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Paper Authors

LAKKARAJU ANJANEYA VARA PRASAD, MAKKENA PHANITHA, NARRA SRI HARI RAJA, KADIYAM PRUDHVI TEJA

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LIDAR MICRO DRONE WITH PROXIMITY SENSING

PVSM KUMAR, Professor, Department of Mech,
Vasireddy Venkatadri Institute of Technology, Nambur, Guntur Dt., Andhra Pradesh.

LAKKARAJU ANJANEYA VARA PRASAD, MAKKENA PHANITHA, NARRA SRI HARI RAJA, KADIYAM PRUDHVI TEJA
[2,3,4,5] UG Students, Department of Mech,
Vasireddy Venkatadri Institute of Technology, Nambur, Guntur Dt., Andhra Pradesh.
Email id: pvsmkumar66@gmail.com
(Corresponding Author),
anjaneyavaraprasad01@gmail.com, phanithamakkena2001@gmail.com, narrachowdary0301@gmail.com, Prudhviteja132@gmail.com

Abstract

These days, drones are used more regularly in a wide range of industries. The price of these drones is a significant problem. And risky to operate while in the air, which explains why they are still not generally accessible. In places with few trees and little space, large-scale drones also need more space to fly high and make more noise than microdrones. As a result, we developed a microdrone that can manoeuvre in tight locations and has an obstacle detection capacity using LIDAR. You can better comprehend drone flight and obstacle detecting with the help of this drone. Due to its small size and low price, flying it in dense forest and difficult circumstances is also less perilous.

In LIDAR, objects in the scene reflect infrared rays that are sent out by a transmitter. The time of flight (TOF) is used to construct a distance map of the scene's objects when the system receiver picks up the reflected light. Obstacles are seen in its area of view.

Four drone motors and propellers, an Arduino Pro Mini F3 EVO controller, a buzzer, and a lidar sensor make up the tiny drone. Infrared technology is used by the lidar sensor to identify any obstacles in front of it. The controller decodes the lidar signal and activates a siren and light to warn the user of the presence of an impediment if one is found. The buzzer's frequency is altered, and the operator is continuously cautioned of the drone may be manoeuvred securely and without colliding with objects using buzzer and led based on proximity.

The tiny drone's four motors are used for both take off and flight control. The RC controller commands are converted into the necessary flying action by the flight controller using the rf receiver.

Keywords: ARDUINO Pro Mini, F3 EVO Controller, Buzzer, LIDAR Sensor

Introduction

Today, drones are widely used in a variety of industries. Drones can be used for everything from thermal inspections to videography and filming. The expense of drones is the main problem with them. Drones are still a relatively uncommon item because they are often expensive to

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purchase and pose a significant danger of damage while in flight.

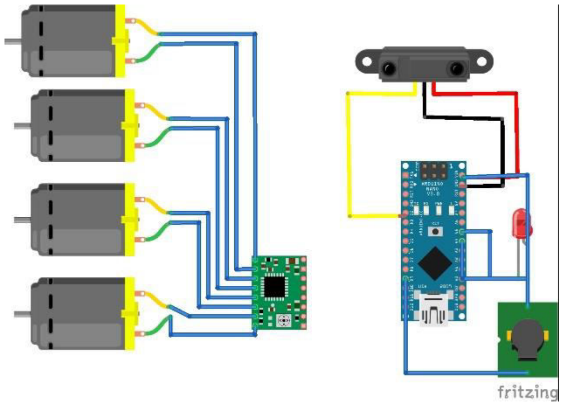
The tiny drone is made up of four drone motors and propellers, an Arduino Pro Mini F3 EVO controller, a buzzer, and a lidar sensor. The lidar sensor makes use of infrared technology to detect any obstructions in front of it. If an obstacle is discovered, the controller decodes the lidar signal and turns on a siren and light to alert the user to the obstacle's proximity. In order to manoeuvre the drone safely and avoid collisions, the operator is continually notified of surrounding objects by changing the frequency of the buzzer and led according to proximity.

The four motors on the tiny drone are employed for both take off and flight management. The RC aircraft has to move in order to fly.

