
Automatic Signal and Application of the Emergency Brakes for Crossing the Limit by an Airplane

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Abstract

Airplanes landing on the runway of airport has to travel a distance before getting stop and de-board the passengers. While travelling on the runway mostly during the night time the airplanes pass off to the unsafe zones which leads to the crash of the airplanes even after the safe landing. So to avoid such crashes there is a need to develop such an alarm system and thereafter the stoppage of the airplane either by the pilot or with the application of the automatic brakes of the airplane. In this research paper such a technique for the automatic braking of the airplane has been proposed which is based on the infrared technology. This technique will be helpful for the avoidance of the air crash after the safe landing of the airplanes. Thus it will help to save a lot of lives which get lost during the crash and the loss of the property and the airplane.

Keywords: *Airplane, Braking, Landing, Pilot, Runway.*

I. INTRODUCTION

Controlling the air traffic is not a simple task and it is a highly stressful business. Mistakes are not allowed. It involves not only directing the planes for the takeoff and the landing. It involves continuously monitoring the ground presence of the planes on the ground. During the mishaps the planes crosses the airport taxiways which are forbidden to cross. Some accidents also occur due to vehicles movement in the path followed by the airplane after landing. Although a number of systems and continuous monitoring is also done to ensure the clearing of the passage but all system are warning systems and controlling of the airplane depends upon the pilot. There is need of an automatic monitoring system so that airplane already defined should not be used by any other plane or the vehicle for the movement. For this the detectors should be installed on the airplane or the vehicle so that the sensors can detect their movement path and in case they are on the wrong

path there should be an alarm system. Using the infrared technology can be helpful in manufacturing the sensors and detector system for the path selection.

An infrared (IR) sensor is an electronic system which measures and detect the infrared radiations in its outer environment. These radiations were discovered by the astronomer Herschel in 1800 when he was measuring the temperature of each color which was dispersed by the prism. So while measuring the temperature of the color beyond the red color he noticed the highest temperature [1]. As IR is not visible to the human eye and the wavelength of the IR is longer than the visible light on the same electromagnetic spectrum. Any object emitting out the heat always emits infrared radiations. IR sensors are mainly of two types: Active and Passive Active sensors do both the tasks of emitting and the detection of the infrared radiations. Active IR sensors possesses two parts part one for the emitting of the light that is light emitting diode (LED) and the second one is a receiver. When an object comes near the sensor, the infrared light will emit out from the LED, reflected and then detected by the detector. Theses sensors also acts as the proximity sensors and are commonly referred to as the obstacle detection systems. Passive infrared sensors only detect the radiations and do not emit from the LED. It comprises of: A sensor which is pyroelectric sensor, an infrared filter which blocks all the extra wavelengths means other than required one, a Fresnel lens which works for the collection of the light from a number of angles into a single point, a covering unit or housing unit for the avoidance of the environmental degraders like the moisture. Passive infrared sensors or PIR sensors are generally used for motion detection such as in home security systems. Whenever a moving object generating the IR enters the sensing range of the detector, the plus minus between the levels of the IR for the two pyroelectric elements is measured, which is sensed by the sensor leading to the passage of the signal to an embedded computer thus raising the alarm. The Arduino UNO is the best board to start with the electronics and coding/programming. The UNO is the very much in demand and documented board of the whole Arduino family [2]. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 are analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), one USB connection, one power jack, one ICSP header and one reset button. It also contains everything required to support the microcontroller; by simply connecting it with a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in the Italian and was chosen to mark the release of Arduino Software –IDE b 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino [3]. The Uno board is the first one in the series of USB Arduino boards and the reference model for the Arduino platform, for an extensive list of the current, past and the outdated boards.

II. LITERATURE REVIEW

Denise R. Jones in his research paper proposed a Runway Incursion Prevention System (RIPS). This system integrates the airborne and ground based technologies to provide an enhancement in the awareness regarding the surface to negate the blunders and also provides alerts for the runway conflicts to prevent the accidents on the runway thus improving the operational capabilities of the

runway [4]. To ensure its operational capability a number of tests were conducted in a high fidelity simulator. The tests were conducted with eight commercial airline crews completing 467 tests. The present research also provides an enhancement in the current technology with the implementation of the infrared based technique to prevent the airplane to travel on the wrong path and alerting the same. The important point in this research is it is independent and specific to the airplane and airplane system is self-responsible for the control of the airplane. B.C. Breen in his research paper proposed Ground Proximity Warning System(GPWS) for the controlled flight into terrain [5]. It leads to the large drop in the number of CFIT accidents. For this trainings, checklists, recommendations and the videos have also been produced to reduce the risk of CFIT. But even then the accidents continued due to the shortcomings in GPWS detection algorithms. So an enhanced version of this GPWS has been proposed in his research paper. In this current research paper accident prevention methodology for the prevention of the collision of the airplane has been proposed. Geetha M.S, Shivashankara B.S in their research paper proposed for an automated airfield system to avoid the crashes on the runway. For that the GPS system will monitor the path of the airplane for landing should be clear from fog, rain slippery, ice [6]. The entry of the vehicles in the path of the airplane is also controlled using the stepper motor. For the wireless communication the ZigBee transceiver has been used.

