



ANGLE DIVERSITY RECEIVERS FOR MOBILE USERS THROUGH INDOOR MIMO VISIBLE LIGHT SYSTEMS

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ABSTRACT

This paper proposes two novel and practical designs of angle diversity receivers to achieve multiple-input-multiple output (MIMO) capacity for indoor visible light communications (VLC). Both designs are easy to construct and suitable for small mobile devices. By using light emitting diodes for both illumination and data transmission, our receiver designs consist of multiple photo detectors (PDs), which are oriented with different inclination angles to achieve high-rank MIMO channels and can be closely packed without the requirement of spatial separation. Due to the orientations of the PDs, the proposed receiver designs are named pyramid receiver (PR) and hemispheric receiver (HR). In a PR, the normal vectors of PDs are chosen the same as the normal vectors of the triangle faces of a pyramid with equilateral N-gon base. On the other hand, the idea behind HR is to evenly distribute the PDs on a hemisphere. Through analytical investigation, simulations and experiments, the channel capacity and bit-error-rate (BER) performance under various settings are presented to show that our receiver designs are practical and promising for enabling VLC-MIMO. In comparison to induced link-blocked receiver, our designs do not require any hardware adjustment at the receiver from location to location so that they can support user mobility. Besides, their channel capacities and BER performance are quite close to that of link-blocked receiver. Meanwhile, they substantially outperform spatially-separated receiver. This study reveals that using angle diversity to build VLC-MIMO system is very promising..

Keywords: ARM, PIC, LIFI and Keil Software.

