Automatic Update of Communication Equipment Serviceability Status

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***Abstract*- CNS- Communication, Navigation and Surveillance, aeronautical communications, navigation, and surveillance systems are the key to the delivery of safe and efficient air traffic management. Accurate and timely radio communications, both voice and data link are essential for air safety. The ultimate aim is to provide a perfect update in all the ground equipment so as to provide a flawless communication. Hence, we put up a schedule to monitor the whole Ground equipments like DVOR, DME etc. from the stations and updating the information into cloud with the help of ethernet so that the equipment could be monitored from anywhere in this world without any restriction. This would save time and man power. Hence, the ultimate aim of updating the status of CNS equipment is achieved and the safety and security of the whole system is ensured.**

I. INTRODUCTION

Planning, procurement and commissioning of all CNS facilities and support systems foe air navigation based on short term and long term requirements to synchronize the organizations plan with International Civil Aviation Organization-ICAO's approved plans is managed by CNS Planning Department. Preparation of qualitative requirements and system specifications in coordination with all concerned agencies/ organizations, preparation of estimates, invitation of tenders, tender evaluation of commercial and technical bids and other such responsibilities are discharged by the CNS Planning Department. Apparently, all the responsibilities of it are fundamental in all aspects.

CNS/ATM uses many systems include satellite systems, and varying levels of automation. The aviation communication is a crucial component considering the successful functionality of aircraft movement both on the ground and in the air. The risk of an accident is reduced by increased communication. There are several instruments and equipment that are involved in communication and the safe landing/take off of the aircraft.

II.PROBLEM IDENTIFICATION (EXISTING METHOD)

Here the existing system is not efficient as the errors in the readings of the equipments could be made due to human intervention. The equipments are located in different places and most probably the data is hand written where all the equipment connections are wired. The equipment readings may not be monitored frequently this may lead to a misinterpretation in the values. As the equipments provide information which is to be kept safely, they have to be stored in a safer storage which is not available in the existing system.

In the existing system the readings are manually monitored which increases human work. The system highly focuses on the readings provided by the equipments and not the status and the service schedules. The standby mode in the equipments cannot be monitored with the help of the existing system.

In the existing system the service status of equipments from the near past are only present since there is no access to a larger storage space. The existing system has the recording of information in the form of notes which could be lost due in some circumstances. In case of any failure in the equipment, the maintenance team would be only available if someone reports it to them. The equipments are to be monitored on a regular basis to

avoid any damages in the future. Each equipment would have a different period of monitoring, and therefore the periodic schedule for different equipments are found in different locations. As there are more equipments whose status are to be monitored the laying down of wires and the communication channels are complicated. This may put a more risk in fetching the equipment status from another location. In the existing system at the time of maintenance of equipment the standby is switched on manually. This would make the equipment outputs to delay for a few moments. The existing system fails to provide a precise result in the long run. The existing system is more time and money consuming as the humans working in the maintenance have their freedom to do their work irrespective of the condition of the equipment and having workers to monitor the equipments would lead the industry to pay them. Therefore, the organization cannot save money in this system.

III.FUNDAMENTAL NAVIGATION RADIO NAVIGATION SYSTEMS

A. VHF Omni Directional Radio range (VOR)

The VOR is a type of short-range system for aircraft, enabling aircraft with a receiving unit to determine their position and stay on course by receiving radio signals transmitted by a network of fixed ground radio beacons. It uses the very high frequency (VHF) band from 108.00 to 117.95 MHz.

A VOR ground station send s out an omni directional master signal and a highly directional second signal is propagated by phased antenna array and rotates clockwise in space 30 times a second. This signal is timed so that its phase (compared to the master) varies as the secondary signal rotates and this phase difference is the same as the angular direction of the spinning signal. These parameters have to be precise to determine the angle to the aircraft from the station.

B. Doppler Very High Frequency Omni Range (DVOR)

DVOR is a ICAO ground based radio navigational aid that provides bearing information to aircraft to define air traffic control routes for en-route, terminal and instrument approach/departure procedures. DVOR when collocated with Distance Measuring Equipment (DME) provides the angle and slant distance of aircraft with respect to ground station.

C. Distance Measuring Equipment (DME)

DME is a transponder based radio navigation technology that measures slant range distance by timing the propagation delay of VHF or UHF radio signals. Aircraft uses DME to determine their distance from a land-based transponder by sending and receiving pulse pairs.

