

# Topological Survey Using Lidar Motion Drone

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**Abstract-** Topography mapping utilizing LIDAR detecting ramble employments two advances LIDAR and Drone. AS you know LIDAR, which stands for Light detection and ranging, may be a remote detecting strategy that employments light within the shape of a beat laser to degree ranges (variable separations) to the Soil. . And drone is an unmanned air ship. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned flying machine frameworks. So a LIDAR sensor is mounted on a ramble which flies over a certain zone and takes LIDAR scans it which are converts that point objects into a x,y,z co-ordinates and that co-ordinates computer program to urge exact LIDAR Mapping Picture by using meshlab software. Our Project's primary center is to diminish the taken a toll and make a rearranged mapping ramble as compared to the current expensive accessible rambles in Othe advertise. And to create the framework more dependable and cheap to us.

**Index Terms:** Lidar, Drone, Light

## Introduction

We have designed an interesting and cheap lidar based drone. This drone which takes the pictures of an object and converts it into 3d image. In this project we are going to use Arduino Nano Board,CC3d Flight controller, Meshlab Software and some other components. A drone consists of a number of electronic components that communicate with a CC3D controller working together to fly a drone. We use Lidar to make a 3d images of an objects.

Drones are nowadays broadly being utilized in a number of areas. Applications of drones ranes from shooting and videography to warm reviews. The major issue related with drones is the taken a toll. Drones are by and large expensive buy and there's a tremendous hazard of damage while flying drones that's why drones are still not a really common contraption. Moreover large drones make a part of clamor and require a parcel of clear space to fly. They cannot be flown indoors or in thick woodlands or zones with numerous trees. The Unmanned Aerial Vehicles (UAVs) commonly known as drones are getting to be an integral portion of our lives due to their broad arrangement in different applications. Initially connected with military applications, drones

appreciate an ever-increasing popularity in civil applications whose applications and working we have referred from different literatures said. The drones application scene is very different and spans over a few verticals counting excitement (aerial photography and videography), geography (mapping and surveying), transportation (activity checking), security (look and protect, crowd checking, crisis reaction, and disaster help), shipping (divide delivery), farming (crop observing, spraying, and feathered creature control), and communication (emergency communication framework).

## Literature Survey

Precision agriculture is reliant on making timely, effective measurements to optimize workflow and crop yield. Manual inspection techniques are time consuming and do not support a frequent and autonomous monitoring of the field. This paper examines an innovative application of using a bistatic LIDAR sensor integrated into a UAV to monitor in-field CO<sub>2</sub> concentrations. Measuring variations in atmospheric CO<sub>2</sub> concentrations in agriculture can be used to detect plant health through correlation of photosynthesis efficiency and used to determine soil quality. LIDAR systems can maintain highly accurate

measurements, particularly of small changes in CO<sub>2</sub> concentrations, from substantial distances, making it ideal for remote UAV monitoring. Integration of such system into the UAV requires resolving mechanical, electrical, communication computing and control aspects, which are addressed in this paper through a feasibility study of the ground station tracking the system to steer the gimbal, on which the sensor is mounted. There is substantial interest in determining the appropriate UAV platform and consequently the hardware and software architecture and integration into the UAS.[1]

This paper addresses the problem of detecting humans in a point cloud taken with a 3D-LiDAR onboard a UAV. The potential use cases of this technology are numerous, examples include security and surveillance, disaster relief and search and rescue operations. In this paper, a CNNbased approach is proposed which is able to analyse point clouds returned by a 3D LiDAR sensor in such a way that it can detect humans. The algorithm described here consists of 3 main components: data pre-processing, post-processing, and human classification. In this paper objects were assigned to one of two classes: human and non-human. The classification was performed by projecting the 3D point cloud onto a series of 2D planes using occupancy grid mapping. This creates a set of silhouettes of the object corresponding to the top, front and side views. Classification is achieved by 12 supervised CNNs using single-view and multi-view (3 channels) images patches.[2]

### Components Design

#### Arduino Nano:

The Arduino Nano is a small, complete, breadboard-friendly circuit board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality as the Arduino Duemilanove, but in a different package. It has only DC power and can use a Mini-B USB cable instead of a standard cable. 5V control power supply to power the board, and 3.3V output from the built-in regulator.

#### ESC:

An electronic speed controller (ESC) is an electronic device that controls and regulates the speed of the motor. It can provide engine reversing and dynamic braking. Miniature electronic speed controllers are used for electronic speed control models. Full-size EVs also have systems that control the speed of the driver.

#### BLDC:

Brushless DC motors (BLDC), also known as electronically switched motors, are synchronous motors that use direct current (DC) power. It uses an electric motor to convert the DC current into the motor windings, which creates a magnetic field that rotates in place and acts as a permanent magnet. The controller controls the speed and power of the motor by adjusting the phase and amplitude of the DC current pulses. This control replaces the commutator (brushes) used in many conventional electric motors.

#### Li Po Battery:

A lithium polymer battery (LiPo), in true LiPo terms, is a rechargeable battery that uses a polymer material as the electrolyte and lithium as one of the electrodes. The LiPos product is a hybrid: a gel polymer in the form of a bag or liquid electrolyte, or rather a lithium-ion polymer battery. Its products make Li-polymer batteries suitable for use in slim smartphones, tablets and wearables.

