Warplane Security and Communication System using Li-Fi

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Abstract— **The steady increase in atmosphere, along with air service operators moderately adopting network technologies, has led to the transformation concept of e-Enabled or ''connected'' airplanes. This new substructure visualizes a single aeronautical data exchange structure connecting across the entire spectrum of the theory of flight sector. However, due to the complicated and multidimensional nature of aeronautical sunoperations, which even a one technology cannot solve the above problem. Instead, building an integrated system which uses multiple communication code of behaviour and architectures, as well as cloud computing and big data analytics, is the most promising way forward. At last this paper surveys the brand new technologies in rising network communication systems for commercial aeronautical industries. Arrange of cyber threats is then identified for the e-Enabled aircraft paradigm, followed by discussion son related solution methodologies. Note that the topics related to military aviation security are not considered here.**

Keywords—Security, connected aircraft, e-Enabled aircraft, aircraft communication, threats.

1. INTRODUCTION

Light Fidelity (Li-Fi) is a two way directional , rapid and fully networked wireless communication technology similar to wireless fidelity the term was stamped by Harald Haas and is a form of visible spectrum transmission and a fragment of optical communications through wireless and might be an accompaniment to Radio frequency communication , or even a replacement in contexts of data broadcasting. It is wire and ultra-violet visible-light transmission or infrared and near-ultraviolet as an alternative of radio-frequency spectrum, part of optical wireless communications technology, which carries more data and has been solved as a problem happened to the RF-bandwidth limitations.

Standards

802.11 protocols are used by Light-fidelity technology which is wireless same as Wi-Fi; but visible light communication are use in this technology instead of radio frequency waves, which has much wider bandwidth. EEE 802 work group established the communication protocols after modelled the part of VLC. In optical wireless communications field it fails to consider the trending technological developments, especially the data rates, multiple-access and energy efficiency are optimized by the optical orthogonal frequency-division multiplexing (O-OFDM) modulation methods.

The PHY I and PHY II are recognized by modulation formats which are on-off keying (OOK) and variable pulse position modulation (VPPM). The PHY I and PHY II layers are use the Manchester coding includes the clock inside the transmitted data by representing a logic 0 with an OOK symbol; and a logic 1 with an OOK symbol all with a DC component. In case of an extended run of logic 0's the DC component avoids light extinction.

The Consumer Electronics Show presented the world's first VLC smartphone in Las Vegas from January 7–10 in 2014.
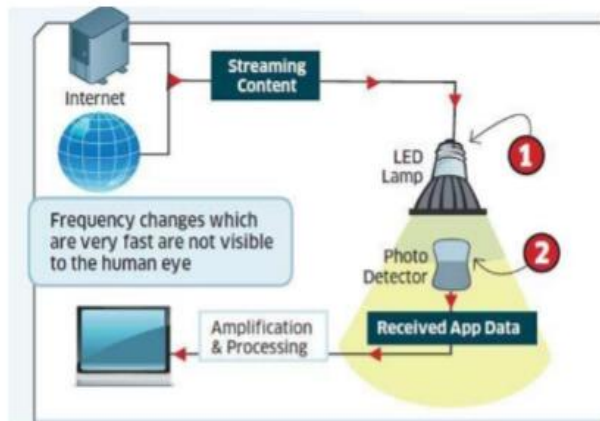
In watches and smartphones a small layer of crystal glass can be added that make them solar powered. Smartphones should earn 15% more battery power during a typical day. This technology should arrive in 2015 used by the world's first smartphone. The smartphone camera and the screen also receives the VLC signals. These screens cost per smartphone such as $2 or $3, much cheaper than most new technology.

Transfer of data from one place to another is one of the most important day-to-day activities. When multiple devices are connected our current networks which are connected to the internet are very slow. As the high number of devices that access the internet , it more and more complex to use high data transfer rates and connect to a secure network with the available fixed bandwidth. But, for data transfer the required radio waves are small part of spectrum available. Using of Li-Fi is the only solution for this problem. Li-Fi stands for Light-Fidelity. Li-Fi is transmission of data through

Radiance by taking the fiber, sending data through an LED light bulb that varies in power faster than the human eye can follow out of fiber optics. Some have used to map the fast and not expensed wireless communication system Li-Fi is the term which is the optical version of Wi-

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Fi. Visible light instead of Gigahertz radio waves used by Li-Fi technology for data transfer.

