THE STUDY OF MINI SPY HELICOPTER CONTROL USING PC

A.D.Sreerag[1], N.S.Akhil[2], John Stephen[3], Ajmalsha Assis[4],Dr.Ramalingam[5]

[1]*UG Student, Department of Mechanical Engineering,*
James college of Engineering and Technology, Nagercoil, India,
[2]*UG Student, Department of Mechanical Engineering,*
James college of Engineering and Technology, Nagercoil, India,
[3]*UG Student, Department of Mechanical Engineering,*
James college of Engineering and Technology, Nagercoil, India,
[4]*UG Student, Department of Mechanical Engineering,*
James college of Engineering and Technology, Nagercoil, India,
[5]*Principal, Mahakavi Bharathiyar college of Engineering and Technology, Vasudevanallur,India,*

ABSTRACT

The main aim of the project is design a remote controlled helicopter and more particularly to an improved arrangement for controlling the flight path of such a helicopter with wireless camera connected to capture the area where it travels. By operating the radio controlled helicopter in very low altitude close to the ground without danger it clearly shows the place. It provides reliable and low power consumption.

1. INTRODUCTION

Nowadays, the innovative technologies have become an integral part of human life. In addition, the microcontrollers are playing a very important role in the development of the smart systems. The microcontroller is basically a single chip microprocessor suited for machine controlling and system processing because it carries out autonomous operations and takes smart decisions. Moreover, the devices such as air conditioners, power tools, toys, office machines employ microcontrollers for its operation. Saving of power is the main important criteria in the present world.

Radio controlled aircraft have been popular for recreational purposes for a number of years. Such aircraft include radio controlled helicopters. Recently, however, it has been realized that radio controlled, pilot less helicopters may be used for a wide variety of functional purposes. For example, the use of such radio controlled helicopters for military purposes such as militants has been found to be a criminal purpose. By employing radio controlled helicopters for this use, it is possible to watch relatively travel to areas where it is required. This is possible because the radio controlled helicopter can be operated at a very low altitude close to the ground without danger.

2. HARDWARE DESIGN

The 230V AC supply is first stepped down to 12V AC using a step down transformer. This is then converted to DC using bridge rectifier. The AC ripples is filtered out by using a capacitor and given to the input pin of voltage regulator 7805.At output pin of this regulator we get a constant 5V DC which is used for MC and other ICs in this project.

The helicopter direction is controlled through wireless control from PC. The microcontroller is connected with driver circuits with relays and RF receiver; it controls the helicopter blade rotor and direction by what it receives from the RF signal. The camera is connected on the helicopter body which transmits the captured picture through wireless communication to the PC. In PC we are monitored the situation going on that place.

