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Emergency Landing System Using LIDAR and RSSI

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Abstract - *In recent years there has been many problems related the safe landing of Aeroplane and their accidents due to various reasons like bursting of tier, poor visibility, lack of synchronization between the flight and the base station. This results into the accident of the Aeroplane and loss of life of passengers. Also according to the survey, we can conclude that most of the accidents takes place during flight landing. This could be avoided and safety can be assured to the passengers by synchronization between the base station and Aeroplane. In our project we have developed and efficient way to solve these problems and ensure safety to the lives of passengers. Using this system various collision and problem related to flight landing can be minimized. Thus, in future we can develop a system which will help in automatic landing of planes, the key player here is LIDAR and RSSI. This two combines to notify the height and horizontal distance of the plane from runway.*

Key Words: LIDAR (Light Detection and Ranging), RSSI (Received Signal Strength Indicator).

1. INTRODUCTION

In case of emergency landing systems, there are basically two systems available today. In these systems one is with respect to the GPS which maps the nearby areas of the flight, while the other thing maps the amplitude at which the flight is currently flying. So in this case two components are to be mapped, but while in case when we use LIDAR and RSSI unit, the LIDAR maps the vertical distance of the flight from the runway. On the contrary, RSSI maps the horizontal distance of the flight form the runway.

The system helps both the Airport Authority as well as the pilot to map the correct position of flight as well as of runway. Depending on the type of flight, and the class of airspace, Airport authority may issue instructions that pilots are required to obey, or advisories (known as *flight information* in some countries) that pilots may, at their discretion, disregard. Generally the pilot in command is the final authority for the safe operation of the aircraft and may, in an emergency, deviate from Air traffic control instructions to the extent required to maintain safe operation of their aircraft. The Chart.1 shows that the risk factor during the landing of the flight is far more than any other instance. So we must ensure that the landing of the flights should be safe. If the weather is foggy, or else Rainy, it is far more difficult for the pilot to map the position of the runway. Thus, the flight is either directed towards some other airport, because of this the flight delay and the complete imbalance in the air traffic occurs.

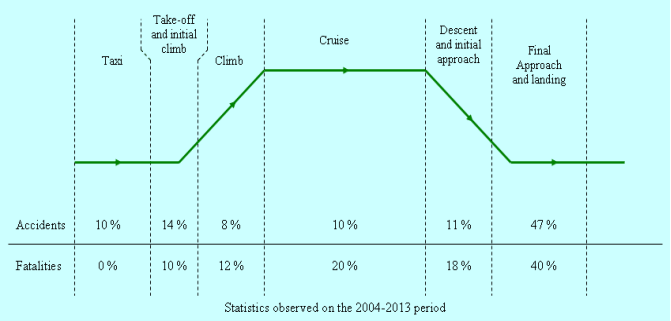

Chart – 1 Survey of the casualty's occurred

2. PREVIOUS WORKS

Presently pilots are using Forced Landing system in which the aircraft is forced to make a landing due to technical problem (such as failure of engines, hydraulics, landing gear), but at this time they are using LASER cameras for landing in such situation.

Many times the pilots could not detect the ground during foggy weather, so in this the flight landing cannot be taken place.

Because of unavailability of smarter way to land flights, we go through the process such as Ditching and Forced Landing.

In this systems the rate of casualty to occur is more, as forced landing focuses only on the flight to land at any cost irrespective of the damages and a proper screening of the area.

LASER cameras and infrared sensors are mostly used nowadays to have a blur view about the landing ground.

3. INNOVATION

The Light detection and ranging is useful for obtaining the depth of the ground using Laser.

Thus the Laser makes it easy to detect the evenness of the ground.

The Received signal strength indicator mainly focuses on calculating the distance(i.e., horizontal) by using RF.

The distance and depth once obtained, thus then focuses on the most ideal surface to land the flight.

This technique will obtain the 2D and 3D images of the planes, making sure to choose the safest ground.

This technique is more efficient as it can also been used irrespective of any climate, i.e., in foggy weather pilots are not able to get the location of runways, so LIDAR and RSSI solves this issues.

Both RSSI and LIDAR gives single Graph, with respect to the height and the distance.