A German physicist, Harald Hass, introduced the idea of Li-Fi, which he also referred to as -data through illumination‖. Harald Haas was in his TED Global talk on Visible Light Communication using the first Li-Fi. According to Harald, the D-Light which is referred by him as a light, can be used to produce data rates higher than 10 megabits per second and it is much faster than our average broadband speed. Li-Fi can play a major role in relieving the high loads which the current Wi-Fi systems challenging since it adds a new and unutilized bandwidth of visible light to the trendy available radio waves for data transfer.

Block diagram of Li-Fi system

2.   SYSTEM ANALYSIS
2.1. EXISTING SYSTEM

Spread Spectrum Technique used by Ranging System and Vehicle to Vehicle Communication has been proposed. In this system, the target vehicle (Vehicle-B) gets the information from a source vehicle (Vehicle-A) and the distance between vehicles simultaneously. Though, in this system, the number of the target vehicle is exactly one. Even when interference signals exist, whether the proposed system is effective and that is confirmed by a computer simulations. A number of methods and protocols have not attained high location accuracy required for VANET safety applications. In existing system a smart home is implemented .That uses Li-Fi technology as medium of combination between all the connected devices and uses a sensor system based on Wireless Sensor Network. Li-Fi is a rapid-speed two-directional fully connected technology. In this system, illumination using LED light bulb are provides transmission of data. No one develop warplanes communication in war field.

VLC Using a CMOS

The standard photolithography techniques use by commercially available epitaxial wafers grown on c-plane sapphire substrates which are fabricated the micro -LED devices. Elsewhere, Further details of the device processing steps may be found . The micro-LED devices that had peak emission wavelengths such as 370, 405, 450 or 520 nm, respectively, with typical electroluminescence (EL) linewidths (full widths at half maximum) of the order of 20

nm. The devices consisted of an 8x8 array of individually-addressable pixels on a 200 m centre-to-centre pitch, with each row consisting of pixels of identical size, but columns containing the pixels with diameters that progressing from 14 m to 84 m with 10 m increments. Every pixel that shares a common n-contact which is electrically addressed by a contact 'ring' which surrounds the array. Each pixel that has its own individual 92x92 m p-contact pad to which it is connected by a metal track.

The relatively large separate p-pad allows an electrical contact to be made conveniently with the smaller area of micro-LED pixels. The layout of these 8*8 micro-LED arrays matches that of the 8 8 CMOS driver chip we have previously reported, and is also compatible with the layout of the 16x16 CMOS driver chip that to be discussed in this paper. The devices are in the 'flip-chip' format, that means the light is primarily extracted from the device via the transparent sapphire substrate.

A flip-chip bump bonding process that was used to physically and electrically contact the two chips together using Au bumps, such that every micro-LED was connected to its own individual CMOS driver. The 16x16 CMOS driver chip reported here is similar in its design and operation to the previously reported 8 8 chip. There are, however, some key enhancements that have been made. First of all, each driver is now 100x100 m on a 100 m centre-to-centre pitch (as opposed to 200x200 m on a 200 m pitch).
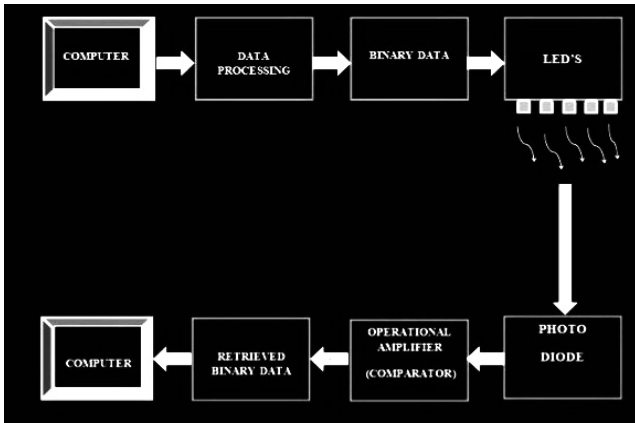
Thus the new CMOS chip contains a 16x16 array of individually-controllable drivers within the same area as the previous 8 8 CMOS driver array. Also, in the 16x16 CMOS devices each column of drivers can be modulated by a separate input signal. That allows the array to be driven with up to 16 independent parallel data channels simultaneously. From the I-V characteristics it can be observed that the smaller diameter pixels tend to have higher turn-on voltages than their larger counterparts, which may be attributed to the relatively larger dry-etching induced damage and/or poorer p-contact quality.

