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An Intelligent Technology for Identification of Flight Landing Area During Emergency Period Using Remote Airfield Lighting System

[1], Chaithanya Krishna G[2], Venkata Seshu Babu G[3], Bhoopalan S[4]

UG Scholar[123], Assistant Professior[4]
Department of Electronics and Communication Engineering
Muthayammal Engineering College – Rasipuram, Namakkal(D.t), Tamilnadu - INDIA

ABSTRACT:

The core this project is to automate the airfield by providing adequate visualization of the lights in the landing runways. In current system there is no power management in lightning in runways, so that the power loss is going occurred as well as in poor weather conditions the vision of the runway will become poor that will occur problems in landing of flights. So that providing adequate lighting to these airfields is necessary and challenging. The findings from the RALS research specified a light that had low power needs and a color/intensity to meet the requirements for airfield identification and landing. To make these lights more appropriate to wide spread applications, including both automatically/remotely switching on/off the lights under the control of a microcontroller. For sensing the visualization here we are utilizing light density sensor. The microcontroller manipulates the light intensity based on sensor output for how much light should be providing to the airfield. The objective of this system is twofold: to propose a complete model for narrowband RF (radio frequency 434MHZ links in RALS power lines as well as to evaluate the impact of the RALS elements in the communications system. The resulting hardware model will help engineers to properly design, maintain, and operate RALS systems based on RF technologies.

INTRODUCTION

There are numerous small, remote communities in the United States (even more around the entire world) which do not have convenient, paved road access. For occasional emergency and provisional supply functions, remote airfields are a vital lifeline for these communities. To aid the pilots identifying the runway of the airfields as well as landing safely at night time, adequate lighting is necessary; however, a traditional airfield lighting system could cost hundreds of thousands of dollars and still be unusable because of an inadequate power supply for the lighting system.

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AT89S52 MICROCONTROLLER:

Generally Microcontrollers have a CPU, Memory, Addressing Circuits, Interrupt handling circuits an internal UART, Ports, timers.

The microcontroller models vary in data sizes from 4 to 32 bits. Four bit units are produced in huge volumes for very simple applications. 8-bit access is more versatile then others 16-32 bit words are used in high speed application in signal processing.

To develop a microcontroller application, a development system is required. A microcontroller kit along with an assembler usually constitutes a development system. Serial and parallel communication devices are like RS232, data encoder, Data decoder and vice versa.

The AT89S52 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 high-density nonvolatile memory technology and is compatible with the industry- Standard 80C51 instruction set and pinout. 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 AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 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 AT89S52 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

