IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

Smart Courier System

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Abstract: *The advent of e-commerce has significantly increased the demand for efficient last-mile delivery solutions. Traditional courier systems often struggle to meet the growing demands of consumers, leading to delays, inefficiencies, and customer dissatisfaction. To address these challenges, this paper proposes a Smart Courier System (SCS) designed to optimize and streamline the last-mile delivery process. The SCS incorporates advanced technologies such as Internet of Things (IoT) to enhance efficiency, accuracy, and reliability throughout the delivery journey. Key components of the SCS include real-time tracking and monitoring. By leveraging these technologies, the SCS aims to minimize delivery times, reduce operational costs, and improve overall customer experience. Additionally, the paper discusses potential challenges and implementation considerations for deploying the SCS in real-world courier operations. Overall, the Smart Courier System presents a promising solution to address the evolving demands of the modern logistics landscape and pave the way for a more efficient and reliable last-mile delivery ecosystem. This document gives formatting instructions for authors preparing papers for publication in the International Journal. The authors must follow the instructions given in the document for the papers to be published. You can use this document as both an instruction set and as a template into which you can type your own text.*

Keywords: Internet of Things

I. INTRODUCTION

"Welcome to the future of courier services: introducing our innovative Smart Courier System. Revolutionizing traditional delivery methods, our system combines cutting-edge technology with unparalleled efficiency to streamline the delivery process like never before. Say goodbye to lost packages, and frustrating tracking experiences. With our Smart Courier System, reliability, speed, and convenience are guaranteed, ensuring a seamless experience for both senders and recipients.

II. IDEA OF PROJECT

Traditional Courier system often lack real time tracking capabilities, leading to uncertainties about the status and location of packages during transit and also manual handling of courier data results in error and inefficiency in monitoring. Without proper mechanism packages are at risk of being lost, stolen or misplaced during transit leading to financial losses and reputation damage for courier companies. To overcome these problems the smart courier system aim to real time monitoring of courier packages using IoT device technology equipped with RFID scanner, enabling stakeholders to monitor the status of the Courier throughout the delivery process.

DOI: 10.48175/IJARSCT-17579

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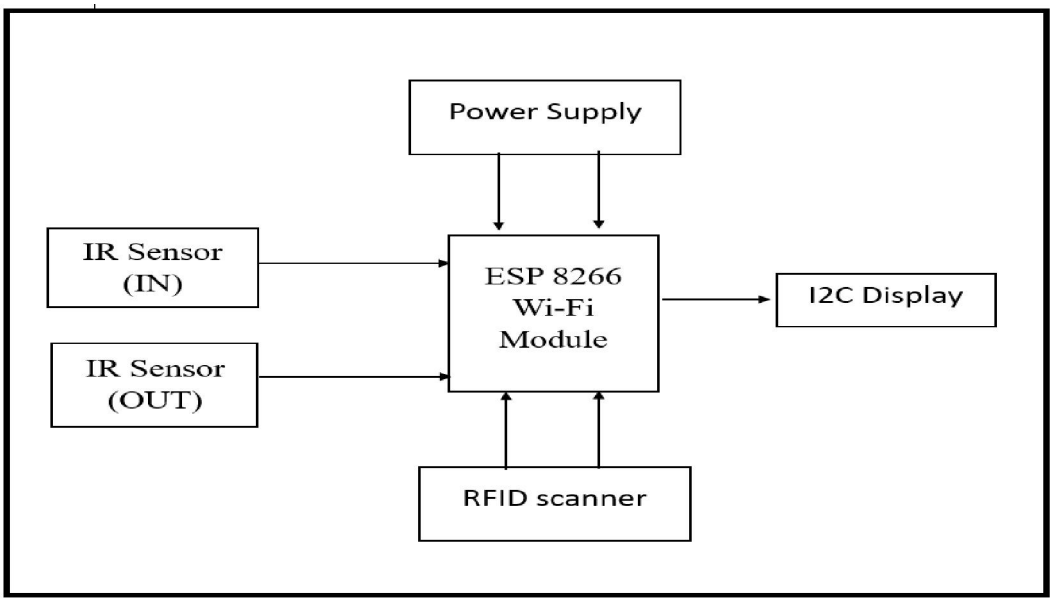
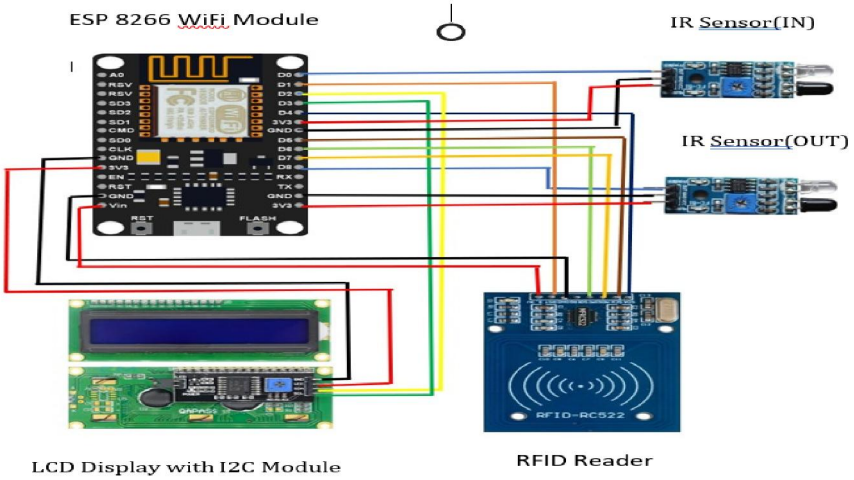
III. BLOCK DIAGRAM