2.1.1. DRAWBACKS
- A light source is mandatory for an Internet. Li-Fi could be used within the distance limit.
- Since Li-Fi uses spectrum light, and the light cannot transmit through walls, the signal's range is limited by the physical barriers.
- Other sources of light may interfere with the other signal. One of the biggest potential disadvantages is the interception of signals in outdoors. Sunlight will interfere the signals, that resulting in interrupted Internet.
- A whole new infrastructure for Li-Fi that would need to be constructed.

2.2. PROPOSED SYSTEM
- In this proposed system we will implement LI-Fi communication in war planes at war field
- Li-fi is a most secured communication. It will communicate between device to device and also monitoring sensor data's

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BLOCK DIAGRAM

2.2.1. ADVANTAGES:

- More security
- Immediate action
- Everyone will use
- Hacking process avoided

3.   IMPLEMENTATION

3.1. MODULE

- Data processing
- Binary data
- Led
- Photo diode
- Operational amplifier

3.1.1. DATA PROCESSING

- A data processing system is a group of machines, people, and processes that for a set of inputs produces a predefined set of outputs.
- The inputs and outputs are interpreted as facts, data, information etc.
- It is depending on the interpreter's relation to the system.

3.1.2. BINARY DATA

- The Module for Binary formats lets you work with any type of such messages.
- Binary bodies of HTTP requests are converted to the hexadecimal representation.
- You can edit it and insert variables containing hexadecimal code of session-specific binary values.

3.1.3.LED:

- LED Modules offer a fully integrated solution that is also a sorce for transmit the data(light source, driver, optics, thermal) to get LED luminaires to market faster.
- LED Accessories are complementary parts used in LED luminaire designs and optimized for Cree LEDs and LED modules and these are not expensive.

3.1.4.PHOTO DIODE

- Photodiode module is a high-precision photodetector that integrates a Si photodiode and a current-to-voltage amplifier.
- The output from the photodiode module is an analog voltage and can be easily checked with a voltmeter, etc.

3.1.5. OPERATIONAL AMPLIFIER

- An operational amplifier (often op-amp or opamp) is a DC-coupled high-gain electronic voltage amplifier with a differential input and, usually, a single-ended output.
- Operational amplifiers had their origins in analog computers, where they were used to perform mathematical operations in many linear, non-linear, and frequency-dependent circuits.

Construction of Li-Fi System

Li-Fi is a fast and cheap optical version and replacement of Wi-Fi. It is based on Spectrum Light Communication (VLC).VLC is a data transition medium, which uses spectrum light between 400 THz (780 nm) to 800 THz (375 nm) as optical carrier that used for illumination and data transmission. That uses rapid pulses of light to transmit information through wirelessly.

The main components of Li-Fi system those are as follows:

a) A high luminated white LED which acts as transmission source.

b) A silicon photodiode with a good response to visible light as the receiving element.

LEDs can be switched on and off to generate digital strings of different combinations of 1s and 0s. To generate a new data stream, that the data can be encoded in the light by varying the flickering rate of the LED. The LEDs can be used as a sender or source or transmitter , by altering the LED light with the data signal. The LED output appears constant to our eye by virtue of the rapid flickering rate of the LED. Transition rate that is greater than 100 Mbps that is possible by using rapid speed LEDs which is the help of various multiplexing techniques. VLC data rate that can be grow by parallel data transmission using an array LED,s that transmits a different data stream.

The Li-Fi emitter system that consists of 4 primary subassemblies.

a) Bulb

b) RF power amplifier circuit (PA)

c) Printed circuit board (PCB)

d) Enclosure

The PCB controls the electrical inputs and outputs of the houses and lamp the microcontroller used to manage different lamp functions. A RF (radio-frequency) signal

that is generated by the solid-state PA and is guided into an electric field about the bulb. The highly concentration of energy in the electric field that vaporizes the contents of the bulb to a plasma state at the bulb's center; this controlled plasma generates an intense source of light. All of these subassemblies are contained in an aluminum enclosure.

