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# Bidirectional Communication Aircraft Landing System

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***Abstract:*** **This paper describes the analysis of Air Traffic Management domains and potential air traffic control strategies. The main objective of this project is to monitor and control the flow of aircrafts in the airport to reduce the down time of activities. Aircraft Landing System is most essential and required for the most modern airports. Integration of the various modules with the monitoring systems consumes less time for the flow of quality air traffic, with the help of monitoring the ambient parameters like temperature, humidity, wind speed and its direction can avoid confusion in arrival and departure of the aircrafts. There might be a chance of accident due to abnormal position of flight during landing. By checking the position of Lever, the chance of accident can be reduced. Integration of the various modules with the existing system gives more advantages like reduction of time consumption, manpower and improvement the flow of quality and safe air traffic. It gives economic affordable solution for perfect take off and landing System for airports.**

***Keywords:*** **Aircraft landing system, Air Traffic Services, Air Traffic Management, Control strategies, Air Traffic Control, operator models.**

## 1. INTRODUCTION

Air transportation growth has increased continuously over the years. Delays caused congestion is a major problem at many airports. The primary objective in my work is to improve the efficiency of air travel. The traditional method of dealing with the problem focused on airport capacity expansion, but this is expensive and often only generates more traffic. Installing more advanced air traffic control systems can also enhance capacity, but this tends to be marginal compared with costs involved. Therefore, more attention has been paid to applying administrative and economic methods to the reduction of airport congestion without large investments. Safe aircraft landing at low altitude is essential for widespread acceptance of aircraft that must complete mission close to the ground, and such capability is widely sought. Assessing a landing zone reliably is essential for safe operation of takeoff and landing aerial vehicles that land at improved locations. Aircraft Landing System is mainly designed to helps the Air Traffic Services (ATS) to monitor and control the flow of aircrafts in the airport. With the help of this project model, ATS can monitor ambient parameters like temperature, humidity, wind speed and its direction, thereby avoiding the confusion in arrival and departure of the aircrafts. There might be a chance of accident due to abnormal position of flight during landing. Also enables ATS to the monitor and controls the activities of pilot.

## 2. OBJECTIVE

The objectives of this paper are: identification, review and comparison of various methods assessing aircraft landing system and evaluation of the reliable methods to use in terms of accuracy, application, and capability.

The main contributions of this article are

• an analysis of the problem of landing site evaluation for aircraft.

• an incremental model-based method to calculate and evaluate landing sites for aircrafts.

• an efficient sensor design that utilizes the sensor for obstacle avoidance and landing site selection.

• results based on sensor data that show LZs found in real environments.

• results of the first full-scale aircraft that selects its own landing sites and lands.

This article first surveys prior work, conveys the problem, our approach, and then presents results for the landing site evaluation and landing.

## 3. PROBLEMS

The suitability of a landing zone depends to a large degree on the characteristics of the aircraft that will be landing on it. We consider larger vehicles such as aircrafts; however the problem scales to smaller aircraft. Landing of aircraft can roughly be separated into two independent phases: approach, and ground contact. During the approach, the aircraft ideally keeps a steady and relatively shallow descent angle in a straight line to come to a hover at some altitude above the ground. It then orients itself with respect to the ideal location on the ground and descends vertically. For typical landings, approach and ground contact are separated for landing in unimproved terrain. In the particular problem we are considering a ground goal has to be reachable from the Landing Zone (LZ) so that a human or robot could traverse the last segment. Assessment of a LZ needs to include two main factors: the ground conditions and the approach conditions. The ground conditions are all factors that are relevant when the aircraft is in contact with the ground, while the approach conditions are related to moving to the LZ. The ground conditions that need to be considered for assessing an LZ are

- wind direction
- Wind speed
- Fog, mist, visibility, ice or snow
- direction of the abort paths
- minimum size of the site
- skid contact
- static stability on ground based on the center of gravity of the aircraft
- load bearing capability of the contact surface
- Clearance of aircraft with surrounding terrain and objects while the approach conditions are the clearance of the path with respect to the terrain.

The ground path needs to be evaluated for traversability cost and path length. To ensure a reliable and successful landing it is necessary to consider all these factors in a landing site evaluation algorithm. However our geometric evaluation is insufficient to measure some factors such as the load bearing capability of the terrain or small foreign objects. In our approach we assume that a geometrically good site will be able to hold the load of the aircraft and objects will be classified as sufficient roughness to cause a rejection.