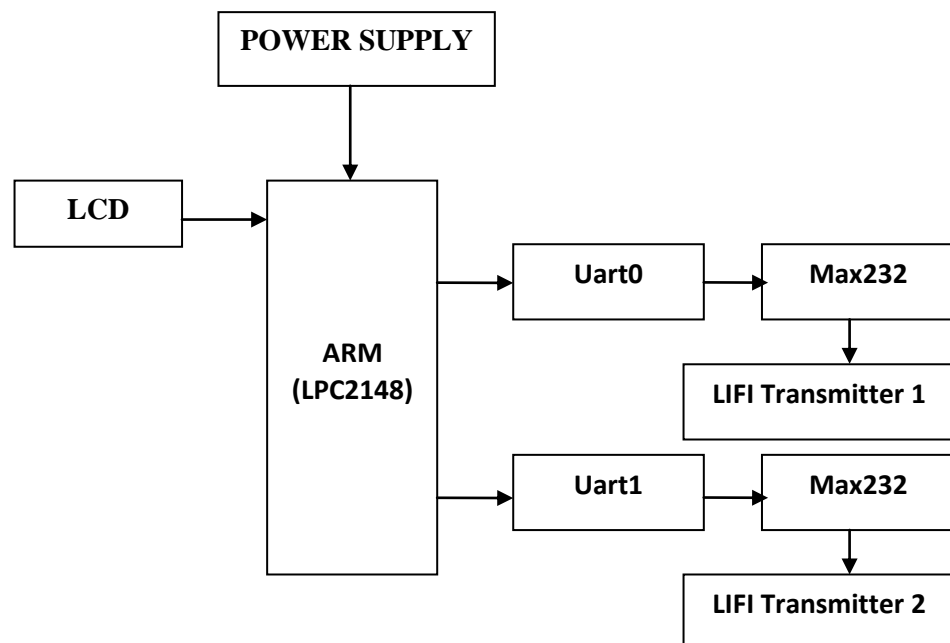
I INTRODUCTION

Existing and Proposed System

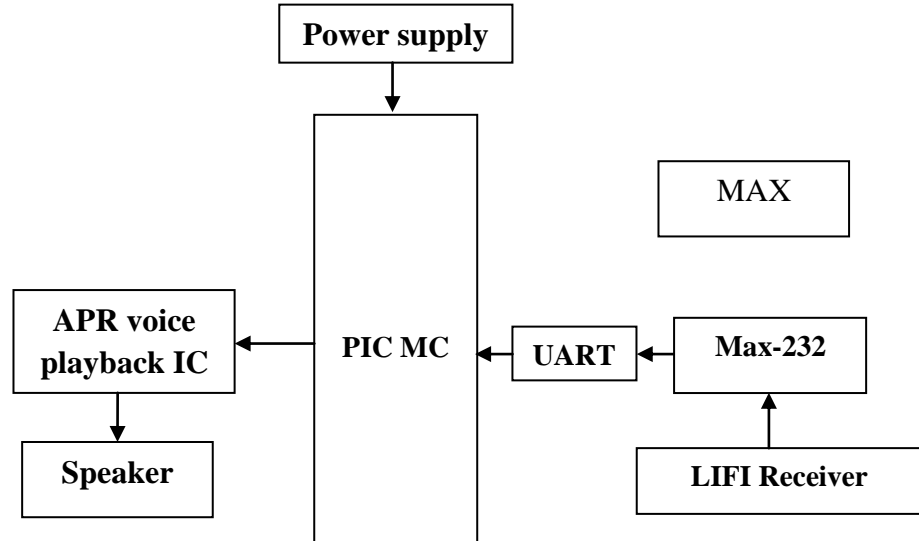
Existing system	Proposed System
<ul style="list-style-type: none"> ➤ In the golden days, the blind people need some other helps for navigation in indoor environment. ➤ But every often we asking the help to another is impossible. <p>Drawbacks</p> <ul style="list-style-type: none"> ➤ They need other help. ➤ There is no automatic system. ➤ Third person also make any misuse. 	<ul style="list-style-type: none"> ➤ Here we introduce a new technology in blind navigation system for blind people. ➤ LIFI technology is used to wide transmission of data without occurring of noise. <p>Advantages</p> <ul style="list-style-type: none"> ➤ The system automatically guide in indoor without any manual work. ➤ It secures blind person and reduces complexity of the person.

II BLOCK DIAGRAM

Indoor TX section



Blind person RX section



III WORKING PRINCIPLE

The proposed system can be used in situations where a house, hospitals that wherever the blind person are living in the place. The proposed system consists of indoor transmitter section and blind person receiver section. The transmitter section is kept in the indoor and receiver section given to blind person. Whenever the LIFI receiver receives the data from transmitter section, then it gives voice output using voice playback IC either that is hall or bed room. The entire control is managing by ARM and PIC microcontroller.