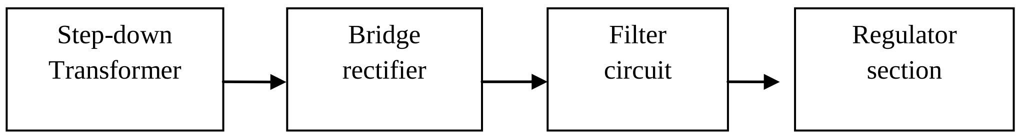

Figure 1.power supply

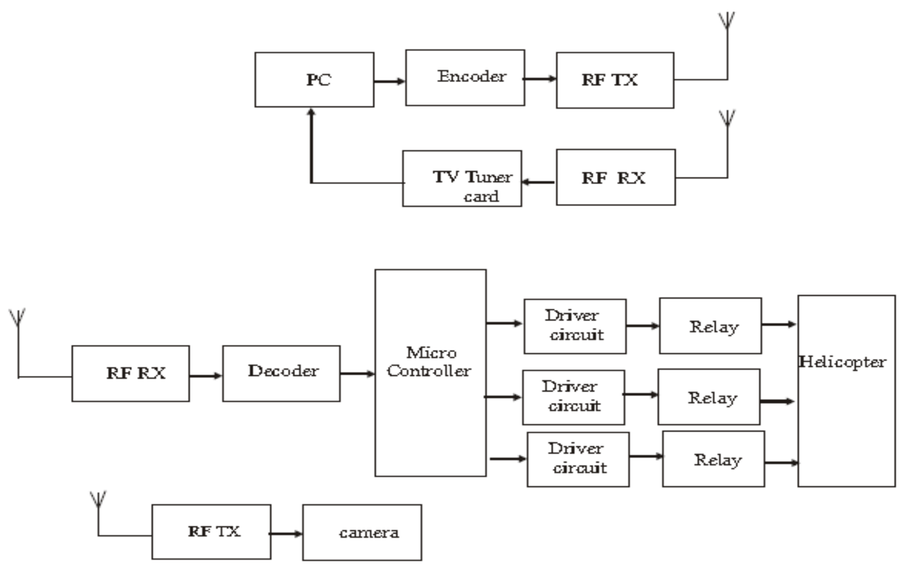

Figure 2.Main section

3. CONTROLLER, DRIVER CIRCUITS AND RELAYS

The hardware capabilities of PIC devices range from 6-pin SMD, 8-pin DIP chips up to 144-pin SMD chips, with discrete I/O pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types.

The manufacturer supplies computer software for development known as MPLAB X, assemblers and C/C++ compilers, and programmer/debugger hardware under the MPLAB and PIC Kit series. Third party and some open-source tools are also available. Some parts have in-circuit programming capability; low-cost development programmers are available as well as high-production programmers.

3.1 MICRO CONTROLLER

PIC devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, serial programming, and re-programmable Flash-memory capability.

The architectural decisions are directed at the maximization of speed-to-cost ratio. The PIC architecture was among the first scalar CPU designs[citation needed] and is still among the simplest and cheapest. The Harvard architecture, in which instructions and data come from separate sources, simplifies timing and microcircuit design greatly, and this benefits clock speed, price, and power consumption.

The PIC instruction set is suited to implementation of fast lookup tables in the program space. Such lookups take one instruction and two instruction cycles. Many functions can be modeled in this way. Optimization is facilitated by the relatively large program space of the PIC (e.g. 4096 × 14-bit words on the 16F690) and by the design of the instruction set, which allows embedded constants. For example, a branch instruction's target may be indexed by W, and execute a "RETLW", which does as it is named – return with literal in W.

Interrupt latency is constant at three instruction cycles. External interrupts have to be synchronized with the four-clock instruction cycle; otherwise there can be a one instruction cycle jitter. Internal interrupts are already synchronized. The constant interrupt latency allows PICs to achieve interrupt-driven low-jitter timing sequences. An example of this is a video sync pulse generator. This is no longer true in the newest PIC models, because they have a synchronous interrupt latency of three or four cycles.

PIC 16F877A is a powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices.

The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I^2C™) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

3.2 RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core (a solenoid), an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two contacts in the relay pictured).

The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. The armature is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB.

When an electric current is passed through the coil it generates a magnetic field that activates the armature and the consequent movement of the movable contact either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Such diodes were not widely used before the application of transistors as relay drivers, but soon became ubiquitous as early germanium transistors were easily destroyed by this surge. Some automotive relays include a diode inside the relay case.

If the relay is driving a large, or especially a reactive load, there may be a similar problem of surge currents around the relay output contacts. In this case a snubber circuit (a capacitor and resistor in series) across the contacts may absorb the surge. Suitably rated capacitors and the associated resistor are sold as a single packaged component for this commonplace use.

If the coil is designed to be energized with alternating current (AC), some method is used to split the flux into two out-of-phase components which add together, increasing the minimum pull on the armature during the AC cycle. Typically this is done with a small copper "shading ring" crimped around a portion of the core that creates the delayed, out-of-phase component, which holds the contacts during the zero crossings of the control voltage.

Contact materials for relays vary by application. Materials with low contact resistance may be oxidized by the air, or may tend to "stick" instead of cleanly parting when opening. Contact material may be optimized for low electrical resistance, high strength to withstand repeated operations, or high capacity to withstand the heat of an arc.