## 4. APPROACH

ATC Strategies: ATC is a highly perceptual, skill-based, context, dependent task. Researchers have examined trajectory prediction and conflict detection strategies and surveyed strategies in an effort to specify requirements for complementary ATC tools. Some strategies involve successive application of heuristics to simplify the conflict detection problem e.g., match speeds and ensure that if ATC is interrupted, aircraft will not collide e.g., separate by altitude. Other strategies establish priorities for addressing conflicts and applying control methods. A prevalent strategy lie vectoring format can nullify potential benefits of concepts like FMS routes in the TRACON. However, such current-day strategies are still crucial for coping with disturbances and maintaining safety. The challenge is to train air traffic controllers to cope successfully to use new strategies that yield benefits when the conditions are right, while maintaining current skills and the capability to recognize when they should be applied. An attendant issue is fostering the appropriate level of trust in new ATC tools. Representative research questions are: What strategy-tool combinations are suitable for controlling traffic with particular characteristics? Under what conditions (i.e., what combinations of factors such as wind-prediction errors beyond a certain limit or initial traffic spacing less than some amount) do particular strategies cease to effective, Can air traffic controllers revert to current smooth operations.

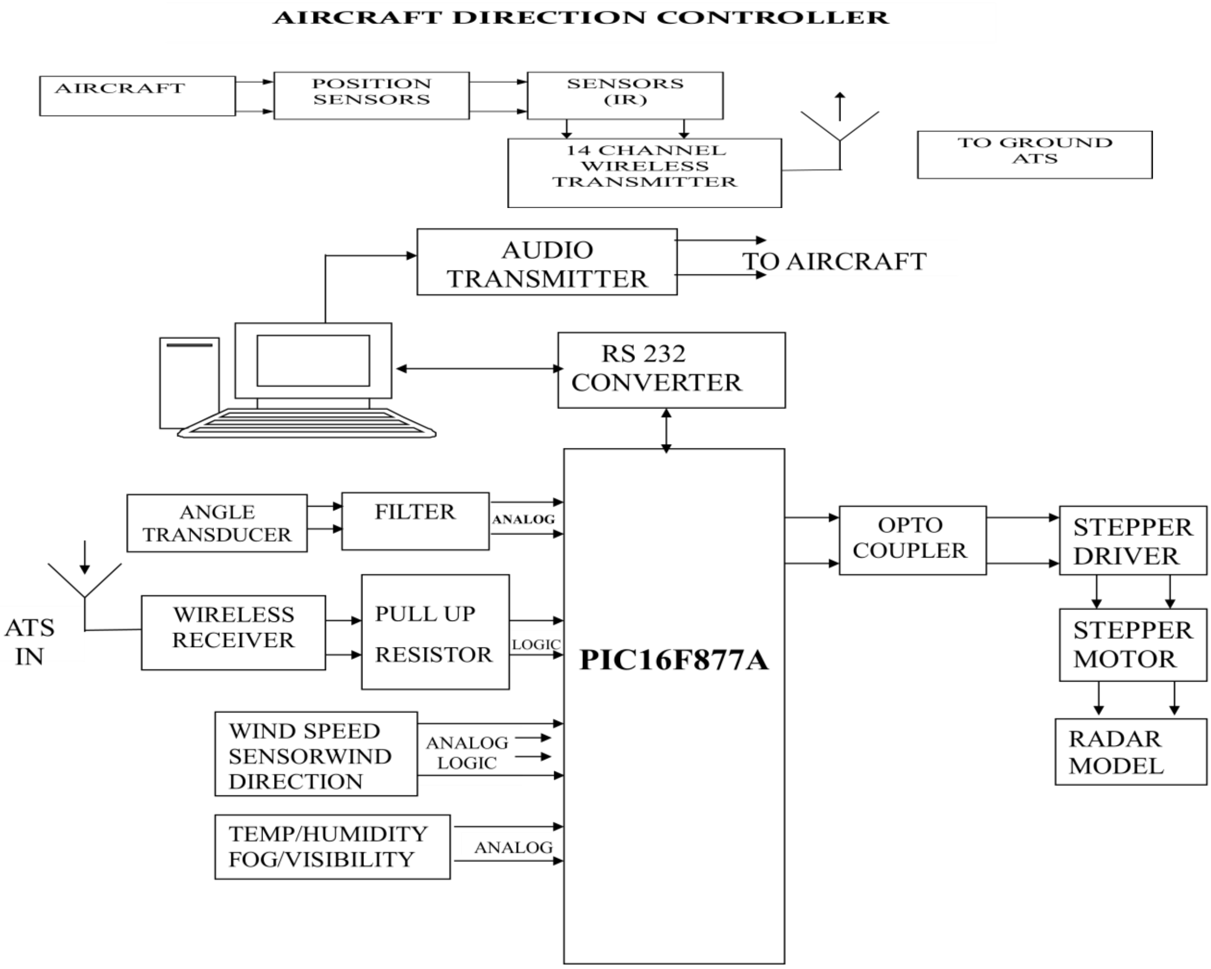
## 5. ANALYSIS METHODOLOGY

This section outlines an analysis methodology aimed at understanding factors that affect ATM concepts. Key elements entail establishing baseline performance and characterizing the effectiveness of particular strategy tool combinations. Such a Embedded Controller methodology might enable identification of traffic scenarios that, when addressed by human air traffic controllers in real-time simulation, are likely to elucidate the robustness of a proposed concept. It would inform experimental scenario selection, glide subject training, and enable researchers to address what if questions proactively.