IV SCHEMATIC DIAGRAM

Indoor TX section

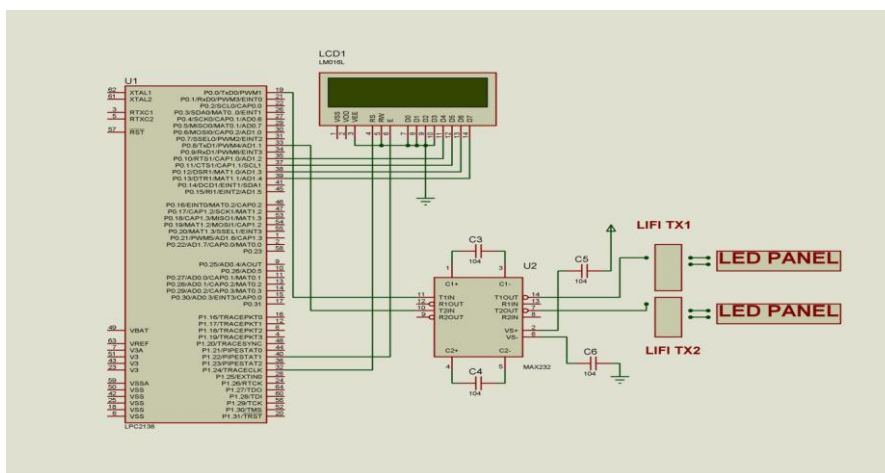


Figure 6.1: Interfacing at the INDOOR TX section

Blind person RX section

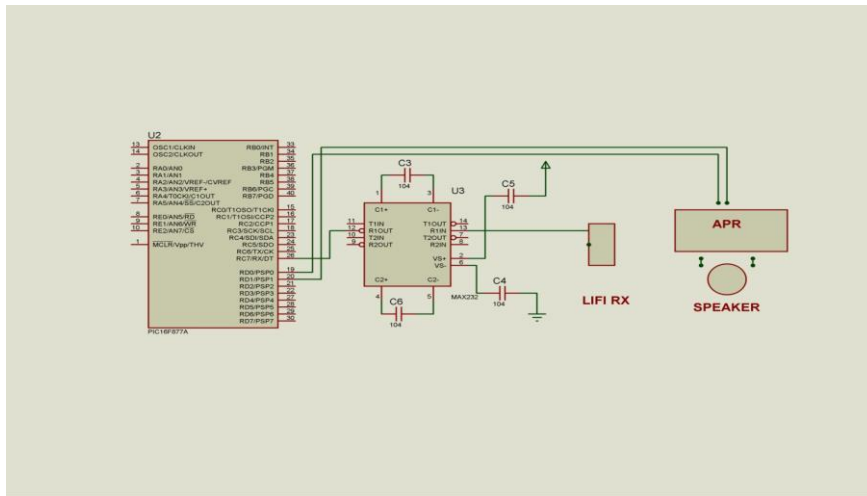


Figure 6.2: Interfacing at the Blind person RX section

V HARDWARE REQUIREMENT

- PIC microcontroller with power supply
- ARM LPC2148 microcontroller with power supply
- APR9600 voice play back IC
- Lifi transmitter and receiver
- LCD