The bulb sub-assembly that is the heart of the Li-Fi emitter. It consists of a sealed bulb that is embedded in a dielectric material. This design is more reliable than conventional light sources and that insert degradable electrodes into the bulb. The dielectric material serves two purposes. It also acts as an electric field concentrator that focuses energy on the bulb.

There are various inherent advantages of this approach which includes excellent color, high brightness quality and high luminous efficacy of the emitter –within the range of 150 lumens per watt or greater. The architecture that one is mechanically robust without typical degradation and that is a failure mechanism associated with tungsten electrodes and glass to metal seals, resulting in useful lamp life of 30,000+ hours. In addition, the unique combination of high temperature plasma and digitally controlled solid state electronics results in an economically

A repository architecture for an IDE

produced family of lamps scalable in packages from 3,000 to over 100,000 lumens.

3.2. CONFIGURATION

3.2.1. HARDWARE SYSTEM CONFIGURATION:-
- Processor - Pentium –IV
- RAM - 4 GB (min)
- Hard Disk - 20 GB
- LiFi transmitter
- LiFi receiver

3.2.2 .SOFTWARE SYSTEM CONFIGURATION:-
- Operating System : Windows 7 or 8
- Application : PYTHON IDLE
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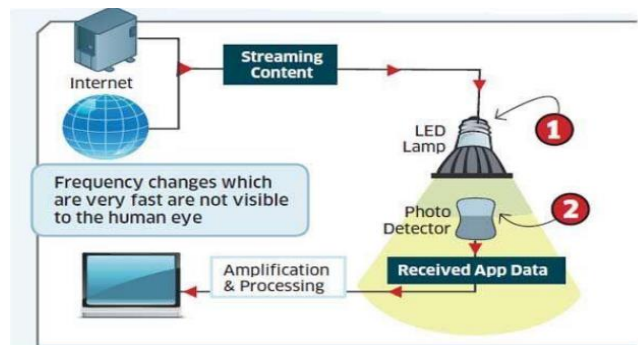## 4. ENVIRONMENT
4.1.HARDWARE ENVIRONMENT

4.1.1. LI-FI
Light Fidelity (Li-Fi) is a two way directional , rapid and fully networked wireless communication technology similar to wireless fidelity the term was stamped by Harald Haas and is a form of visible spectrum transmission and a fragment of optical communications through wireless and might be an accompaniment to Radio frequency communication , or even a replacement in contexts of data broadcasting. It is wire and ultra-violet visible-light transmission or infrared and near-ultraviolet as an alternative of radio-frequency spectrum, part of optical wireless communications technology, which carries more data and has been solved as a problem happened to the RF-bandwidth limitations.

4.1.2. Block diagram of Li-Fi system
The data that can be encrpted to the light by varying the flickering rate at which the LED's flicker on and off to produces different strings of 0s and 1s. The LED intensity is altered so rapidly that our eye cannot notice, so the light of the LED appears constant to humans. Light-emitting diodes that can be switched off and on faster than our eye can detect, causing the light source to appear to be on continuously.