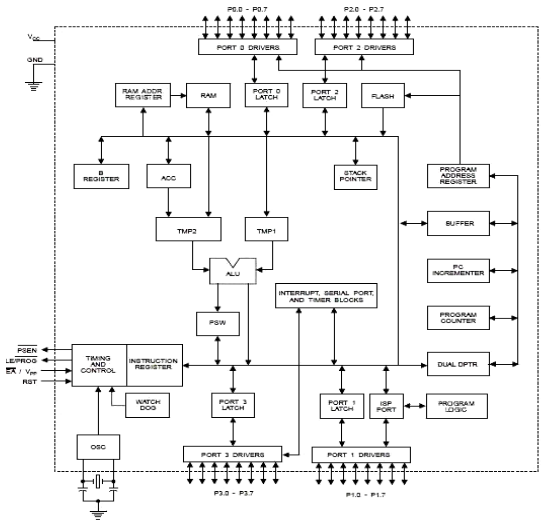

Fig : 1.1 Architecture of Microcontrolle

AT89S52

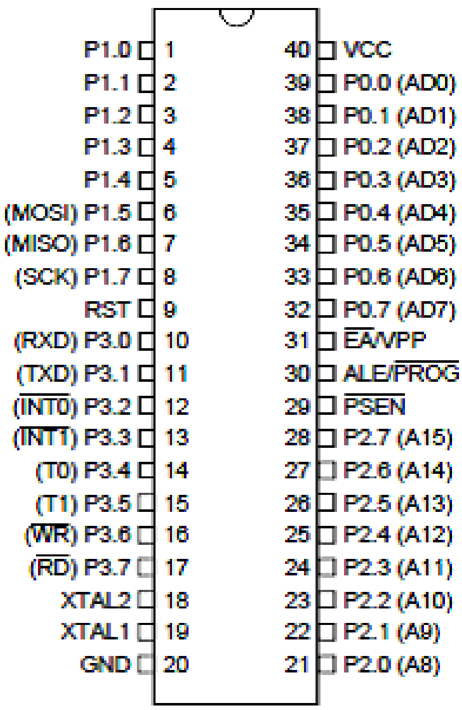

Fig: 1.1.1 Pin Configurations

BASIC CIRCUIT CONNECTION:

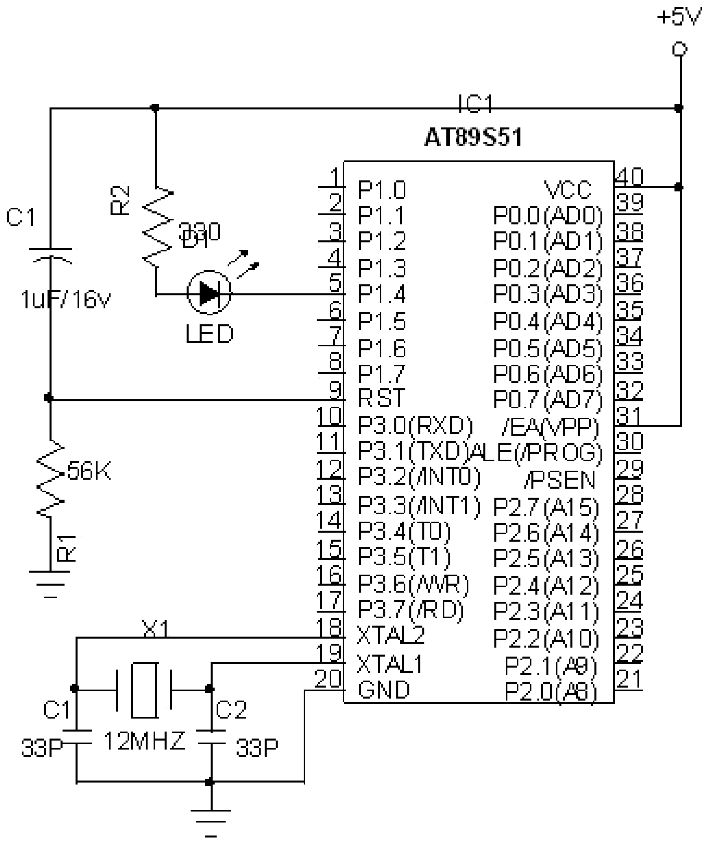

Fig: 1.1.2 Basic Circuit Connection

Table1- I Port Function

Port Pin	Alternate Functions
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{INT0}$ (external interrupt 0)
P3.3	$\overline{INT1}$ (external interrupt 1)
P3.4	T0 (timer 0 external input)
P3.5	T1 (timer 1 external input)
P3.6	$\overline{WR}$ (external data memory write strobe)
P3.7	$\overline{RD}$ (external data memory read strobe)

LITERATURE SURVEY

1. Joaquín Granado, Jorge Chávez, Antonio Torralba, and Ana Cinta Oria

Airfield ground lighting (AGL) systems are responsible for providing visual reference to aircrafts in the airport neighborhood. In an AGL system, a large number of lamps are organized in serial circuits and connected to current regulators that supply energy to the lamps. Controlling and monitoring lamps (including detection and location of burnt-out lamps) are critical for cost-saving maintenance and operation of AGL systems. Power line Communications (PLC) is an attractive technology to connect elements of the AGL, reusing the power distribution cable as a transmission medium. PLC technologies avoid the installation of new wires throughout the airport infrastructure. This paper proposes a new model for power-line communication links in AGL systems. Every element (isolation transformer, primary circuit cable, and lamps) has been analyzed in laboratory and modeled using SPICE. The resulting models have been integrated to build a complete power-line link model. Simulation results are compared to experimental results obtained in real conditions in the Airport of Seville (Spain).

