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Forewarning Survey Weather Investigating for Aircraft System and Self-Supporting System

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***Abstract--*:As aircraft system needs a control command from the respective guide to land. In this paper, proposes a basic Wireless Sensor Network(WSN) based on weather monitoring system for aircraft system. The suggested frame work constitute of sensor WSN and it can be used in both short term real time incident management as well as long term strategic planning. This conceptual structure would use the IOT communication system and also yield low cost in real time monitoring system. Wireless sensor network is the system used to observe the temperature, humidity, and pressure values of aircraft system. Actually by establishing this sensor system we can monitor pressure values and can enter the values in web portal without any delay. By using this type of wireless sensor network a pilot can land the aircraft at a required place on a near by airport without any guideless given by the control head in control room. Hence it can intercept from accident.**

Keywords—Aerospace safety, MEMS Sensor, Wireless sensor network

I. INTRODUCTION

Linear microphone array can be used to estimate the bearing of an airborne sound source. This method uses two common approaches 1) Beam forming method 2) Time delay method. Time delay method uses two sensors. Last past twenty years number of unmanned aircraft system operations has been increased rapidly. The traffic alert and collision avoidance system is developed by the Federal Aviation Administration (FAA). A chance constraint optimization program is solved via the so-called scenario approach.

II. LITERATURE SURVEY

1) Monitoring system for shock absorbers application to light weight aircrafts

Each shock absorber are used to measure acceleration and pressure to infer sustained mass, and further calculate forces applied to them. Another accelerometer is also fixed on the suspended mass (i.e. aircraft body), to evaluate energy dissipated by the shock absorber dashpot [1]. As seen on Fig. 1, the prototype was developed modularly, with three main component:

- a signal conditioning board, one for each landing gear, taking care of sensors signals acquisition and digitizing;
- a main embedded electronic board, fixed on the aircraft body, measuring environmental data, orchestrating slaves polling and acting as a Bluetooth gateway;
- a Java HMI for smart phones or tablets, connected as a Bluetooth client, receiving all data packet[1].

Smartphone

Master board Signal conditioning

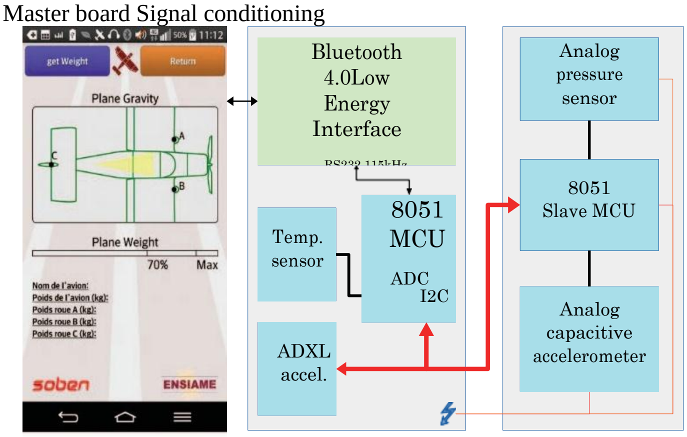

Fig 1: overview of designed architecture

2) Probabilistic Model Checking of the Next-Generation Airborne Collision Avoidance System

ACAS X works by giving advisories to pilots that instruct the pilots to fly within a certain range of vertical velocities effective the instant the advisory is issued. Typically it issues advisories when aircraft are within approximately 20-40 seconds of a potential collision. The COC advisory is tantamount to no advisory. It represents the common case. The MAINTAIN advisory is context dependent. When the aircraft is currently climbing, this advisory guides the pilot to maintain the current climb rate or greater, whereas if the aircraft is descending the guidance is to descend by the current rate or greater. The aircraft that houses an instance of ACAS X, and which that instance of ACAS X is responsible for protecting, is referred to as the own-ship. The system, as illustrated in Figure 1, is comprised of two main components: the surveillance and tracking module (STM) and the threat resolution module (TRM) [2].