The off-on activity of the bulb which seems to be invisible enables data transmission using binary codes: switching on an LED is a logical '1', switching it off is a logical '0'. By varying the rate at which the LED's flicker off and on, information can be encoded in the light to different combinations of 0s and 1s. This method of using rapid pulses of light to transmit information wirelessly is technically referred to as Visible Light Communication (VLC), though it is famously called as Li-Fi..
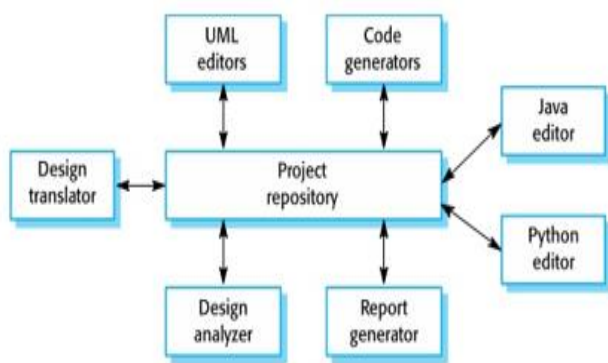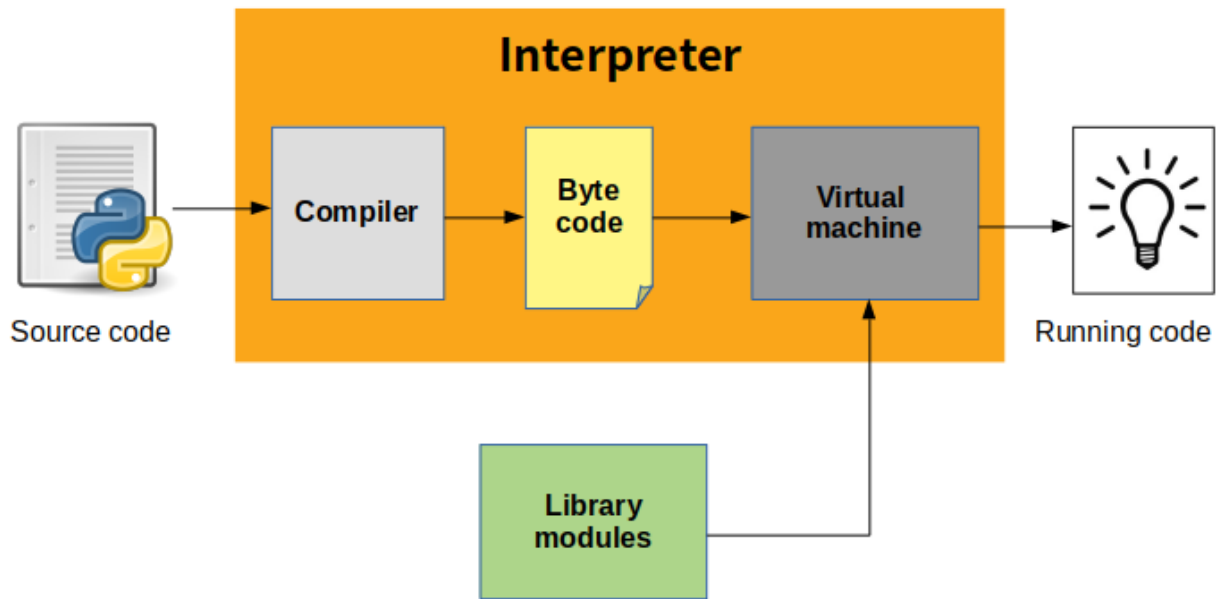

4.2. SOFTWARE ENVIRONMENT
4.2.1. Python Technology:
Python is an high-level, interpreted, general-purpose programming language. Python supports multiple including procedural, programming paradigms, functional programming and object-oriented. Python is often described as a **"batteries included"** language attributable to its comprehensive standard library.

4.2.2 .The Python Platform:
The underlying platform's data used platform module in Python, such as, interpreter, system, and hardware version information. The module that includes tools to see the platform's hardware,

operating system, and interpreter version information where the program is running. There are four functions for getting data about the current Python interpreter. The python version tuple () and python version() that returns different versions of the interpreter with minor, major patch levels. Python compiler() that provides on the compiler used to build the interpreter. And python build () that gives a version string for the build of the interpreter. Platform () that returns string containing a general purpose platform identifier. The function accepts two optional Boolean arguments. When terse is true, then that returns a minimal value with some parts dropped

It is not only a language but also more it is a technology platform that has come together through a greatest collaboration from thousands of individual professional developers forming a huge and peculiar community of aficionados

4.2.3.OPEN-SOURCE AND FRIENDLY COMMUNITY

As stated on the official website, that is developed under an OSI-approved open source license, making it freely distributable and usable. Additionally, the development is driven by the community, organizing conference and actively participating, hackathons, meet-ups, etc. fostering friendliness and knowledge-sharing.