2. Mirela Bejleri, Vladimir A. Rakov, Fellow, IEEE, Martin A. Uman, Fellow, IEEE, Keith J. Rambo,

The interaction of rocket-triggered lightning with an airport runway lighting system has been studied. The lighting system included a buried counterpoise with attached vertical ground rods for protection of the series lighting cable from lightning. Experimental data for voltages and currents at various locations in the runway lighting system due to direct lightning strikes are presented along with the causative lightning current. The data include the first measurements of the responses of an underground bare conductor (counterpoise) to direct lightning strikes. These measurements can serve as ground truth for the testing of the validity of various counterpoise models.

3. Sangkil Kim, Student Member, IEEE, Apostolos Georgiadis, Senior Member, IEEE,

This paper demonstrates the design of an 800-MHz solar-powered active wireless beacon composed of an antenna and an integrated oscillator on a low-cost paper substrate. Inkjet printing is used to fabricate the conductive circuit traces and the folded slot antenna, while the oscillator circuit is designed using off-the-shelf components mounted on the paper substrate. Flexible, low-cost, amorphous silicon (a-Si) solar cells are placed on top of the slot ground and provide autonomous operation of the active circuit eliminating the use of a battery. A prototype is built and characterized in terms of phase noise, radiation patterns, and the effect of solar irradiance. Such low-cost flexible circuits can find significant applications as beacon generator circuits for real-time identification and position purposes, wearable bio monitoring as well as solar-to-wireless power transfer topologies. The measured phase noise is 116 dBc Hz at 1-MHz offset, while drain current is 4 mA and supply voltage is 1.8 V.

4. Saraf, N. ; Electron. Dept., Univ. of Mumbai, Mumbai, India ; Salvi, R. ; Salunkhe, N. ; Sahasrabuddhe, R

The system is provided for continuous operation, fed through constant current regulators and series circuits, and could be remote controlled by means of a wireless computerized system. The system is easily transportable housed inside containers transportable by trucks and/or aircrafts. Inside the container the equipment are stowed in wooden boxes, easily lifting by hand. The accessories necessary for the fixation of the fittings to the ground are contained in one metallic box only. The cable leads are wound on suitable steel spools, which can be stowed one over the other. The constant current regulators are contained inside a cabinet with control board. Suitable versions with single constant current regulators and separated control board are available. The installation is very quick because each light fitting includes the isolating transformers and all the cable leads are provided with moulded FAA L-823 connectors.

EXISTING METHOD

Airfield ground lighting (AGL) systems are responsible for providing visual reference to aircrafts in the airport neighborhood. In an AGL system, a large number of lamps are organized in serial circuits and connected to current regulators that supply energy to the lamps. Controlling and monitoring lamps (including detection and location of burnt-out lamps) are critical for cost-saving maintenance and operation of AGL systems. Power line Communications (PLC) is an attractive technology to connect elements of the AGL, reusing the power distribution cable as a transmission medium. PLC technologies avoid the installation of new wires throughout the airport infrastructure.

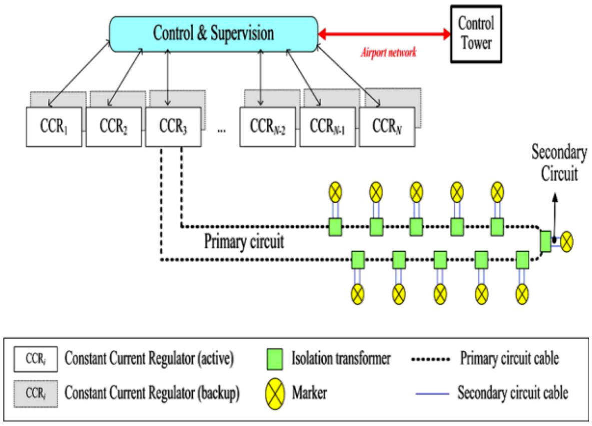

Fig 3.1 Block diagram of Existing system of airport lightning system

This system proposes a new model for power-line communication links in AGL systems. Every element (isolation transformer, primary circuit cable, and lamps) has been analyzed in laboratory and modeled using SPICE. The resulting models have been integrated to build a complete power-line link model. Simulation results are compared to experimental results obtained in real conditions in the Airport of Seville (Spain).

