0.$$

C2=variable capacitors
C1=stationary capacitors
x=displacement
d=distance bet plates

Vx=output voltage in direction of x

Vo=maximum input voltage

b) Comparator

Comparator is comparing the signal. Basically we are using the IC LM324 which will compare four input signal. These circuits consist of four independent, high gains; internally frequency compensated operational amplifiers .They operates from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

c) Encoder and decoders:

The 212 encoders and decoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding and decoding information which consists of N address bits and 12 N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E and HT12D or a DATA trigger on the HT12A further enhances the application flexibility of the 2^12 series of encoders. The HT12A additionally provides a 38 kHz carrier for infrared systems.

d) RF Transmitter and RF Receiver

the signal transmitted by the RF transmitter FROM encoder which is in serial form ,four bit data and RF transmitter operate on the frequency which is 433MHz The STT-433 is ideal for remote control applications where low Cost and longer range is required. The transmitter operates from a 1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance. Output power and harmonic emissions are easy to control, making FCC and ETSI compliance easy. The manufacturing-friendly SIP style package and low-cost make the STT-433 suitable for high volume applications. Same is for the RF Receiver

e) Microcontroller

Here we are using 89c51 microcontroller. This has 4 ports. A microcontroller is a computer-on-a-chip, or, if you prefer, a single-chip computer. Micro suggests that the device is small, and controller tells you that the device might be used to control objects, processes, or events. Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or Embedded in, the devices they control. You can find microcontrollers in all kinds of things these days. Any device that measures, stores, controls, calculates, or displays information is a candidate for putting a microcontroller Inside here we are using the microcontroller for controlling the speed of motors so that quad copter will perform the particular task

f) Electronics speed controller

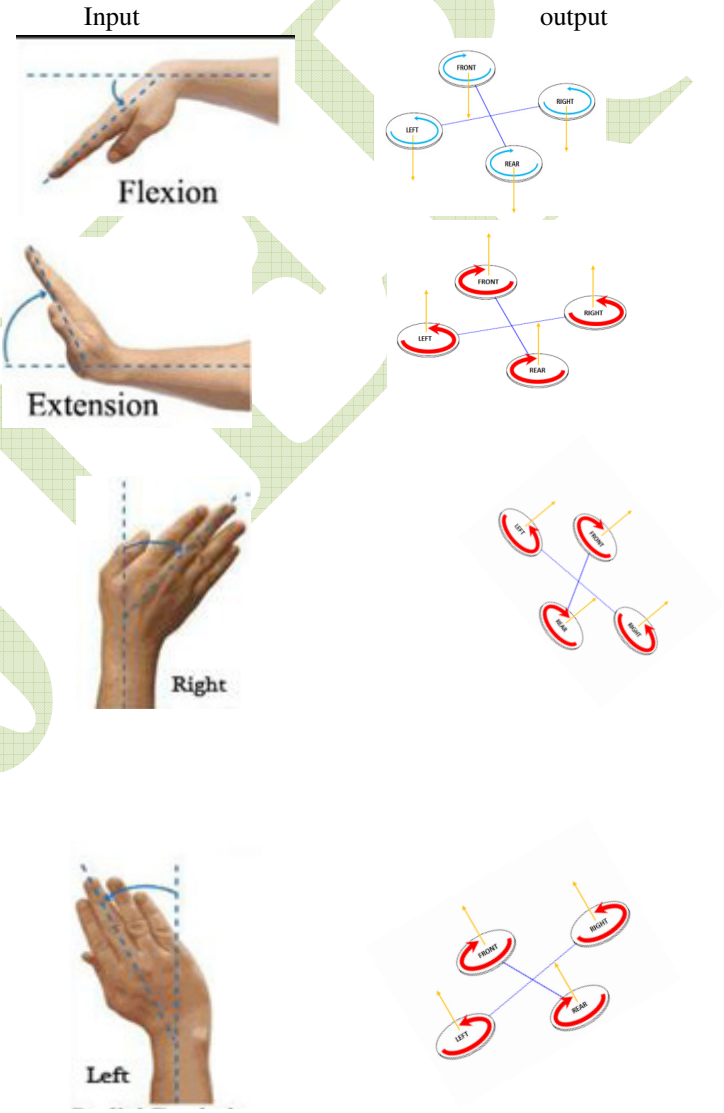
The quad copter motor speed is totally depend upon the speed controller and speed controller is going to controlled by microcontroller basically the ESC consist of the JFET Converts the battery pack DC voltage to a three phase alternating signal which is synchronized to the rotation of the rotor and applied to the armature windings. The motor speed is set by the ESC in response to a pulse width modulated control signal.

G) Brushless DC motors

Brushless DC motors provide higher power density and efficiency compared to brushed DC motor architectures, but require careful driving and commutation, leading to system complexity. They are becoming increasingly popular as they are compact in size and have good power density, controllability and efficiency while avoiding the maintenance, acoustic noise and electromagnetic interference of brushed DC motors the motors are also continually improving and decreasing in cost due to advances in permanent magnets, structural design and control. Due to these advantages BLDC motors are the most commonly used motors in UAV technology

SIMULATION/EXPERIMENTAL RESULTS

We achieved our objective without any hurdles i.e. the control of a quad copter using gestures. The quad copter is showing proper responses whenever we move our hand. Different Hand gestures to
Make the quad copter move in specific directions are as



CONCLUSION

In this way we have completed our task without hurdles the quad copter can be easily operated by person just by using hand gestures

FUTURE SCOPES

1. In this paper we are using RF for wireless transmission, the range is quite limited; nearly 50-80m. This problem can be solved by utilizing a GSM module for wireless transmission. The GSM infrastructure is installed almost all over the world. GSM will not only provide wireless connectivity but also quite a large range.

2. An on-board camera can be installed for monitoring the quad copter from faraway places. All we need is a wireless camera which will broadcast and a receiver module which will provide live streaming.

3. It can be used as weight lifter, and can easily move from one place to another

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