We now own a small, light micro drone that can navigate through gardens, inside of buildings, and across forests while spotting obstructions using LIDAR proximity sensing.

The drone uses an Arduino Pro micro to detect nearby objects using LIDAR and to control the led and buzzer as necessary.

As a result, we now have a tiny, lightweight micro drone that can fly through gardens, inside buildings, and across forests while spotting obstacles using LIDAR proximity sensing.



Arduino pro mini

The Arduino Pro Mini is a microcontroller board based on the ATmega328.

Six analogue inputs, a built-in resonator, 14 digital input/output pins, six of which can be used as PWM outputs, a reset button, and mounting holes for pin headers are all present on the device. A six-pin header must be connected to an FTDI cable or Spark fun breakout board in order to provide the board with USB power and communication.

The Arduino Pro Mini is made to be temporarily installed in displays or other objects. The usage of several connector types or wire direct soldering is made possible by the absence of pre-mounted headers on the board. The pin configuration is applicable to the Arduino Mini.

There are two variations of the Pro Mini. 8 MHz, 3.3V, and 3.3V for one.

18 pins plus 2

The Arduino Pro Mini has 18 conveniently accessible pins, which are plenty for a board with up to 81 keys (9x9).

It is simple to turn two more pins, which are occupied by the onboard LEDs, into usable pins. Simply follow my Pro Micro

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upgrade tutorial, then connect your wire to the pads where the RX/TX LEDs' resistors were previously located. You can wire up a board with up to 100 keys in this way by using the 18+2 pins in a matrix with 10 rows and 10 columns.

The extra pins are B0 and D5, according to the ATmega16U4/32U4 data sheet.

There are 26 extra GPIO pins on the Atmega32u4 that can be soldered directly to the microprocessor.

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Pin count: 18 + 2

There are 18 easily accessible pins on the Arduino Pro Mini, which is theoretically enough for a board with up to 81 keys (9x9).

Two additional pins, used by the onboard LEDs, can be easily converted into usable pins. Simply adhere to my Pro Micro upgrade tutorial and attach your wire to the RX/TX LEDs' removed resistor pads. By using the 18+2 pins in a matrix with 10 rows and 10 columns, you can wire up a board with up to 100 keys in this manner.

The additional pins are **B0** and **D5** as described in the ATmega16U4/32U4 data sheet.

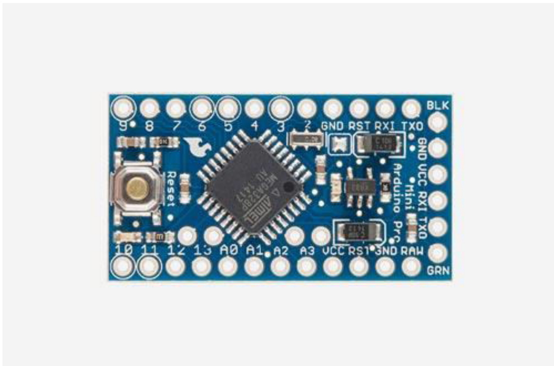
The Pro Mini comes in two different versions. 3.3V and 8 MHz for one, and 3.3V.

Pin count: 18 + 2

There are 18 easily accessible pins on the Arduino Pro Mini, which is theoretically enough for a board with up to 81 keys (9x9).

Two additional pins, used by the onboard LEDs, can be readily converted into useable pins. Simply adhere to my Pro Micro upgrade tutorial and attach your

There are 26 more GPIO pins on the Atmega32u4, but they can only be accessible by directly soldering to the microcontroller, which is normally not advised for beginners.



pinout and pin names

If you use the Pro Micro outside of the Arduino IDE, the pin names on the board must be translated (for example, with QMK).

The Atmega32u4 includes an additional 26 GPIO pins, which can be accessed by directly soldering to the microcontroller, but that is not generally recommended for beginners.

Pin names and pinout

You must convert the Pro Micro's PCB's designated pin names to AVR ones if using it outside of the Arduino IDE (such as using QMK). For instance, the Pro Micro's pin 3 corresponds to the Atmega32u4's D0.