IV. CIRCUIT DIAGRAM



V. HARDWARE DESCRIPTION

1.ESP 8266 Wi-Fi Module

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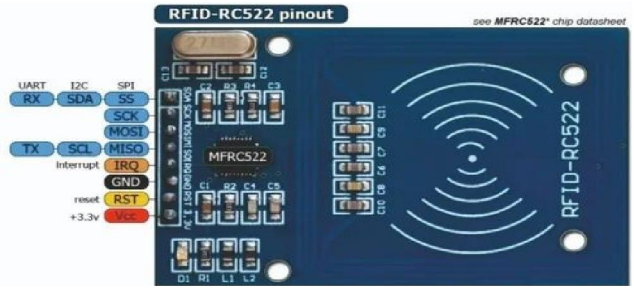
Node MCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Express if Systems, and hardware which is based on the ESP-12 module, The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi.It can be used with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or it can be used as a self-sufficient MCU by running an RTOS-based SDK.

Specifications

Node MCU ESP8266 Specifications & Features.
Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
Operating Voltage: 3.3V
Input Voltage: 7-12V
Digital I/O Pins (DIO): 16
Analog Input Pins (ADC): 1
UARTs: 1
SPIs: 1
I2Cs: 1
Flash Memory: 4 MB
SRAM: 64 KB
Clock Speed: 80 MHz

2.MFRC 522 RFID Reader



The MFRC522 RFID Reader module is designed to create a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags (ISO 14443A standard tags). The reader can communicate with a microcontroller over a 4-pin Serial Peripheral Interface (SPI) with a maximum data rate of 10Mbps. It also supports communication over I2C and UART protocols.The module comes with an interrupt pin. It is handy because instead of constantly asking the RFID module "is there a card in view yet? ", the module will alert us when a tag comes into its vicinity.
The logic level converter operating voltage of the module is from 2.5 to 3.3V, but the logic pins are 5-volt tolerant, so it can be easily connected to an Arduino or any 5V logic microcontroller without using any
MISO / SCL / Tx pin acts as Master-In-Slave-Out when SPI interface is enabled, acts as serial clock when I2C interface is enabled and acts as serial data output when UART interface is enabled.
MOSI (Master Out Slave In) is SPI input to the RC522 module.
SCK (Serial Clock) accepts clock pulses provided by the SPI bus Master i.e. Arduino.
SS / SDA / Rx pin acts as Signal input when SPI interface is enabled, acts as serial data when I2C interface is enabled and acts as serial data input when UART interface is enabled. This pin is usually marked by encasing the pin in a square so it can be used as a reference for identifying the other pins.

Specification

- Operating temperature is -20mbit/s.
- Shipping weight is 0.07.
- Data communication speed is10mbit/s

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LCD display with I2C Module

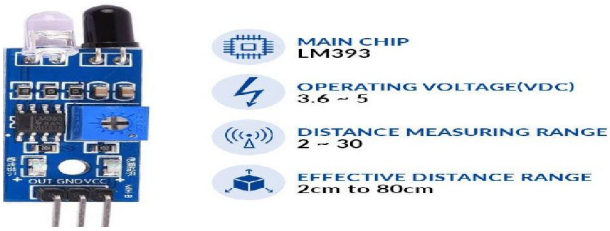
LCD stands for Liquid Crystal Display. LCD is a flat-panel display. It uses liquid crystals combined with polarized to display the content. LCD uses the light modulation property of LCD.LCD is available both in Monochrome and Multicolor. It cannot emit light directly without a backlight. In some LCDs, It displays the content only with the help of a backlight in a dark place.

I2C or IIC stands for Inter-Integrated Communication. I2C is a serial communication interface to communicate with other I2C devices. I2C uses multi-master / multi slave method. I2C uses 2 lines named SCL and SDA for transmission/reception and another 2 lines for power supply and ground. Each and every I2C device has I2C address to identify. I2C addresses of multiple devices may have the same address. The address is in the format of "0x20". The serial Clock (SCL) pin is to synchronize the transmitter and receiver. serial Data (SDA) pin is to transfer data

I2C Serial Interface Adapter The 16 pins for connect to 16x2 LCD and the 2 pins out of 4 pins are SDA and SCL. SDA is the serial data pin and SCL is the clock pin. The rest 2 pins for power supply (Vcc and ground). There is a POT on the I2C Module. We can control the contrast of the LCD display by rotating this POT.

