

# Radio Altimeter (Radalt) Simulator on Aircraft using Arduino UNO

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**Abstract.** This research proposes the architecture simulation radio altimeter (radalt) on aircraft using the Arduino UNO. This research is a method of experimentation through the process of designing the software and hardware configuration, components, implementation tools and the evaluation of the test results of simulation of the radio altimeter (radalt) on aircraft using the Arduino UNO. On the design of the simulation tool is the main set of 6 blocks. Arduino Uno as a microcontroller to process input from the sensors and results will be displayed on the display panel that contains the 16x6 LCD, LED, and Buzzer. Meanwhile, dc motor and servo motor used for the mechanism of the movement of the model plane. The results of the research of the LCD will show the distance indicating system goes according to the design.

## 1. introduction

In the era of globalization such as technology evolves very quickly. So is technology on a means of transport. The current aircraft is one of the means of transport which is quite sophisticated. One of them is shown with components that are best in class. The most important component in the plane is a navigation system that showing the position of the aircraft at the time of broadcast.

The use of inertial navigation systems (INS) in collaboration with the global navigation satellite system (GNSS) is one of the most typical methods that have been used to reach the aircraft navigation solutions because it works complementary to integrate their respective strong points. . Although the data is considered the main initial INS to achieve aircraft navigation solutions, disability INS that matters such as the drifting time is still unresolved. Thus, the use of the INS is assisted by other sources to complement the shortcomings. Because of the GNSS can keep the vehicle positioning errors are limited in extent, GNSS is used as a method of supporting the standard INS [1].

The radar Altimeter is one tool to measure the height of the most widely used by aircraft on landing. This measures the height above the Earth's surface based on difference frequency (beat frequency) between signals that are transmitted and received [2]. This included in Altimeter an instrument landing system. Instrument Landing System provides information guide terminal to the aircraft during the final approach to the airport. Remote control and monitoring of the operations of the station in the system is done with solid state circuits that are connected to a cable that is buried connecting stations in a centralized location field (control tower) [3].



However valuable an Altimeter is quite expensive, therefore it needs more affordable simulation tools in the issue price but should still be effective in how it works. Simulation tool rated very effectively to address this problem.

It takes a few components to build this simulation tools such as ultrasonic sensor, Arduino UNO, dc motor, 16x2 LCD, led, and buzzer. This tool is used in ultra-sonic sensors to determine the distance between objects with other objects. Sensors ultrasonic (US) are widely used to detect objects in various areas of applications such as parking sensors in the car, help navigation UAV and others [4].

Ultrasonic sensor is a sensor that serves to change physical quantities (sound) into electric quantity and vice versa. The workings of this sensor is based on the principle of the reflection of a sound wave so it can be used to interpret the existence (distance) of an object with a specific frequency. Referred to as Ultrasonic sensors because the sensor using ultrasonic waves (ultrasonic sound).

Ultrasonic waves are sound waves that have a very high frequency of IE 20,000 Hz. ultrasonic Sound cannot be heard by the human ear. Ultrasonic sounds can be heard by dogs, cats, bats, and dolphins. Ultrasonic sounds could propagate through solid, liquid and gas. Ultrasonic sound reflectivity on the surface of solid substances similar to ultrasonic sound reflectivity on the surface of the liquid. However, ultrasonic sound waves will be absorbed by the textiles and foam.

Ultrasonic sensor transmits ultrasonic waves 40 kHz from the ends of the trigger far outside the range of human hearing and received a 40 kHz ultrasonic waves back in the late reverberation. This moves away from the pulse transmitter in the shape of a cone at the speed of sound (340 m/s). The wave is reflected in the case of the existence of objects. Flight time sent and received is the wave of the calculated distance between sensor and object [4].

## 2. Methods

Aircraft components are certainly not sold freely in the market. The radar altimeter is an instrument in an aircraft that measures distance two-way between radar and the Earth's surface, which depends on the return signal is transmitted from the aircraft to the ground [5].