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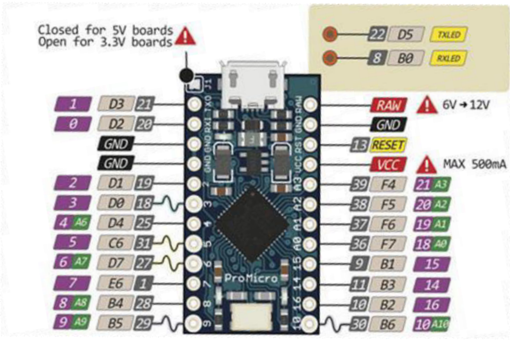
It is perplexing that Arduino doesn't map its pin numbers to AVR ports, but there is a valid explanation. On the Pro Micro, some AVR pins may have those names because they can be used for special applications like serial, timer input, PWM output, and others.

Here is the mapping:



F3 EVO Controller

Due to its capabilities, the F3 Racing EVO flight controller is the perfect board for your next multirotor (drone) racing build. A compact, stackable design that is ready for racing has been able to achieve incredible flight performance. It is very reasonably priced and has the most modern sensor, timing, and logging technology. The communication options are also nice.

The F3 Racing Evo uses the Clean flight control (FC) programmer, which is free and open-source and has a big and welcoming user and developer community. The system can be improved because it is open-source. The hardware for clean flying was created by the project's chief developer to be more durable than STM32F1-based boards from the previous iteration.

For the best possible installation compatibility with current products, the stack pins, ESC/Servo outputs, and connections on the F3 EVO board are situated in the same area as those on the F3 Acro and Deluxe boards.

In conclusion, the F3 EVO makes your multirotor (drone) fly like it's on rails by utilizing cutting-edge CPU, sensor, and software technology. The Clean flying software enables precise flying, which is required for quick FPV racing. carries out flight computations efficiently, allowing it to complete more jobs more quickly, using the ARM Cortex-M4 72Mhz CPU and Math co-processor (FPU). Because the gyroscope and accelerometer sensors are coupled to the quick SPI bus, the software can acquire additional data even faster to aid in better stabilizing your craft.

LIDAR Module

A TOF (Time of Flight) LiDAR sensor, the TFMini-S Micro LiDAR Module can measure an object's distance from up to 10 centimeters away (+/- 6cm up to 6m) and up to 12 meters away (+/-1% starting at 6m). The reflectivity of your target item and the illumination will have an impact on your effective detection distance, as they do with all LiDAR sensors, but what sets this sensor apart is its size. Because the TFMini-S is so small (only 42x15x16mm), LiDAR can now be used in situations where smaller sensors were previously the only viable option.

A single-point ranging LiDAR based on the TFMini upgrade is called the TFMini-S. The blind zone has been reduced to 10 cm, and varied reflectivity perform more accurately and well outdoors. It can now function with more accuracy, sensitivity, and steadiness over a wider frequency range.

buzzer

This 5V passive buzzer is small enough to mount on a Board. Using Audio Alert in your electronic designs is a terrific idea. It uses a coil element to produce an audible tone and runs on a 5V supply.

LED

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. The semiconductor releases energy in the form of photons as a result of the recombining of electrons and electron holes. The colour of the light, which relates to the energy of the photons, depends on the energy required for electrons to cross the semiconductor's band gap. White light can be produced on a semiconductor device using a layer of light-emitting phosphor or several semiconductors.

A semiconductor light source called a light-emitting diode (LED) produces light when current passes through it. Recombining electrons and electron holes in the semiconductor results in the release of energy in the form of photons. The energy needed for electrons to pass through the semiconductor's band gap determines the hues of the light, which correlate to the energy of the photons. A layer of light-emitting phosphor or several semiconductors can be used to create white light on a semiconductor device.

Conclusion

As Bringing the drone concepts into application practically, it requires high budget and lot more components. So here we get a prototype of lightweight micro drone that can take off from anywhere, fly indoors or in forests or gardens and sense obstacles using LIDAR proximity sensing.

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