4.2.4.LIMITATIONS

There are some problems that the error checking of the compiler package. The interpreter detects the syntax errors in two phases. One set of errors is detected by the interpreter's parser, the other set of error's by the compiler. The compiler package that relies on the interpreter's parser, so it get the first phases of error checking for free. It implements that the second phase itself, and that implementation is incomplete.

4.2.5.DEVELOPMENT ENVIRONMENTS:

Most Python implementations (including CPython) include a read–eval–print loop (REPL),

permitting them to function as a command line interpreter for which the user enters statements sequentially and receives results immediately. Other shells, including IDLE and IPython, add further abilities such as auto-completion, session state retention and syntax highlighting.

5. IMPLEMENTATIONS

Reference implementation

C Python that is the reference implementation of Python. It is written in C, meeting the C89 standard with some select C99 features. It compiles Python programs into an intermediate bytecode which is then executed by its virtual machine. CPython is distributed with a large standard library that written in a mixture of C and native Python. It is available for many platforms, including Windows and most modern Unix-like systems. Platform portability that was one of its earliest priorities.

Other implementations

- PyPy, which is a fast, compliant interpreter of Python 2.7 and 3.5. Its just-in-time compiler that brings a significant speed improvement over CPython but several libraries written in C cannot be used with it.
- Stack less Python, is a significant fork of CPython that implements micro threads.
- Circuit Python and Micro Python are Python 3 variants molded for microcontrollers. This includes Lego Mindstorms EV3.
- Rust Python, which is a Python 3 interpreter written in Rust.

Unsupported implementations

Python compilers have been developed, but some are now unsupported:

Unladen Swallow was a Google's project began in 2009, with the aim of improving its multithreading ability

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to scale to thousands of cores, of speed up the Python interpreter five-fold by using the LLVM, while ordinary implementations suffer from the global interpreter lock.

Psyco is a just-in-time specialising compiler that integrates with CPython and converts machine code from byte code at runtime. The emitted code is specialized for several data types and that is faster than standard Python code.

In 2005, Python interpreter for the Series 60 mobile phones released by Nokia named PyS60. The project that has been kept update to run on all variants of the S60 platform, and certain third-party modules are available. Python with GTK widget libraries are supported by the Nokia N900, enabling programs to be written and run on the target device.

Cross-compilers to other languages

There are several compilers to high-level object languages, with unrestricted Python, a restricted subset of Python, or a language similar to Python as the source language:

- Jython enables the use of the Java class library from a Python program.
- Iron Python follows a similar approach in order to run Python programs on the .NET Common Language Runtime.
- The RPython language can be compiled to C, and is used to build the PyPy interpreter of Python.
- Pyjs compiles Python to JavaScript.
- Cython compiles Python to C and C++.
- Numba uses LLVM to compile Python to machine code.

6. PERFORMANCE

A performance comparison of various Python implementations on a non-numerical (combinatorial) workload was presented at EuroSciPy '13.

API DOCUMENTATION GENERATORS

Python API documentation generators include:

- Sphinx
- Epydoc
- HeaderDoc
- Pydoc

7. CONCLUSION

E-Enabled aircraft paradigm is being developed to improved operational efficiency, reduce costs and streamline traffic management. This vision integrates many different types of communications technologies, such as wireless sensor networks, ADS-B, LDCAS, next-generation satellites, and ubiquitous IP-based networking. Therefore it is imperative to identify and address all types of cyber-threats facing emerging e-Enabled aircraft in order to ensure the continued safety of millions of travelers and workers across the world.

First time we implement this method in warplane communication during secret war missions. By using this technique the communication commands between the warplane must is secret.

FUTURE ENHANCEMENT

Within a few years, we expect to see LiFi in addition with other wireless complementary technologies to create a new ubiquitous computing platform. Under this forthcoming integration, every device large enough to mount a LED and a light sensor can be connected and powered by LiFi. This paper points out the LiFi's state-of-the art development, strengths and weaknesses of the technology as well as the challenges still in front of the fully developed LiFi network. So far, the VLC standard needs to be enhanced to cover the latest improvements of LiFi taking into account the wide spread interest for this technology as a feasible substitute of Wi-Fi in certain places and situations. Since the main research nowadays is focused on development of proper modulation techniques applied in LiFi system, we considered important to underline in this paper few of the most competitive ones developed so far

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