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# Drone Safety System

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**Abstract:** *The Use of Unmanned Aerial Vehicles is becoming increasingly popular and their safety is a major concern. Due to the high cost of advanced drones and the requirements for safe arrival, the development of reliable drone recovery systems is a hot topic right now. In this paper, we describe the development of a parachute system with accelerometer-gyroscope MPU - 6050 crash detection and a Kalman filter-based algorithm to reduce acceleration errors while drone flying. We have developed an accelerometer error- related compensation algorithm. Parachute system testing is performed from a small elevation in a soft surface. Later, the system was tested under real-world conditions. the system worked successfully, resulting in parachute opening times of less than 0.5s. We also discuss citizen and military applications for an improved rescue system in a difficult environment (high temperature).*

**Keywords:** Drone, etc.

## I. PROBLEM STATEMENT

Preventing human / Economic / Environmental losses caused by Drone accidents. Over the past few years, a number of public and private research developers have begun investing in a large number of unmanned aerial vehicles (UAVs), or ‘drones. These fast-growing devices that deliver large public transmissions open up an astonishing number of new opportunities as useful tools to address a variety of social challenges, including agriculture and forestry analysis, building boundary markers, building site or corridors of roads and railways, cargo capacity. statistics, floods, coastal erosion monitoring, property information management, disaster risk planning and planning, remote or undeveloped areas, and logistics. Opportunities for digital production and technology development face community challenges such as making public sectors and domains more friendly, efficient and competitive. This project will work to provide security for these drones**.**

## II. LITERATURE SURVEY

The losses in this kind of aerial accidents are unprecedented for Fastmoving Consumers and it has been very high since they have entered into big international markets. The unmanned MQ-9A Reaper quickly lost power and hit the ground about a minute after its takeoff from Hancock International Airport in Syracuse, N.Y., resulting in a loss of over $6 million in government property, the Air Force accident investigation board headed by Lt. Col. Brian E. Prichard said. https://www.military.com/daily-news/2021/04/12/gone-65-seconds-pilot-errorled-6-million-loss-military-drone-rash.html

Kill switch' failed as drone hit controlled space near Gatwick: The report said the unmanned aircraft, an Alauda Air speeder Mk II, climbed to about 8,000ft (2,400m) and entered controlled airspace at a holding point for flights arriving at Gatwick, before its battery ran out and it crashed in a field. https://www.bbc.com/news/uk-england-sussex-56112694 Kevin Poormon, a University of Dayton engineer who has performed numerous bird strike tests on airplanes, mimicked a midair collision between a 2.1-pound DJI Phantom 2 quadcopter and a Mooney M20 airplane. The drone bore into the plane much farther than a similarly weighted gel "bird" and damaged the plane's main spar, which carries the weight of the wing. Debris spewed from the aircraft. https://www.usatoday.com/story/travel/ nation-now/2018/10/17/drones-crashing into- airplanes-quadcopters-damage-video/1657112002/About 100 drones lost control and crashed

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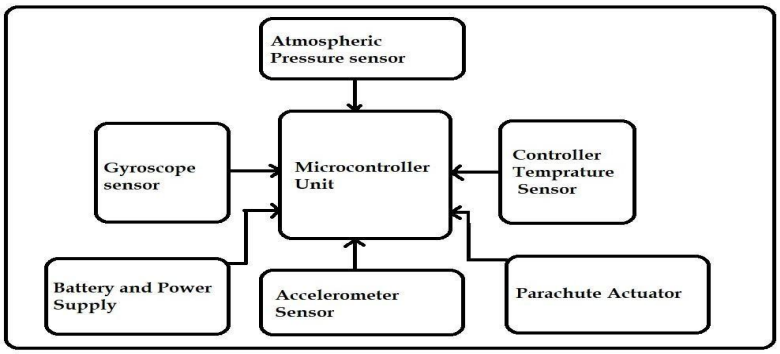
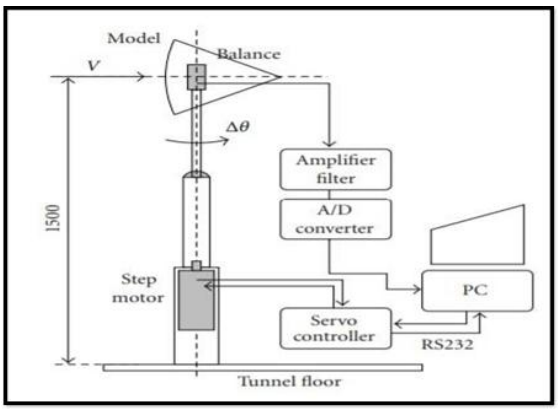
into a building during a show in Southwest China's Chongqing Municipality on Monday night. https://www.globaltimes.cn/page/202101/1214165.shtml.