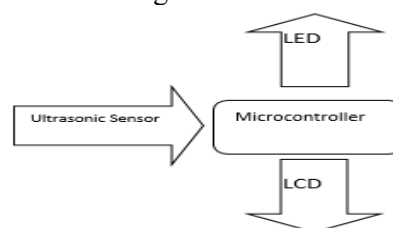
The design of this tool made for media in schools vocational learning which refers to the technology of aircraft. Of course this tool must be easy to operate and easily understood by its users, so it is in the pupils of the school.

Using components that are easily obtainable and the price is relatively cheap does not mean to precision functions of tools are ignored. It is precisely with a simple component expected students will more readily understand the workings of each component.

This tool will light up when the switch on/off is turned on. All the programming is done by the Arduino. Meanwhile the distance measurements of the miniature aircraft against the object below was done by Ultrasonic sensors. Ultrasonic sensor reading of results will be displayed on the LCD 16x2 in the form of letters and numbers. The distance will be read in units of centimeters. Each zone height will be distinguished by the sign of the sound of the buzzer and the LEDs of different colors. Meanwhile, the movement of the miniature aircraft driven dc motor in gear give miniature can move forward, backward, up, and down. Motor dc here have different sources with Arduino, because dc motors require 12 volts.

### 2.1. Block Diagram

The block diagram in this system can see in figure 1.



**Figure 1.** Block Diagram of design tool.

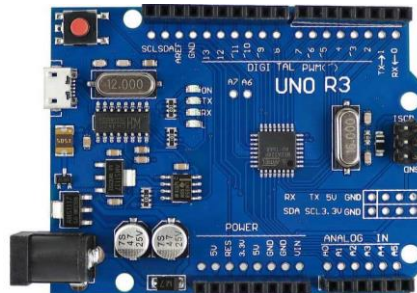
## 2.2. Selection of Components use, Such as:

**2.2.1. Ultrasonic Sensor.** An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves [6]. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. Ultrasonic sensor can see in figure 2.



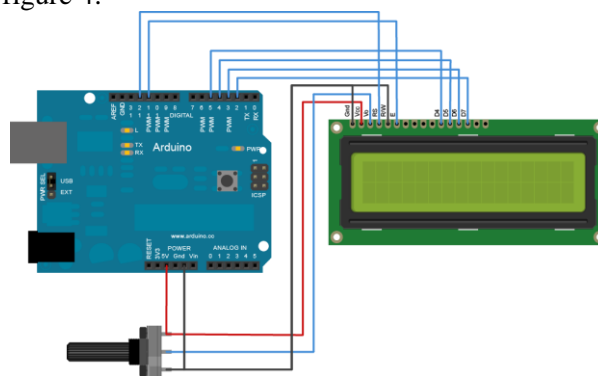
**Figure 2.** Ultrasonic Sensor.

**2.2.2. Microcontroller using Arduino.** The microcontroller functions as center controlling in the whole system and will be displayed on the LCD. Arduino UNO can see in figure 3.



**Figure 3.** Arduino UNO.

**2.2.3. LCD 16\*2.** LCD function to display data that has been processed, the installation LCD with Arduino UNO can see in figure 4.



**Figure 4.** LCD 16\*2.

## 3. Results and Discussion

### 3.1. System Analysis

The decomposition of a complete information system into its component parts with a view to identifying and evaluating the problems, opportunities, constraints and expected needs so that proposed improvements can be proposed.

### 3.2. Problem Analysis

The airplane movement mechanism part is still manually driven and not yet digitized. It's just switch which directly through the DC motor.

### 3.3. Discussion results

Because the tool designed by the author is still in the stage of the design process, then the results of the tool cannot be exposed.

## 4. Conclusions and Future Work

Like inhr problem we have, the airplane model movement mechanisis still driven manually. It's it would be better if the movement of the model of the aircraft was digitized to make it easier for users to move the model of the airplane in accordance with the wishes.

## References

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