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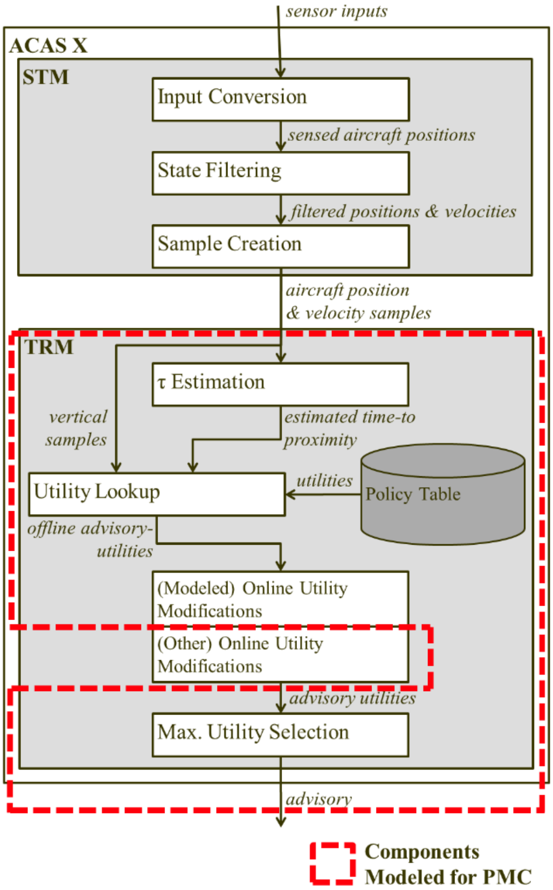
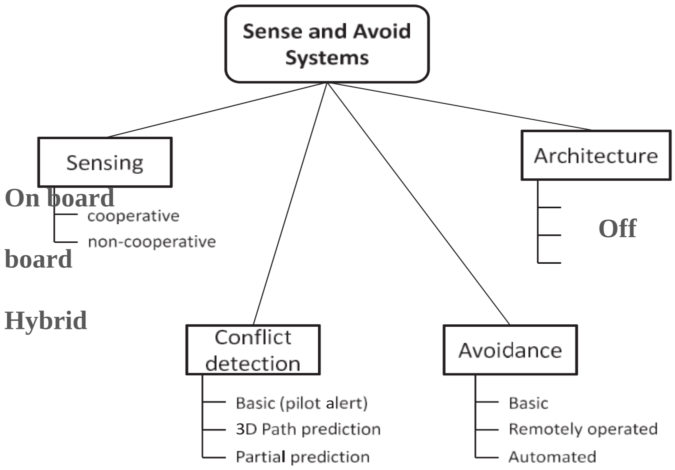


Fig. 1. ACAS X data flow.

3) Sense and Avoid for Unmanned Aircraft Systems

A general taxonomy of SAA systems is presented in Fig. 3.Regardless of the selected architecture, in general SAA consists of two time frames: separation assurance and collision avoidance. The first reduces the probability ofa collision by ensuring that the aircraft remain "well clear" of each other, thereby ensuring safe separation, while collision avoidance is related to immediate prior to closest point. Both functions require an appropriate timeline comprising several distinct phases. . The sensor selections are driven by the requirements for the UAS mission and operational environment, and often require a multiple or hybrid sensor solution to ensure that the critical targets are sensed adequately. There are also a range of solutions for the detection and tracking of the target, and for the determination of the avoidance maneuver. Someparts of these functions may require that the pilot be in the loop to assist with the SAA decisions, while some situations will involve scenarios or timing that will require a decision and action by automation. With these several considerations for SAA, there area number of open issues to be resolved before SAA can be developed for reliable commercial use on approved UAS.

If the UAS is used in a lower risk environment, then the SAA solution does not have to provide the same level of safety certification as the UAS thatis used in a higher risk environment. A larger UAS that is flown in controlled airspace must have a fully certified SAA system to permit it to operate as an equal partner to manned aircraft. Smaller UAS operating in uncontrolled air space must employ SAA systems that are designed to operate in amostly UAS environment, close to ground-based obstacles. If the pilot of the UAS is in the loop for SAA, then there is a substantial requirement for situation awareness that must be provided by the SAA system, to permit the pilot to make separation and avoidance decisions. If the separation and avoidance decisions are being made by the SAA system without the pilot in the loop, then reliable, predictable reactions must be programmed into the decision software. For all of these aspects of SAA, if some portion of the sensing or decision making is on the ground, then the trust worthiness of the C2link becomes paramount. The diversity of UAS, and the related diversity of issues around SAA have contributed to the fact that there is not one accepted answer for SAA for UAS. A number of research and industry efforts area addressing parts of the problem[3].