Problem Statement

The analysis of the system is based on simulink model. The simulink model is error free but practically it has high variation about data predication.

Objective:

The main objective of the system is to design a remote airfield light system for unmanned local airport operation. The operation of the light control is based on environment light intensity variation

PROPOSED SYSTEM

The core this project is to automate the airfield by providing adequate visualization of the lights in the landing runways. In current system there is no power management in lightning in runways, so that the power loss is going occurred as well as in poor weather conditions the vision of the runway will become poor that will occur problems in landing of flights. So that providing adequate lighting to these airfields is necessary and challenging. The findings from the RALS research specified a light that had low power needs and a color/intensity to meet the requirements for airfield identification and landing. To make these lights more appropriate to wide spread applications, including both automatically/remotely switching on/off the lights under the control of a microcontroller. For sensing the visualization here we are utilizing humidity sensor, temperature sensor and light density sensor are used according to the data from sensors the microcontroller, will manipulate how much density of light should be provide to the airfield.

TRANSMITTER:

The transmitter unit consists of matrix keypad, HT12E encoder, RF 434MHZ transmitter module, IC 7805 regulator and 9V battery. The pilot is pressing the keys for searching the runway path of local airport for landing the flight in emergency period. Each press of the matrix key generates the digital data '0'. The output of the digital data is applied to the input of the HT12E encoder. The encoder converts the serial data's into parallel data's. The encoded data's are propagate to free space with the help of RF434MHZ transmitting module. The IC 7805 regulator is used to produces the constant 5VDC for circuit operation. The battery unit supplies the power to the circuit.

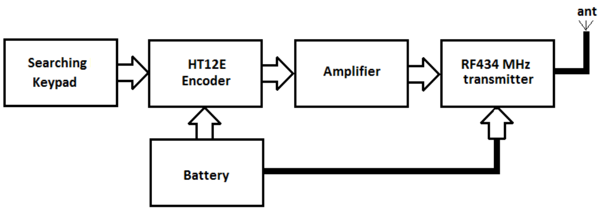

Fig: 4.1 functional block diagram of the transmitter

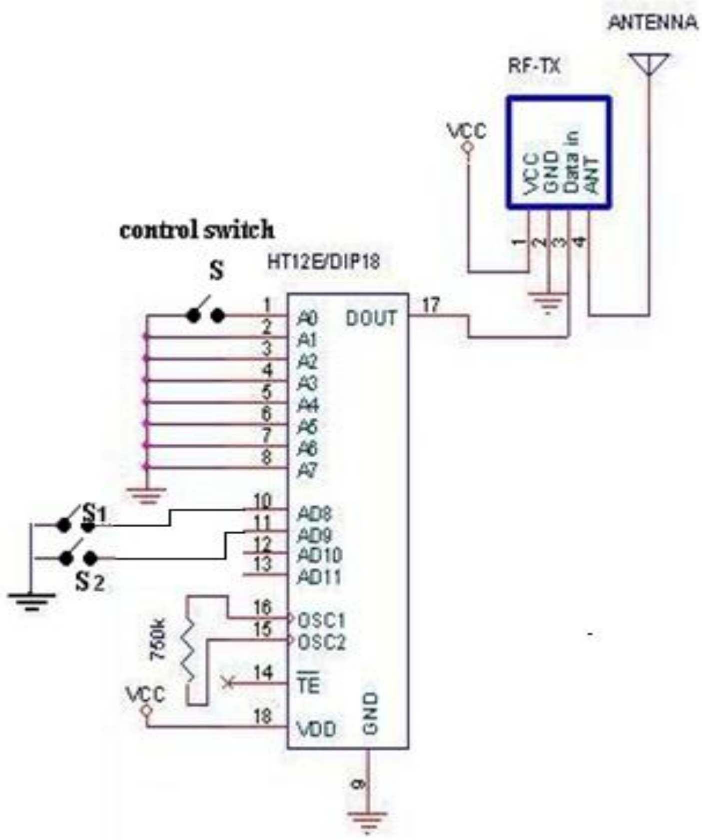

Fig: 3.3 circuit diagram of the transmitter

Circuit consists:

- Selection switches
- HT12E Encoder
- RF434 MHz transmitter
- 9V Battery
- 5V regulator (IC 7805)

RECEIVER (AIRPORT):

The receiver consists of AT89S52 microcontroller, RF 434 MHz receivers, LEDs, solar panel and charging circuit. Solar panel generates the DC electrical signal according to sun light as input. The output of the solar energy is stored in battery unit through charge control circuit. The free power is used to all airport operation. The RF 434 MHz receiver receives the data from transmitter. The received data is applied to the input of the HT12D decoder which converts the parallel data into serial data for controller operation. The controller activates the landing lights based on these data.

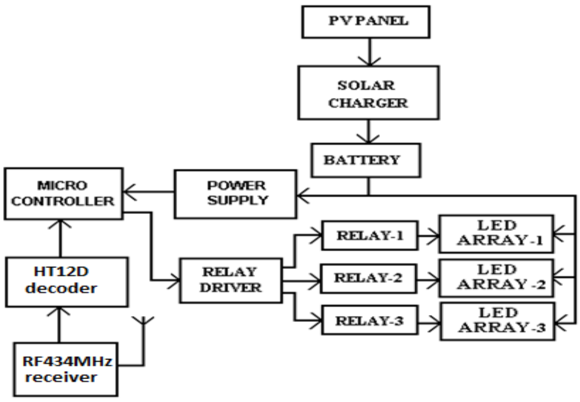

Fig: 4.2functional block diagram of the receiver (Airport)

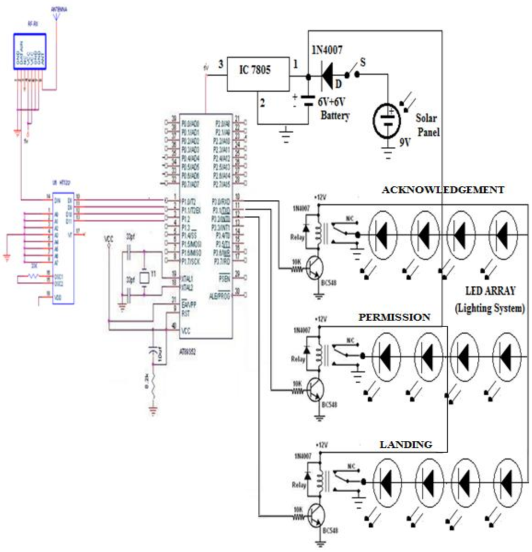

Fig: 4.3 circuit diagram of the receiver

Circuit consists:

1. Atmel Microcontroller.
2. RF 434 MHz Receiver
3. HT12D Decoder
4. Solar panel Battery
5. Charging Circuit

RESULT

Airfield lighting should be visible to both peripheral and foveal (central) vision: “Locate and identify” involves both peripheral detection and foveal examination; Airfield lights should not disappear when looked at directly. A system for mesopic photometry, developed earlier by the LRC, works well for specifying the spectrum of airfield lighting.

- Detection of airfield lighting is best described by a purely scotopic spectral sensitivity.

CONCLUSION

Many remote communities, such as those in Alaska, depend on air transport for business and emergency aid. Night landings at remote airfields are often dangerous. The LRC explored ways to help make night landings at remote airports safer and area communities more accessible. This project developed specifications for remote airfield lighting systems that optimize performance, minimize cost, are visually effective and reliable, use minimal energy, are easy to implement, and require low maintenance.