#### Lidar Sensor:

The LiDAR sensor is the most important component of a 3D mapping LiDAR sensing drone. The sensor emits laser pulses that bounce off objects in the environment and return to the sensor. The LiDAR sensor can generate high-resolution 3D maps of the environment, which can be used for various applications, such as surveying, mapping, and inspection.

#### CC3D Controller:

The CC3D board is a solid hardware terminal running the OpenPilot firmware. It can fly any airframe from a fixed wing to an octocopter and is configured and tracked using the powerful and easy-to-use OpenPilot software. The

CC3D is an upgrade of the original helicopter control board, which now uses a powerful single-chip IMU. The dashboard is versatile with the revolutionary platform including the powerful OpenPilot architecture and cross-platform Ground Control Station (GCS). The CopterControl platform has been developed from the ground up to operate a variety of auto-levelling, multi-rotor, fixed-wing UAVs and even flybarless helicopters.

The newly included Flexiport provides an I2C connection or a second port.

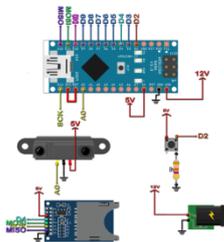


Fig. Lidar Interfacing with Arduino Nano

### Working

Topography mapping utilizing LIDAR detecting drone uses two advances LIDAR and Drone. AS you know Lidar, which stands for Light Detection and Ranging, may be a remote detecting strategy that uses light within the frame of a beat laser to measure ranges (variable separations) to the Earth. And drone is an unmanned flying machine. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems. We combine these two for a unique reason of Geography mapping as you know which may be a incredible and exact for taking measurements. We combine these two techs so that ready to make a Topography Mapping Drone. So a LIDAR sensor is mounted on a drone which flies over a certain region and takes LIDAR pictures which are at that point processed in a program to induce correct LIDAR Mapping Image. Actually we are processing these pictures into an meshlab software in which it

gives some matched 3d images according to the pictures captured by the lidar.

Our Project’s fundamental focus is to decrease the cost and make a simplified mapping drone as compared to the current expensive available drones within the market. And to form the framework more reliable and cheap to utilize.

### System Development

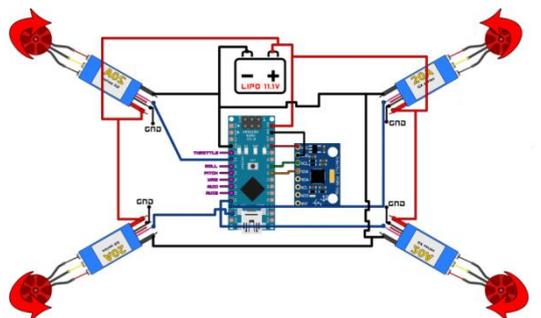
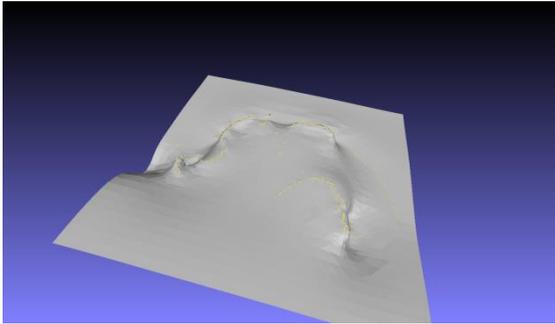


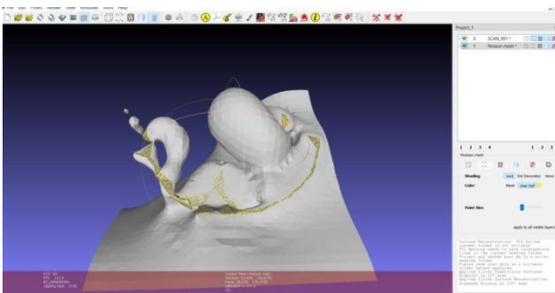
Fig. Circuit Diagram of Drone

### Results

As you can see in the below images we have taken these images via lidar sensor. We have taken the lidar sensor on to top of that objects and it starts taking the x,y,z co-ordinates of that objects which is saved in the file of txt extension and that file stored into the sd card. After uploading that file onto meshlab these kind of images we got.



The above pictures is cover of book which is processed in meshlab



The above image is the stone image which is processed in meshlab

### Conclusion

LIDAR may be a modern rising Innovation and has exceptionally important uses in later times. Topography mapping is done from past ages and has continuously been vital portion humanity's development too drones as we see nowadays have came a long way in it's improvement and our project integrates all these three advances to form a single venture whose reason is to do topography mapping using LIDAR which is based on a drone and work together to form a single purpose objective of Mapping. In conclusion, the components examined over are fundamental for the operation of a 3D mapping LiDAR sensing drone. The BLDC motor, Arduino Nano, ESC, and RF receiver and transmitter work together to control the flight of the drone and establish communication with the ground station. The LiDAR sensor is the essential component that enables the drone to produce high-resolution 3D maps of the environment. With headways in technology, 3D mapping LiDAR sensing drones are getting to be more reasonable and accessible, opening up modern possibilities for different applications.

### Future Scope

In the future, we aim to automate the method of identifying the disintegrating area and identifying the edge focuses. Furthermore, we arrange to integrate the UAV LiDAR information with airborne or satellite-borne LiDAR information to get pattern data for quantifying long-term change as well as extra bathymetric data. This capability will encourage the development of a tall worldly determination hydrologic model and support the choice making for coastal administration.

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