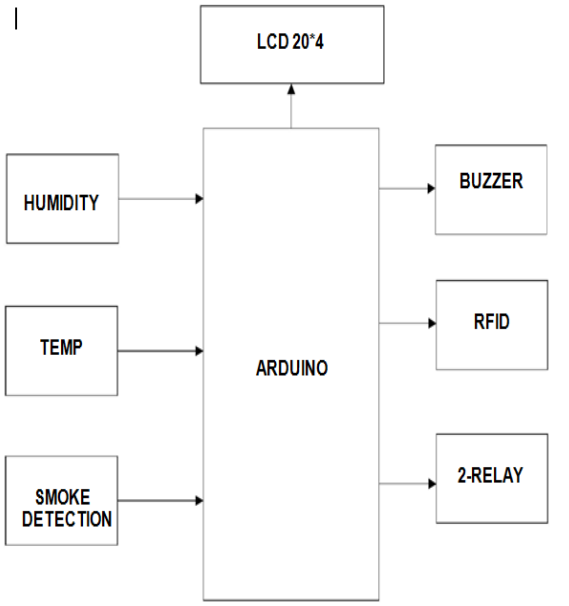
D. Transponder Landing System (TLS)

TLS enables Instrument Landing System (ILS) precision in areas where traditional ILS cannot be used. Basically, a TLS is a computer-generated localizer and glide slope frequencies. The ground equipment consists of a transponder interrogator, ILS frequency transmitters and sensor arrays for detection lateral and vertical positions. It also uses dual computers that constantly check each other and will shut the system down if differences in signal accuracy are detected. TLS system uses a proprietary calibration process that enables it to compensate for the effects of ground based signal reflections from the transponder reply, thus eliminating false needle movement.

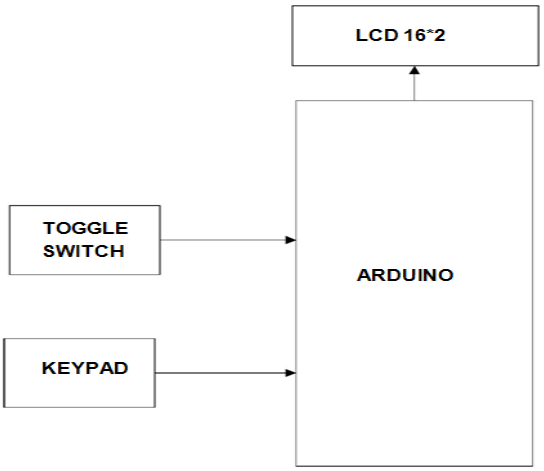
IV. PROPOSED SYSTEM

The project presents an easy and a useful method of monitoring the instruments that are responsible for communication and navigation. The updates are given continuously to ensure safety and accuracy. The temperature inside the room is constantly maintained and deviation from the fixed value is immediately indicated with a help of a buzzer. By using smoke sensors any kind of fire accidents are avoided. RFID module ensures the security and does not allow any unauthorized person into the equipment room. In case of improper functioning of the equipments the toggle switches from standby mode equipment to the other equipment. These updates can be stored and maybe used for future reference. Thereby the CNS equipments are handled with full safety and the security is ensured for the whole system.

V.BLOCK DIAGRAM



(a)Transmitter



(b)Receiver

VI.COMPONETS USED

A. Arduino

Arduino is an open-source platform in electronics accompanied with a hardware and software to design and test electronics prototypes and products. The hardware consists of a microcontroller with other electronic components which can be programmed using the software to do the required functions. The simplicity of it makes it easy to use and it is comparatively cheaper. The arduino is used in this status updater in the transmitter and receiver sides.

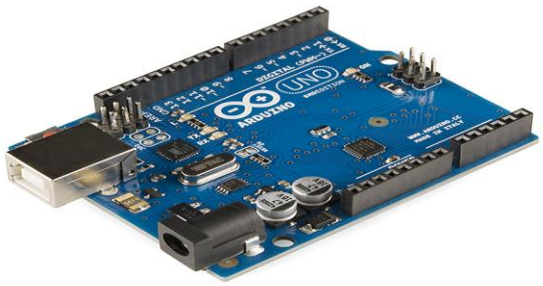


Fig.1-Arduino

B. DHT11 Sensor

Sensors have become a part of our day-to-day lives. They detect and respond to some types of input from the physical environment. This input can be light, heat, motion, smoke or any one if a great number of other environmental phenomena.