Where very low resistance is required, or low thermally-induced voltages are desired, gold-plated contacts may be used, along with palladium and other non-oxidizing, semi-precious metals. Silver or silver-plated contacts are used for signal switching. Mercury-wetted relays make and break circuits using a thin, self-renewing film of liquid mercury.

For higher-power relays switching many amperes, such as motor circuit contatctors, contacts are made with a mixtures of silver and cadmium oxide, providing low contact resistance and high resistance to the heat of arcing. Contacts used in circuits carrying scores or hundreds of amperes may include additional structures for heat dissipation and management of the arc produced when interrupting the circuit.Some relays have field-replaceable contacts, such as certain machine tool relays; these may be replaced when worn out, or changed between normally open and normally closed state, to allow for changes in the controlled circuit.

- Latching relay:

A latching relay (also called "impulse", "bistable", "keep", or "stay" relays) maintains either contact position indefinitely without power applied to the coil. The advantage is that one coil consumes power only for an instant while the relay is being switched, and the relay contacts retain this setting across a power outage. A latching relay allows remote control of building lighting without the hum that may be produced from a continuously (AC) energized coil.

In one mechanism, two opposing coils with an over-center spring or permanent magnet hold the contacts in position after the coil is de-energized. A pulse to one coil turns the relay on and a pulse to the opposite coil turns the relay off. This type is widely used where control is from simple switches or single-ended outputs of a control system, and such relays are found in avionics and numerous industrial applications.

Another latching type has a remanent core that retains the contacts in the operated position by the remanent magnetism in the core. This type requires a current pulse of opposite polarity to release the contacts. A variation uses a permanent magnet that produces part of the force required to close the contact; the coil supplies sufficient force to move the contact open or closed by aiding or opposing the field of the permanent magnet.[16] A polarity controlled relay needs changeover switches or an H bridge drive circuit to control it. The relay may be less expensive than other types, but this is partly offset by the increased costs in the external circuit.

- Mercury-wetted reed relay:

A mercury-wetted reed relay is a form of reed relay in which the contacts are wetted with mercury. Such relays are used to switch low-voltage signals (one volt or less) where the mercury reduces the contact resistance and associated voltage drop, for low-current signals where surface contamination may make for a poor contact, or for high-speed applications where the mercury eliminates contact bounce.

Mercury wetted relays are position-sensitive and must be mounted according to the manufacturer's specifications to work properly. Because of the toxicity and expense of liquid mercury, these relays are now rarely used.

The mercury-wetted relay has one particular advantage, in that the contact closure appears to be virtually instantaneous, as the mercury globules on each contact coalesce. The current rise time through the contacts is generally considered to be a few picoseconds, however in a practical circuit it will be limited by the inductance of the contacts and wiring.

It was quite common, before the restrictions on the use of mercury, to use a mercury-wetted relay in the laboratory as a convenient means of generating fast rise time pulses, however although the rise time may be picoseconds, the exact timing of the event is, like all other types of relay, subject to considerable jitter, possibly milliseconds, due to mechanical imperfections.

- Overload protection relay:

Electric motors need overcurrent protection to prevent damage from over-loading the motor, or to protect against short circuits in connecting cables or internal faults in the motor windings. The overload sensing devices are a form of heat operated relay where a coil heats a bimetallic strip, or where a solder pot melts, releasing a spring to operate auxiliary contacts.

These auxiliary contacts are in series with the coil. If the overload senses excess current in the load, the coil is de-energized. This thermal protection operates relatively slowly allowing the motor to draw higher starting currents before the protection relay will trip. Where the overload relay is exposed to the same ambient temperature as the motor, a useful though crude compensation for motor ambient temperature is provided.