The first element of the Embedded Controller methodology is to establish Base line performance metrics for the air traffic domain under study. This is accomplished by first removing as much variability as possible. The baseline performance determination therefore starts with the ideal case: perfectly set up merging flows of identical FMS-equipped aircraft with minimal wake vortex spacing requirements in still air. This should focus the analysis on route-related factors-in particular, crossing restrictions and the geometry of the merge. The methodology should also enable control Strategy analysis. ATC tools to control traffic with characteristics selected based on the above analysis techniques. The control strategy analysis portion of the methodology should culminate with Monte Carlo simulations with fine-grained variations in air traffic controller (and flight crew) agent behavior. This is an area beyond the scope of this paper, in which further research is needed.

## 6. HARDWARE DESIGN

The Hardware components includes PIC 16F877A micro controller, the Data acquisition module. Block diagram of system hardware.



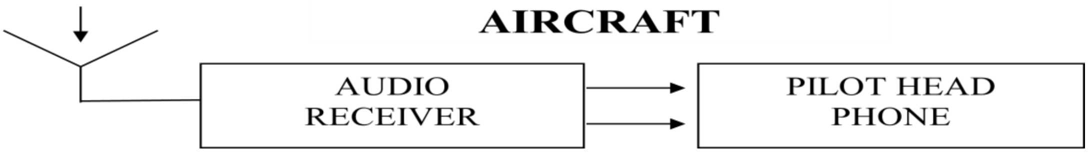



**Figure:** System Hardware Structure

***PIC MICROCONTROLLER***

This 16F877A is made by microchip company. The micro controller has the features of Only 35 single-word instructions to learn, All single-cycle instructions except for program branches, which are two-cycle, Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle, Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory, Pinout compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers.

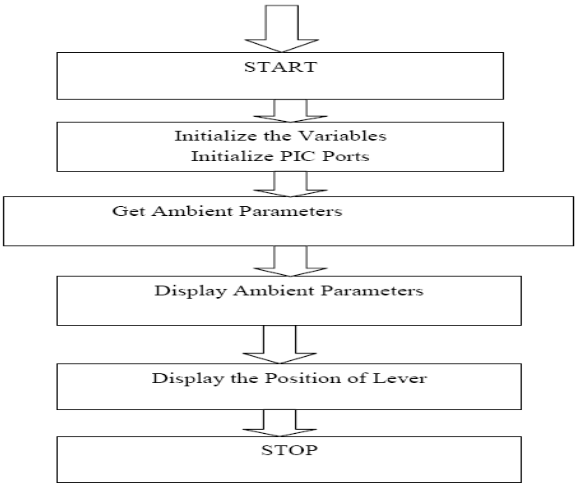
*Peripheral Features of* Timer0: 8-bit timer/counter with 8-bit prescaler, Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock, Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler, Two Capture, Compare, PWM modules, Capture is 16-bit, max. resolution is 12.5 ns, Compare is 16-bit, max. resolution is 200 ns, PWM max. resolution is 10-bit, Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave), Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection, Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only), Brown-out detection circuitry for Brown-out Reset (BOR)