The temperature sensor is required to monitor the temperature inside the room where the instruments are kept. The equipment should not get heated hence maintaining the temperature as a constant is significant. DHT11 Temperature and Humidity Sensor shows calibrated digital signal output with the temperature and humidity. Its technology ensures high reliability and outstanding long-term stability.

Fig.2-DH11 sensor

A high-performance 8-bit microcontroller is connected. This sensor includes a resistive element and a sense of wet NTC temperature measuring device. It has excellent quality, fast response, anti-interference ability and high cost performance advantages.

C. Smoke Detector

A smoke detector is a device that senses smoke, typically as an indicator of fire. Commercial security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household smoke detectors, also known as smoke alarms, generally issue a local audible or visual alarm from the detector itself.

Fig.3- Smoke detector

D. *EM-18 RFID Reader*

Fig.4-EM-18 RFID reader

The EM-18 RFID Reader module operating at 125 kHz is an economical solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to receive pin of your microcontroller. When you show your card within the reading distance and the card number is thrown at the output. This inexpensive module ensures security and does not allow any unauthorized person to enter into the equipment room.

E. LCD

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals.

LCDs are used in a variety of applications. Small LCD screens are common in moveable consumer devices such as watches, calculators including smart phones. LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks. LCD screens have replaced heavy, bulky cathode ray tube (CRT) displays in nearly all applications. LCD screens are available in a wider range of screen sizes than CRT and plasma displays, with LCD screens available in sizes ranging from tiny digital watches to huge, big-screen television sets. A 20*

Fig.-5 LCD

VII.CONCLUTION

This project is regarding the equipment services provided in the Airports (i.e.) in the CNS. CNS equipment is monitored on a regular basis automatically without any human interference. Therefore, results can be monitored from any equipment with an internet access from required places with full security. Radio communications are accurate in which both voice and data link are essential for air safety and equipment safety in the provided area. A schedule is always held to monitor the whole ground equipments like DVOR and DME. The ultimate aim is to provide a perfect update in all the ground equipment systems to provide a flawless communication between the ATC and the equipments room. Equipments status is updated frequently

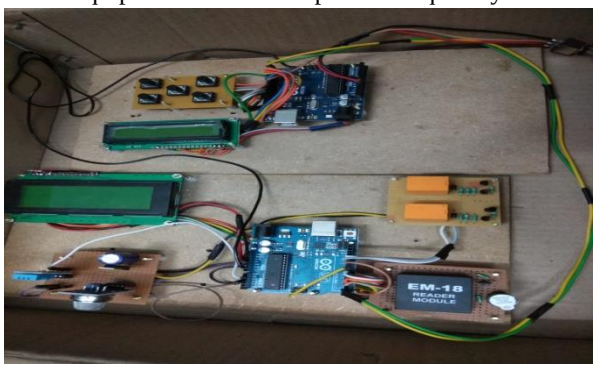


Fig.-6 Automatic status updater

(i.e.) it has the capability of getting refreshed twice per second. Always there will be a communication link between all the stations in the Airport. Service status of the equipments can be saved in de cloud. It reduces the chance of irregularities in the monitoring. The upcoming procedure provides a growth in the satellite based system and also inclusive in supporting the importance of navigation in satellites. The information is updated into the cloud with the help of the Ethernet. Therefore this is an ultimate aim

the equipments are monitored from any part of the world without any restrictions in which this would save time. Thereby the CNS equipments are handled with full safety and the security is ensured for the whole system.

REFERENCES

[1] Wei-Wei Wu "Research of Monitoring System for Network Terminal", Zibo Vocational Inst., Zibo, China

[2] J. Vasco "Design of Automatic Reclosing scheme in distribution feeders",Univ. Politec. Salesiana, Quito, Ecuador A. Aguila, Univ. Politec. Salesiana, Quito, Ecuador

[3] Jae-Won Choi "A Web-based management system for network monitoring", Dept. of Comput. Eng., Changwon Nat. Univ., South Korea, Kwang-Hui Lee, Dept. of Comput. Eng., Changwon Nat. Univ., South Korea

[4] Asma Tabassum "ADS-B message contents evaluation and breakdown of anomalies" ,Mechanical Engineering Department, University of North Dakota, Grand Forks, United States, Nicholas Allen ,Mechanical Engineering Department, University of North Dakota, Grand Forks, United States, William Semke ,Mechanical Engineering Department, University of North Dakota, Grand Forks, United States