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- Time delay relay:

Timing relays are arranged for an intentional delay in operating their contacts. A very short (a fraction of a second) delay would use a copper disk between the armature and moving blade assembly. Current flowing in the disk maintains magnetic field for a short time, lengthening release time. For a slightly longer (up to a minute) delay, a dashpot is used. A dashpot is a piston filled with fluid that is allowed to escape slowly; both air-filled and oil-filled dashpots are used.

The time period can be varied by increasing or decreasing the flow rate. For longer time periods, a mechanical clockwork timer is installed. Relays may be arranged for a fixed timing period, or may be field adjustable, or remotely set from a control panel. Modern microprocessor-based timing relays provide precision timing over a great range.

- Vacuum relays:

A sensitive relay having its contacts mounted in a highly evacuated glass housing, to permit handling radio-frequency voltages as high as 20,000 volts without flashover between contacts even though contact spacing is but a few hundredths of an inch when open.

3.3 DRIVER CIRCUIT:

In electronics, a driver is an electrical circuit or other electronic component used to control another circuit or component, such as a high-power transistor, liquid crystal display (LCD), and numerous others.

They are usually used to regulate current flowing through a circuit or to control other factors such as other components, some devices in the circuit. The term is often used, for example, for a specialized integrated circuit that controls high-power switches in switched-mode power converters. An amplifier can also be considered a driver for loudspeakers, or a voltage regulator that keeps an attached component operating within a broad range of input voltages.

Typically the driver stage(s) of a circuit requires different characteristics to other circuit stages. For example in a transistor power amplifier circuit, typically the driver circuit requires current gain, often the ability to discharge the following transistor bases rapidly, and low output impedance to avoid or minimize distortion.

3.4 **RF MODULE**:

An RF module (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver. They are of various types and ranges. Some can transmit up to 500 feet.

RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required achieving operation on a specific frequency. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected. Finally, radio circuits are usually subject to limits on radiated emissions, and require Conformance testing and certification by a standardization organization such as ETSI or the U.S. Federal Communications Commission (FCC). For these reasons, design engineers will often design a circuit for an application which requires radio communication and then "drop in" a pre-made radio module rather than attempt a discrete design, saving time and money on development.

RF modules are most often used in medium and low volume products for consumer applications such as garage door openers, wireless alarm or monitoring systems, industrial remote controls, smart sensor applications, and wireless home automation systems. They are sometimes used to replace older infra red communication designs as they have the advantage of not requiring line-of-sight operation.

Several carrier frequencies are commonly used in commercially available RF modules, including those in the industrial, scientific and medical (ISM) radio bands such as 433.92 MHz, 915 MHz, and 2400 MHz These frequencies are used because of national and international regulations governing the use of radio for communication. Short Range Devices may also use frequencies available for unlicensed such as 315 MHz and 868 MHz. RF modules may comply with a defined protocol for RF communications such as Zigbee, Bluetooth low energy, or Wi-Fi, or they may implement a proprietary protocol.

3.4.1 **Types of RF modules**:

The term RF module can be applied to many different types, shapes and sizes of small electronic sub assembly circuit board. It can also be applied to modules across a huge variation of functionality and capability. RF modules typically incorporate a printed circuit board, transmit or receive circuit, antenna, and serial interface for communication to the host processor.Most standard, well known types are covered here:

- Transmitter module
- Receiver module
- Transceiver module
- System on a chip module

- Transmitter modules:

An RF transmitter module is a small PCB sub-assembly capable of transmitting a radio wave and modulating that wave to carry data. Transmitter modules are usually implemented alongside a micro controller which will provide data to the module which can be transmitted. RF transmitters are usually subject to regulatory requirements which dictate the maximum allowable transmitter power output, harmonics, and band edge requirements.

- Receiver modules:

An RF receiver module receives the modulated RF signal, and demodulates it. There are two types of RF receiver modules: super heterodyne receivers and super-regenerative receivers. Super-regenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Super-regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage.[citation needed] Super heterodyne receivers have a performance advantage over super-regenerative; they offer increased accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in the past tended to mean a comparatively more expensive product. However, advances in receiver chip design now mean that currently there is little price difference between super heterodyne and super-regenerative receiver modules.