VI SOFTWARE REQUIREMENT

- Keil IDE
- Embedded C

VII RESULTS

OUTPUT SCREEN SHOTS

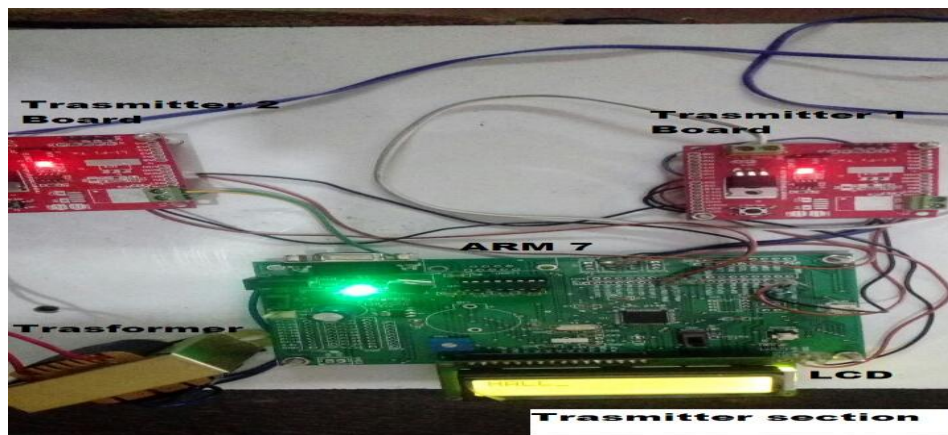


Figure7a: Trasmitter section with two trasmitter for Hall and Bed room

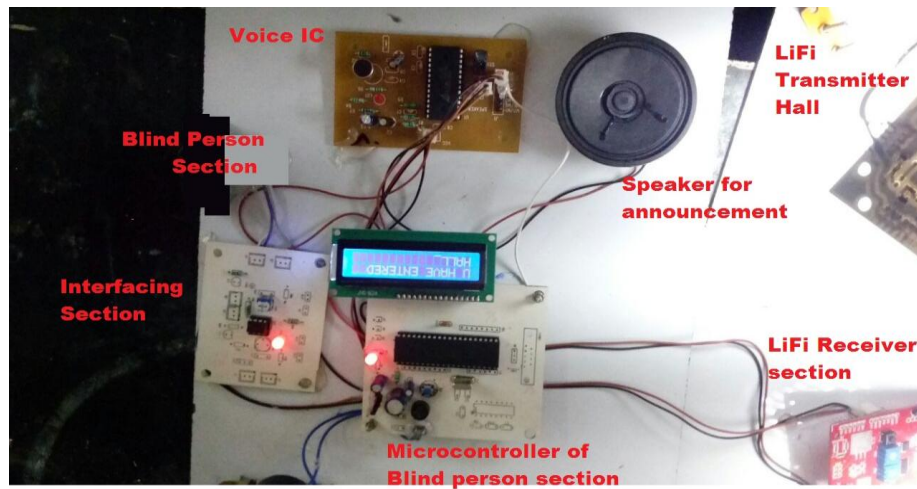


Figure 7b: Blind person section when enter in Hall area

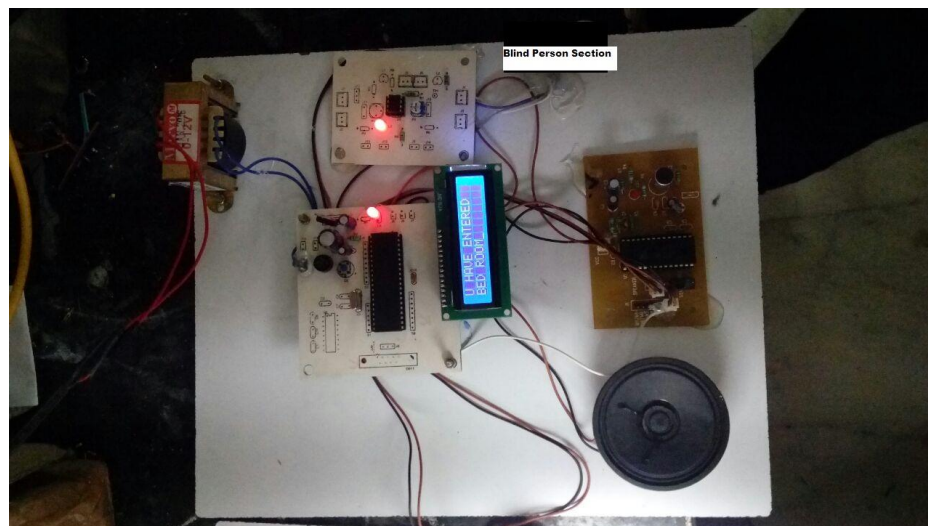


Figure 7c: Blind Section when enters in Bed room area

VIII ADVANTAGES

- Transmit data by sockets of existing light fixtures
- The system automatically guide in indoor without any manual work.
- It secures blind person and reduces complexity of the person.
- Consume far less energy
- Visible light is very safe for human. And, the data can be transmitted by the visible light communication even through a high voltage of home/office lighting.
- Security
- Alleviate a number of problems associated with radio frequency(RF) communication systems
- The lightings are set everywhere. Then, the data wireless transmission system can be easily established through the visible light communication device attached to the lightning.



IX APPLICATION

- Smart Lighting
- Mobile Connectivity
- Hazardous Environments
- Vehicle & Transportation
- Defence & Security
- Hospitals & Healthcare
- Wifi Spectrum Relief
- Aviation
- Underwater Communications
- Location Based Services

X CONCLUSION

In this paper, we proposed a new non-imaging receiver structure utilizing both-side mirror in order to enhance the system performance by interfering the reception of the light in one specific link as well as by enhancing the reception of light in another specific link. Our proposed MDR can further provide lower correlation of channel matrix while enhancing the channel gain itself. We analyzed and verified our proposed for a two-dimensional MIMO-VLC system. This paper proposes two novel and practical designs of angle diversity receivers to achieve multiple-input-multiple-output (MIMO) capacity for indoor visible light communications (VLC). Both designs are easy to be constructed and suitable for small mobile devices.

The proposed system can be used in situations where a house, hospitals that wherever the blind person are living in the place. The proposed system consists of indoor transmitter section and blind person receiver section. The transmitter section is kept in the indoor and receiver section given to blind person. Whenever the LIFI receiver receives the data from transmitter section, then it gives voice output using voice playback IC either that is hall or bed room. The entire control is managing by ARM and PIC microcontrollers.

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