Specifications

- Supply voltage: 5V.
- Interface: I2C/TWI x1, Gadgeteer interface x2.
- Adjustable contrast. I2C Address:0x20-0x27(0x20 default)
- Back lit (Blue with white char color)
- Size: 80x36x20mmz(3.1x1.4x0.7in)



IR Sensor

Sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the **infrared spectrum,** all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength used as infrared sources.

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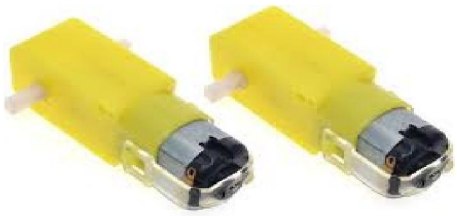
The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response.

Specifications

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Range: Up to 20cm
- Adjustable Sensing range
- Built-in Ambient Light Sensor

Gear Motor



A gear motor is an electric motor and a power reducer combined into a single unit that reduces the number of revolutions but increases the torque of the operating shaft. Such gears for electric motors are often used in modern machines and mechanisms, it is universal for many types of equipment. Some hybrid models combine practicality and durability. The housing is made of plastic and the gears are made of metal. This design gives a minimum noise level during the operation of the devices, the voltage can be from 12 to 24 V.

A hybrid gear motor is considered the best option when it comes, for example, to household appliances. Without it, a cordless mixer, a portable music speaker, an electric toothbrush or electric razor, a car vacuum cleaner, and much more would not work. Even the device that automatically opens curtains or raises blinds has a gear motor.

Specifications

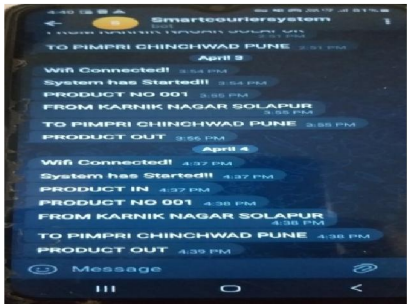
- 5VDC Operating voltage
- Speed 32 rpm to 400pmr
- Power 0.37km To 5.5kw
- Voltage 415/230Three phase

VI. WORKING

Working of Smart Courier system is illustrated in steps:

Step 1: When the Smart Courier system is connected Wi-Fi (Router). It sends message **"Wi-Fi is connected" and "System has Started"** on Mobile phone

Step 2: Courier box enters in the courier office. When courier enters we will assign a RFID card to the courier box. Which contains the whole information about the courier.



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Step 3 : Courier will detect by IR sensor which is placed at the entrance and It will display the message of **"Product IN"** on LCD display.

Step 4: Courier will scanned by the RFID scanner as soon as it gets scanned, system will send message on mobile phone and the message contains the whole information about the courier.

Step 5: When courier is dispatching it will again detect by the IR sensor and display the message "Product Out" also sends the message on mobile phone.

If the courier is lost, we are able to find the location where the courier is lost by checking the history of these message, and the gear motors are used for automatic elevator.

VII. ADVANTAGES

- **Efficiency:** Smart courier systems utilize advanced technologies such as real-time tracking. This leads to faster and more efficient delivery of packages, reducing transit times and improving overall operational efficiency.
- **Scalability and Flexibility:** Smart courier systems are often designed to be scalable and adaptable to changing business needs and delivery volumes. They can easily accommodate fluctuations in demand and scale up or down as required, providing greater flexibility for courier companies.
- **Cost-effectiveness:** smart courier systems can reduce labor expenses. This results in cost savings for courier companies and potentially lower shipping fees for customer

VIII. APPLICATION

- **E-commerce:** Smart couriers enable seamless delivery of online purchases, providing real-time tracking, delivery notifications, and secure package handling, enhancing the overall customer experience.
- **Healthcare:** Smart courier services play a crucial role in delivering medical supplies, lab samples, and medications efficiently.
- **Retail:** Retailers can use smart courier systems to manage inventory replenishment, return logistics, and store-to-store transfers, optimizing supply chain operations and reducing costs.
- **Financial services:** Banks and financial institutions can utilize smart courier services for transporting cash, documents, and valuable items securely between branches, ATMs, and customers.
- **Government services:** Governments can leverage smart courier systems for delivering documents, permits, licenses, and sensitive materials securely and efficiently.

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IX. FUTURE SCOPE

- **Environmental Sustainability:** Introducing eco-friendly packaging materials, electric delivery vehicles, and optimizing delivery routes to reduce carbon emissions and environmental impact.
- **Enhanced Tracking and Transparency:** Providing customers with real-time tracking updates, delivery notifications, and interactive maps for greater transparency and convenience.
- **Customer-Centric Solutions:** Offering personalized delivery options, such as flexible delivery times, location-based delivery, and hassle-free returns, to enhance the overall customer experience.

X. CONCLUSION

The implementation of a smart courier system offers numerous benefits, including enhanced efficiency, real-time tracking, improved security, and greater customer satisfaction. By leveraging technologies such as IoT, AI, and blockchain, companies can streamline operations, optimize delivery routes, and provide customers with transparent, reliable service. As e-commerce continues to grow, investing in a smart courier system becomes increasingly essential for staying competitive in the logistics industry and meeting evolving consumer demands.

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PROJECT IMAGE