III. METHODOLOGY

The infrared ray emitter will be installed on both sides of the path of the runway which is forbidden to be travelled by the airplane during its after landing journey on the runway [7]. The infrared detectors will be installed on both sides of the airplane to detect the infrared rays. The first encounter of the infrared will be on the right side of the airplane, then on left side and then again on the right side which will be the final detection of the infrared rays by the detectors installed on the airplane. For the first detection of the infrared rays by the right side detector there will be message for the passengers to tie the seat belt if not tied because during the landing of the airplane the seat belts are mandatory to be tied, for the second detection the alarm will be raised for the emergency brakes and for the final detection by the right side detector emergency brakes will be applied. The sensed data will always be sent to the microcontroller Arduino Uno or any other microcontroller controller controlling all the functions of the airplane which will control the alarm system, warning system of the airplane and the braking of the airplane [8]. Figure 1 illustrate the installation of the infrared rays emitter on the right and left sides of the runway.

IV. DESIGN

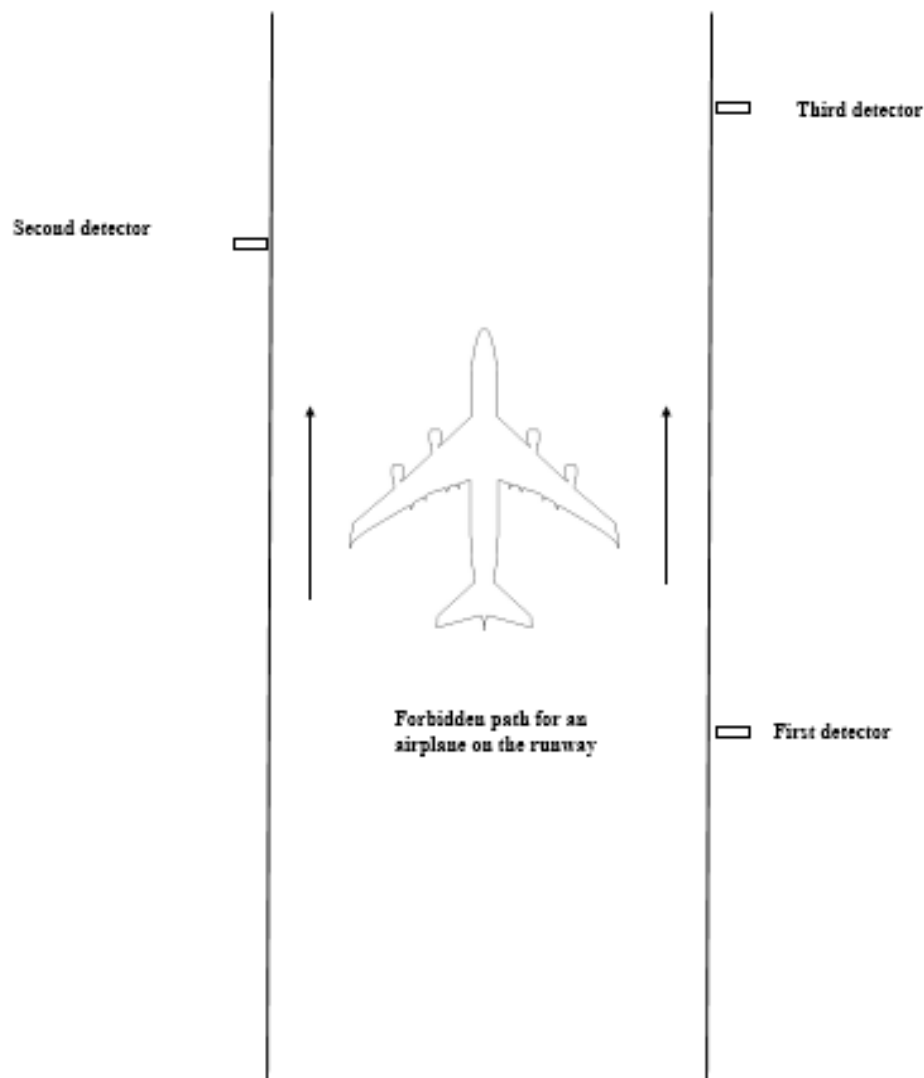


Fig. 1 The installation of the infrared rays emitter on the right and left sides of the runway and the movement of the airplane on the runway with detectors installed on the airplane nose portion

V. RESULTS & DISCUSSION

Three level detection is provided for providing time to the passengers to get ready for the jerk going to produce due to emergency braking of the airplane. So, at the first detection seat belt warning is given to minimize the jerk passage and safety of the passengers. For the second detection which is given after some distance to give maximum time for the passengers to get ready and then second detection just warns the passengers and on the third detection the emergency brakes are applied instantaneously without any warning or with a message “emergency brakes applied”. This system is based on the counter of the detection from the right and left sides with 2 right side detections and one left side detection. These infrared sensors work even on the rainy, foggy day so there will be no effect of the environment on the detection of the airplane on the runway following the wrong path.

VI. CONCLUSION

This technique of emergency brakes will prevent the airplane crash on the runway due to the wrong path chosen or the forbidden path taken by the airplane on the runway. Thus it will make the airplane landings more safe. This system can be implemented for the detection of the vehicles in a forbidden or prohibited area to raise the alarm of any movement or entry in that area is ever detected.

VII. REFERENCES

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