[5] Liang Tang "Identifying missed monitoring alerts based on unstructured incident tickets",Sch. of Comput. Sci., Florida Int. Univ., Miami, FL, USA , Tao Li ,Sch. of Comput. Sci., Florida Int. Univ., Miami, FL, USA , Larisa Shwartz ,Operational Innovations, IBM T.J. Watson Res. Center, Yorktown Heights, NY, USA ,Genady Ya Grabarnik ,Dept. Math & Comput. Sci., St. John's Univ., Queens, NY, USA

[6] [John Barber "Description of Process Control Progress Using On-Line Computers",Martin Marietta Cement, Tulsa, Okla , Lee Morgan ,Martin Marietta Cement, Lyons, Colo. 80540 ,Robert W. Riegel ,Martin Marietta Cement, New York, N.Y. 10017

[7] Junichi Naganawa "Measurement-Based Evaluation on Detection Probability of Extended Squitter for Air-to-Ground Surveillance" ,Electronic Navigation Research Institute, National Institute of Maritime, Port and Aviation Technology, Tokyo, Japan ,Hiromi Miyazaki ,Electronic Navigation Research Institute, National Institute of Maritime, Port and Aviation Technology, Tokyo, Japan , Hirohisa Tajima ,Electronic Navigation Research Institute, National Institute of Maritime, Port and Aviation Technology, Tokyo, Japan

[8] Xiaoxiao Lv "Outage Probability of an Airport Wireless Communication System with AF Relay Scheme and Multiple Receive Antennas" ,Joint Res. Lab. for Aviation Connectivity Technol., Boeing (China) Co. Ltd., Shanghai, China ,Xiaoguang Ge ,Joint Res. Lab. for Aviation Connectivity Technol., Boeing (China) Co. Ltd., Shanghai, China ,Jue Xu ,Joint Res. Lab. for Aviation Connectivity Technol., Boeing (China) Co. Ltd., Shanghai, China ,Wuxiong Zhang ,SIMIT, Shanghai Res. Center for Wireless Commun., Shanghai, China

[9] Samet Ayhan "Aviation Mashups" ,The Boeing Company, Chantilly, VA ,Paul Comitz ,The Boeing Company, Chantilly, VA, Vladimir Stemkovski ,IBM, Raleigh, NC

[10] Victor H. L. Cheng "Research Progress on an Automation Concept for Surface Operation with Time-Based Trajectories", Optimal Synthesis Inc., Palo Alto, California

[11] R. Want "Enabling ubiquitous sensing with RFID", Intel Res., Santa Clara, CA, USA

[12] Ivo Broz "RFID UHF protocol implementation in distributed sensor networks",Locus Ltd, Zagreb, Croatia ,Niko Bako ,University of Zagreb, Faculty of Electrical Engineering and Computing, Unska 3, 10000, Croatia ,Željko Butković ,University of Zagreb, Faculty of Electrical Engineering and Computing, Unska 3, 10000, Croatia ,Adrijan Barić ,University of Zagreb, Faculty of Electrical Engineering and Computing, Unska 3, 10000, Croatia

[13] Yuhui He "A fully integrated Chip-ID tag used in chip information identification" ,Institute of Microelectronics, Tsinghua University, Beijing, China ,Xijin ZhaoXijin Zhao ,Institute of Microelectronics, Tsinghua University, Beijing, China,Chun Zhang ,Institute of Microelectronics, Tsinghua University, Beijing, China ,Zhihua Wang, Institute of Microelectronics, Tsinghua University, Beijing, China

[14] S. Srinivasan "Employee monitoring & HR management using RFID" ,Department of E.C.E, P.B. College of Engineering, Chennai, India ,H. Ranganathan ,Department of E.C.E, Sakthi Mariamman Engg. College, Chennai, India ,R. Srivel ,Department of E.C.E, P.B. College of Engineering, Chennai, India

[15] Min Wang "The Design of Card Reader Applied in RTLS Based on RF Technology" ,Sch. of Electr. Eng. & Autom., Tianjin Polytech. Univ., Tianjin, China ,Li-hua Su ,Sch. of Electr. Eng. & Autom., Tianjin Polytech. Univ., Tianjin, China ,Jinhai Wang ,Sch. of Electr. Eng. & Autom., Tianjin Polytech. Univ., Tianjin, China ,Keping Zhao ,Sch. of Electr. Eng. & Autom., Tianjin Polytech. Univ., Tianjin, China