- Transceiver modules:

An RF transceiver module incorporates both a transmitter and receiver. The circuit is typically designed for half-duplex operation, although full-duplex modules are available, typically at a higher cost due to the added complexity.

- System on a chip (SoC) module:

An SoC module is the same as a transceiver module, but it is often made with an onboard microcontroller. The microcontroller is typically used to handle radio data packetisation or managing a protocol such as an IEEE 802.15.4 compliant module. This type of module is typically used for designs that require additional processing for compliance with a protocol when the designer does not wish to incorporate this processing into the host microcontroller.

3.5 **CAMERA**:

A camera is an optical instrument for recording or capturing images, which may be stored locally, transmitted to another location, or both. The images may be individual still photographs or sequences of images constituting videos or movies. The camera is a remote sensing device as it senses subjects without any contact. The word camera comes from camera obscure, which means "dark chamber" and is the Latin name of the original device for projecting an image of external reality onto a flat surface. The modern photographic camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye. The first permanent photograph of a camera image was made in 1826 by Joseph.

The lens of a camera captures the light from the subject and brings it to a focus on the sensor. The design and manufacture of the lens is critical to the quality of the photograph being taken. The technological revolution in camera design in the 19th century revolutionized optical glass manufacture and lens design with great benefits for modern lens manufacture in a wide range of optical instruments from reading glasses to microscopes. Pioneers included Zeiss and Leitz.

Camera lenses are made in a wide range of focal lengths. They range from extreme wide angle, and standard, medium telephoto. Each lens is best suited to a certain type of photography. The extreme wide angle may be preferred for architecture because it has the capacity to capture a wide view of a building. The normal lens, because it often has a wide aperture, is often used for street and documentary photography. The telephoto lens is useful for sports and wildlife but it is more susceptible to camera shake.

A wide range of film and plate formats have been used by cameras. In the early history plate sizes were often specific for the make and model of camera although there quickly developed some standardization for the more popular cameras. The introduction of roll film drove the standardization process still further so that by the 1950s only a few standard roll films were in use. These included 120 film providing 8, 12 or 16 exposures, 220 film providing 16 or 24 exposures, 127 film providing 8 or 12 exposures (principally in Brownie cameras) and 135 (35 mm film) providing 12, 20 or 36 exposures – or up to 72 exposures in the half-frame format or in bulk cassettes for the Leica Camera range.

3.6 HELICOPTER:

A Radio-controlled helicopter (also RC helicopter) is model aircraft which is distinct from a RC airplane because of the differences in construction, aerodynamics, and flight training. Several basic designs of RC helicopters exist, of which some (such as those with collective pitch control) are more maneuverable than others. The more maneuverable designs are often harder to fly, but benefit from greater aerobatic capabilities.

Flight controls allow pilots to control the collective (or throttle, on fixed pitch helicopters), the cyclic controls (pitch and roll), and the tail rotor (yaw).Controlling these in unison enables the helicopter to perform the same maneuvers as full-sized helicopters, such as hovering and backwards flight, and many that full-sized helicopters cannot, such as inverted flight (where collective pitch control provides negative blade pitch to hold heli up inverted, and pitch/yaw controls must be reversed by pilot)

The various helicopter controls are affected by means of small servo motors, commonly known as servos. A solid-state gyroscope sensor is typically used on the tail rotor (yaw) control to counter wind- and torque-reaction-induced tail movement.

4 APPLICATIONS

- Military application
- Agricultural Application (Spray the seeds over agri area)
- Monitor the condition over any meeting places
- Traffic monitor

5 CONCLUSIONS

The project related to a remote controlled helicopter and more particularly improved the arrangement for controlling the flight path of helicopter with wireless camera connected to capture the area where it travels. The use of such radio controlled helicopters for military purposes. By employing radio controlled helicopters for this use, it is possible to watch relatively travel to areas where it is required. This is possible because the radio controlled helicopter can be operated at a very low altitude close to the ground without danger.

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