4)Preliminary analysis of ads-b performance for use in ACAS systems

Research was initiated on a new approach to collision avoidance logic to deal with TCAS shortcomings. The FAA started research on the next generation system, the Airborne Collision Avoidance System (ACAS X). ACAS X is defined as an interoperable expansion of a family of aircraft collision avoidance systems developed for use in Next Generation airspace. ACAS X can be divided into two parts: logic development and logic usage.

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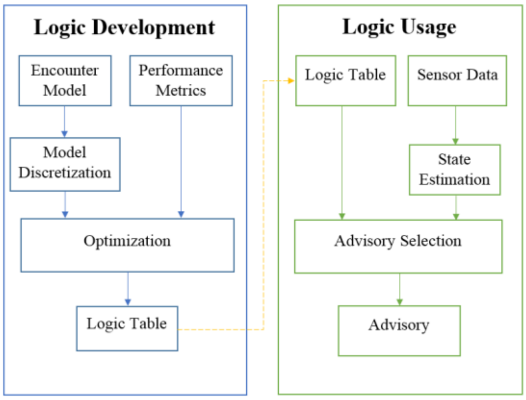

Fig 4: ACAS X Logic Development and Usage

The collision avoidance algorithm is a sequential decision problem and is modeled in ACAS X as a Markov decision process. This process involves the definition of a set of states that represent the states of the aircraft involved. The action taken by the ACAS X system (i.e. issuing one of the available advisories or choosing not to issue an alert) leads to a transition from the current state to another state. In addition to the action taken, each transition has an associated probability of transitioning based on the probability models. Performance metrics are chosen and weighted to define a single cost function that associates a cost with every transaction. High costs, for example, are assigned for near midair collisions (NMAC), and lower costs for issuing a resolution advisory [4].

5)Decision Support Tool for Predicting Aircraft Arrival Rates from Weather Forecasts

Air traffic congestion has become a widespread phenomenon in the United States. The principle bottlenecks of the air traffic control system are the major commercial airports, air traffic control currently operate near or above their point of saturation under even moderately adverse weather conditions. The congestion problem is made worse because most airline schedules are optimized without any consideration for unexpected irregularities. When irregularities occur, the primary goal of the airlines is to get back to the original schedule as soon as possible, while minimizing flight cancellations and delays. When trying to get back on schedule, sometimes it is the complexity of the situation, coupled with time pressure, which results in results in quick decisions that may be less than optimal. Therefore, it would be advantageous to develop techniques to lessen the complexity of the situation and increase the time available. The impact of weather can be predicted to create a tool it is a one way to increase available time on future inbound flight operations delay and capacity of the airport within the forecast area. AARs forms are used to estimate the capacity that are produced for four time periods of the operational day. Ground Delay Program estimates of duration and program AARs along with expected delays can be derived from the predicted AARs[5].

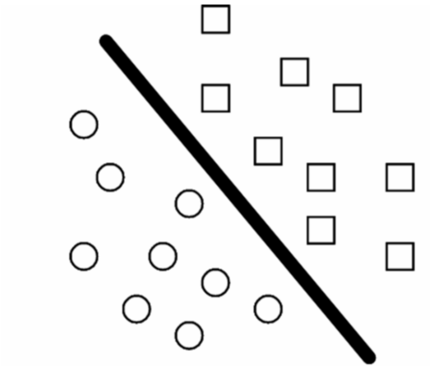

Fig 5: Separating Line Defines A Boundary

The general procedure used to determine a connection between weather forecast and airport capacity was:

- Collect data from various available data sources,
- using assorted tools, format the data into a useable layout,
- use a classification tool to connect the two sets, and test the data to ensure there is correlation.

A disadvantage of the SVM is that is does not show if any factor has more influence on the outcome then another. For each individual prediction equation developed, there were same factors that were weighted higher then others. The prediction equation is not an intuitive answer. However, across all of the prediction equations, there was not a value that consistently had more influence than another. By the nature of the algorithm, recursive partitioning searches for the value that best divides the data, so if determining which factors have the most influence on the final solution, the recursive partitioning method is more appropriate.

CONCLUSION

From the above review it is clear that various techniques are available to avoid accidents in aircraft system. We have reviewed different approaches by different researchers for aircraft monitoring and safety. Generally in all the papers they are uses the sensor to monitor the variations and alert the pilot by using various networks. The overall aim of this analysis provides various methods to secure the aircraft.

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