## III. IMPLEMENTATION

**Block Diagram:**




**Design & Architecture:**




**Amplifier Filter:**

Amplifier is the generic term used to describe a circuit which produces and increased version of its input signal. However, not all amplifier circuits are the same as they are classified according to their circuit configurations and modes of operation. In "Electronics", small signal amplifiers are commonly used devices as they have the ability to amplify a relatively small input signal, for example from a Sensor such as a photo-device, into a much larger output signal to drive a relay, lamp or loudspeaker for example. There are many forms of electronic circuits classed as amplifiers, from Operational Amplifiers and Small Signal Amplifiers up to Large Signal and Power Amplifiers. The classification of an amplifier depends upon the size of the signal, large or small, its physical configuration and how it processes the input signal, that is the relationship between input signal and current flowing in the load.

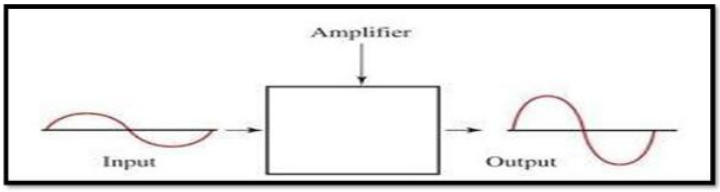



**Figure:** Amplifier Block Diagram

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**A/D Converter:**

A device that converts continuously varying analog signals from instruments and sensors that monitor conditions, such as sound, movement and temperature into binary code for the computer. The A/D converter may be contained on a single chip or can be one circuit within a chip. Every digital desk phone and cellphone has an A/D converter that turns electronic sound waves into digital PCM code. Every digital camera, camcorder and scanner uses A/D converters to transform the variable charges captured in CCD and CMOS chips into the binary pixel data that make up a digital image.


**Figure:** A/D Converter Block Diagram

**RS232:** In telecommunications, RS-232 or Recommended Standard 232 is a standard originally introduced in 1960 for serial communication transmission of data. It 15 formally defines signals connecting between a DTE (data terminal equipment) such as a computer terminal, and a DCE (data circuit-terminating equipment or data communication equipment), such as a modem. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and thephysical size and pinout of connectors.


**Servo Controller:**

A servo motor controller is a circuit that is used to control the position of a servo motor. It is also called as a servo motor driver. A servo motor controller consists of a controller, the servo motor and the power supply unit. Servo motor driver may be used to control a single servo or even a group of servo motors. In many projects where servo motor controlling is the mainstay of the task to be accomplished, the controller must drive more than one servo. An example of this is an RC airplane, which uses many servos.

**Parachute Exhaust System:**

The parachute was made from a rugged nylon material. Parachute dimensions are chosen such that a 2 kg drone does not fall faster than 5 m/s. Under the selected dimensions, a 16-segment dome-shaped parachute with overlock stitches was made. The diameter of the parachute is 1.45 m.

**Figure:** Parachute

The parachute exhaust housings were made of PVC pipe, glass fiber board, and a bottom-mounted mounting piece made ofthree-dimensional printing. Atmospheric/Barometric Pressure Sensor: A barometric pressure sensor is a sensor that detects atmospheric pressure.

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**Figure:** Parachute Exhauster

**Gyroscope Sensor:**
Gyro sensors, also known as angular rate sensors or angular velocity sensors, are devices thatsense angular velocity.

**Microcontroller Unit:**
Microcontroller is a compressed microcomputer manufactured to control the functions of embedded systems in office machines, robots, home appliances, motor vehicles, and a number of other gadgets.

**Temperature Controller Sensor:**
A temperature controller is a device used to hold a desired temperature at a specified value.

**Accelerometer Senor:**
An accelerometer sensor is a tool that measures the acceleration of any body or object in its instantaneous rest frame.

**Battery and power Supply:**
Continuously check the voltage of the system, if it is greater than 3.8V or not.

**Parachute Actuator:**
The main component of the system which include servo motor which open the parachute.
CodeLink: https://1drv.ms/w/s!AnuFSNt8xMmilWZVREeoHVv5R5ZB

## IV. CONCLUSION AND DISCUSSION

We have proposed a parachute-based system for drone recovery with the accelerator sensor temperature compensation mechanism. The parachute system has been successfully tested in real- life conditions. The fall is detected almost immediately (within 0.5 s). However, it takes much more time for the parachute to unfold, so at less than 20 m height, theparachute still may not be able to unfold in time. The system also includes a mechanism for prevention of unintended parachute deployment. In calculating the rate of fall, the resulting acceleration errors, even after compensation, were high.
The calculated speed data could not be relied upon even at small intervals, assuming that an initial speed of falling is equal to 0 m/s. The acceleration deviations can be offset by applying the Kalman filter. The accelerometer values depend significantly upon the environment temperature, so the compensation mechanism based on linear regression was introduced to allow stable detection of drone fall state during harsh environment conditions, such as in a desert environment during a hot summer.

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