4. IMPLEMENTATION AND DESIGN

4.1 LIDAR Model

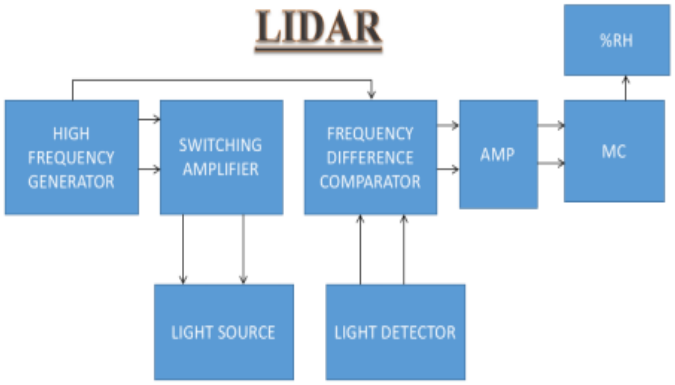

Fig - 1 Block Diagram

The LIDAR unit generally works on the principle of emitting a light pulse and the capturing it back within an amount of time, thus this is how it can map the depth of the ground from the flight. Thus the Light source is placed. While we consider to develop the amount of frequency the crystal oscillator is used. It is the piezo crystal oscillator. The frequency is passed from the switching amplifier is emitted by the light source is stored. When the frequency returns back to the frequency difference comparator, here the previous frequency of the light source is stored. Both the frequencies are compared and thus the change is frequency can be used to determine the depth of the ground from the flight.

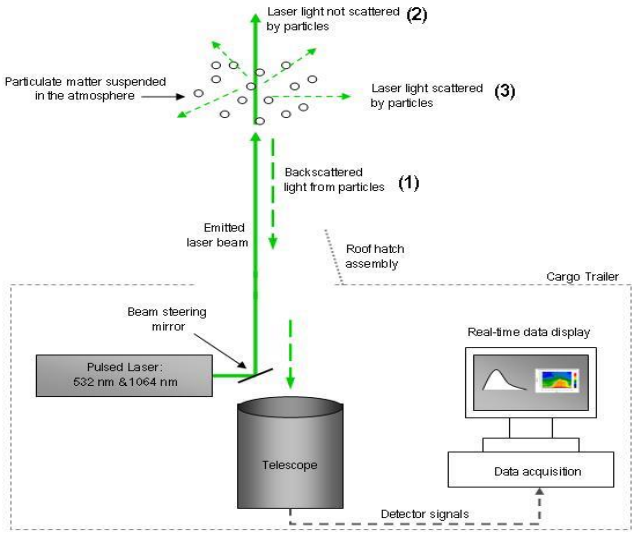

Fig – 2 LIDAR model

4.2 Microcontroller

The AT89S51 is a low-power, high-performance CMOS 8-bit microcontroller with 4K bytes of In System Programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with In-System Programmable Flash on a monolithic chip, the Atmel AT89S51 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, two 16-bit timer/counters, a five-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next external interrupt or hardware reset.

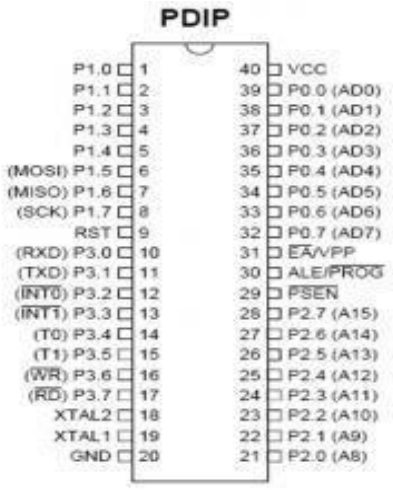

Fig - 3 Microcontroller AT89s51

4.3 RSSI Model

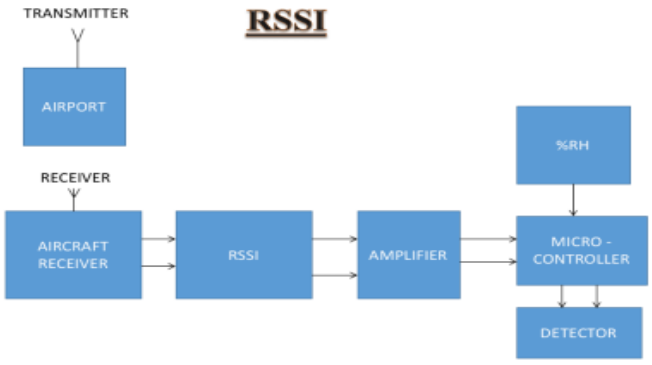

Fig – 4 RSSI unit Block Diagram

RSSI is also known relative received signal strength in a wireless environment, in arbitrary units. RSSI is an indication of the amount power level being received by the receiver radio antenna. Therefore, the higher the RSSI number, the stronger the signal. Thus, when an RSSI value is represented in a negative form (e.g. −100), the closer the value is to 0, the stronger the received signal has been.

RSSI can be used internally in a WNC(wireless networking card) to determine when the amount of radio energy in the channel is below a certain threshold at which point the network card is clear to send(CTS). Once the card is clear to send, a packet of information can be sent. RSSI thus constitutes in giving the exact distance of the flight form the runway, which enable the airport authority the position of the flight form the runway.

6. CONCLUSION

The proposed system can reduce and eliminate many aircraft landing systems especially limitations of current GPS system because the Aircraft landing ground-based system is completely autonomous. It forms its own graph denoting a single variation in the landing system, rather than different systems for GPS and the altitude measurement. All the tracks data regarding the landing is stored here. So that to make it much more easier to analyse the ground.

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