*Analog Features of* 10-bit, up to 8-channel Analog-to-Digital Converter (A/D), Brown-out Reset (BOR), Analog Comparator module with two analog comparators, Programmable on-chip voltage reference, (VREF) module Programmable input multiplexing from device inputs and internal voltage reference Comparator outputs are externally accessible. *Special Microcontroller Features of* 100,000 erase/write cycle Enhanced Flash program memory typical, 1,000,000 erase/write cycle Data EEPROM memory typical, Data EEPROM Retention > 40 years, Self-reprogrammable under software control, In-Circuit Serial Programming™ (ICSP™) via two pins, Single-supply 5V In-Circuit Serial Programming, Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation, Programmable code protection, Power saving Sleep mode, Selectable oscillator options, In-Circuit Debug (ICD) via two pins *CMOS Technology of* Low-power, high-speed Flash/EEPROM technology, Fully static design, Wide operating voltage range (2.0V to 5.5V), Commercial and Industrial temperature ranges, Low-power consumption.

## 7. SOFTWARE DESIGN

During the design of the software platform, adopting the Visual Basic program is used to schedule and manage the task of the system can meet the requirements about real time and expansibility. Also by using Micro controller system, it makes application system design simple and the whole system structure easily to be operated.

Main program flowchart is illustrated in figure.



## 8. CONCLUSION

The project titled "Bidirectional Communication Aircraft landing System"helps Air Traffic Services (ATS) for controlling smooth and safe take-off and landing of many aircrafts in the airport. With the help of monitoring ambient parameters like temperature, humidity, wind speed and its direction can avoid confusion in arrival and departure of the aircrafts. There might be a chance of accident due to abnormal position of flight during landing. By checking the position of Lever, the chance of accident (caused by pilot fault) can be reduced. Integration of the various modules with the existing system gives more advantages like reduction of time consumption, manpower and improvement the flow of quality air traffic with an economic affordable solution for perfect take off and landing System for airports. ATS can monitor and control the air-traffic more efficiently and economically. Automatic Aircraft landing system, Advanced Aircraft landing system and Auto pilot system also can be develop for future.

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## REFERENCES

[1] H. Erzberger, T.J.Davis, and S. Green, "Design of center-tracon automation system," in Proceedings of the Guidance and Control Symposium on Machine Intelligence in Air Traffic Management, Physical, Volume 152, Issue 2, 18 June 2009,pp. 146-150.

[2] R. A. Slattery, ''Terminal area trajectory synthesis for Air Traffic Control Automation," in American Control Conference, 2010.

[3] T. Callantine, and B. Crane, "Visualizing pilot automation interaction," Proc. Intl. Conf. on Human-Computer Interaction in Aeronautics HCI-Aero 2009,Toulouse, pp. 87-92, September, 2009.

[4] SI.G. Klein, "The human air traffic management role in a highly automated air traffic system," ARDATMR-MTR-92W0000075, The MITRE Corporation, McLean, VA,2011.

[5] Burghart, J. T. and Delanty, E. A., "Impact

[6] of Time-Based Air Traffic Management Procedures on Future Navigational Guidance," Institute of Navigation National Aerospace Meeting, Apr. 2011.

[7] Erzberger, H. and Chapel, J. D., "Concepts and Algorithms for Terminal Air Traffic Management,"Proceedings of the 2009 American Control Conference, San Diego, Calif., June 2009.

[8] Jack R.Smith, "Digital Temperature Sensors" Programming the PIC Microcontroller with MBASIC 2005.

[9] Wen Tsai Sung, Yao chi Hsu, "Design of real-time measurement and monitoring system based on embedded system", Expert system with Applications, Volume 38, Issue4, April 2011.

[10] J. R. Fisher & Carla Beaudet "Functional Description of PIC16F877A Functions and Interfaces to Electronics Division" Technical Note No. 208 April 26, 2005.

[11] Ashford, N., Stanton, H.P.M., Moore, C.A., 2004. Airport Operations, second ed. McGraw-Hill, New York.

[12] Brander, J.R.G., Cook, B.A., 2006. Air transport deregulation and airport congestion: the search for efficient solutions. Transportation Research Record 1094, 18–23.

[13] De Neufville, R., Odoni, A., 2003. Airport Systems: Planning, Design and Management. McGraw-Hill, New York.

[14] SAE ARP 4754. Certification considerations for highly- integrated or complex aircraft systems. Washington D.C.: SAE Inc., 2005.