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MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# School of Computer Engineering & Technology Synopsis

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**Group No: 47**

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**Project Title:** Design and implementation of Visible Light Communication Transceiver Pair using RPi, Camera and 8x8 LED matrix

**Project Domain :** Internet of things (IOT), Visible Light Communication

**Name of the External Guide:**
Dr. Sanket Salvi

## Abstract:

A key element of display-based optical camera communication is pattern recognition. Each pattern demands significant processing resources to decode. A growing number of Internet of Things (IoT) areas are interested in using optical camera communication (OCC) to offer non-radio frequency-based communication solutions. This OCC system is based on quantum chromodynamics (QCD) concepts and can provide user-centric multiple-input multiple-output (MIMO) capabilities. In order to obtain longer communication distance and effective pattern classification, Quantum Chromodynamics Inspired 2D Multicolor LED Matrix to Camera Communication. Using nested outer and inner patterns, custom patterns are created at the transmitter based on input data. For quicker decoding on the receiver side, inner and outer patterns are subjected to multi-threaded pattern matching simultaneously. The steps involved are encoding the bit pattern and decoding the same.

## Project Objectives:

Creating a trustworthy and secure system for uniquely identifying and accessing digital objects in a situation where conventional wireless communication methods like Wi-Fi or Bluetooth may not be appropriate or secure could be the goal of a project involving Object Recognition Engine technology using Li-Fi (Light Fidelity). Here is a project goal that is more specific:

To develop and implement an Object Recognition Engine system utilizing Li-Fi technology for the efficient and secure identification of digital objects in locations where traditional wireless technologies are constrained or security issues are present.

Using an 8 x 8 LED matrix and quantum chromodynamics principles, color map data, develop and test a simulator for the proposed QCD-inspired OCC modulation, and implement MIMO.

**Key Elements and Objectives:**

1. Li-Fi Integration: Create a system that incorporates Li-Fi technology to transport information between items and the object identification engine, providing high-speed and dependable communication even in environments with electromagnetic interference or dim lighting.

2. Algorithms for Object Recognition: Use cutting-edge computer vision and machine learning techniques to identify objects with high accuracy and in real time.

3. Real-Time Tracking: This feature enables the system to track the location and movement of recognized items in real-time, delivering location information and ongoing updates.

4. Diverse Object kinds: The Object Recognition Engine should be built to recognize and track a variety of object kinds, from straightforward forms to intricately detailed objects, making it adaptable for use in a variety of applications.

5. Performance in Low Light: Object recognition algorithms should be tuned to perform well in low light, enabling the system to function properly in areas with limited visibility.

**H/w & S/w Requirements:**

**Hardware:**

- 2 x Raspberry Pi
- 2 x 8*8 Light emitting diode (LED)
- 2 x Raspberry Pi Camera

**Software:**

- Python
- OpenCV

**Diagram: Overview of proposed QCD–OCC system.**