IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁙ Peer-reviewed & Refereed journal ⁙ Vol. 11, Issue 5, May 2024

DOI: 10.17148/IARJSET.2024.11575

POWER OF PROXIMITY DEVICE TO DEVICE COMPUTING

Mrs. Kavyashree J[1], Adithya S[2], Ananya S N[3], C R Anusha[4], Sharath Kumar M B[5]

Assistant Professor, Department of Electronics and Communication Engineering, PES College of Engineering, Mandya, India[1]

Final Year UG Students, Department of Electronics and Communication Engineering, PES College of Engineering, Mandya, India[2-5]

Abstract: Significant safety concerns are associated with trekking in distant or difficult areas, as people are frequently at risk of getting lost or running into emergencies. This article suggests integrating Fog IoT technology into hiking GPS systems to provide real-time tracking and safety monitoring for trekkers in order to successfully address these difficulties. The approach entails the thoughtful placement of edge sensors and gateways along the hiking route in addition to the strategic deployment of IoT devices with GPS sensors on both trekkers and equipment. Strategically placed at vital junctures, fog nodes are essential for locally processing GPS data, allowing for quick analysis of planned route deviations and possible crises. By taking a decentralized method, latency is drastically decreased and bandwidth is preserved, guaranteeing effective data transfer to a central base station.

When possible problems are found in trekker GPS data, the base station acts as a complete command centre, making it easier to coordinate rescue efforts in reaction to alerts. To further improve overall safety and rescue effectiveness, the system keeps a library of past GPS data for post-event analysis, route optimization, and incident assessment. Even in the most distant and difficult environments, this integrated method significantly increases outdoor adventure security by streamlining resource utilization, strengthening safety procedures, and utilizing cutting-edge technology.

Keywords: Fog Computing, Cloud computing, Arduino IDE, IOT (Internet of Things), HTTP (Hypertext Transfer Protocol), etc.

I. INTRODUCTION

Two ideas serve as cornerstones of innovation in the rapidly changing field of modern technology: cloud computing and fog computing. An era where traditional local storage systems have been replaced by remote servers accessed through the internet has been ushered in by cloud computing, signaling a fundamental shift in the way data and programs are stored and accessed. Users now have unmatched flexibility and accessibility to their digital assets because to this transition.

On the other hand, fog computing—a pillar of the Internet of Things (IoT) revolution—offers a decentralized computing model that reallocates data storage and processing closer to the network's edge. Fog computing reduces latency and boosts efficiency by distributing processing power and storage capacity over local networks where Internet of Things devices are located, especially in situations with constrained bandwidth or connectivity.

But even with these advances in technology, the difficulties that come with outdoor activities still exist. Due to their isolated and unknown landscape, outdoor activities such as trekking carry a great danger to one's safety in case one gets lost or encounters an emergency. Time becomes an essential resource in such dire situations, and effective search and rescue efforts provide a lifeline for individuals in need.

The combination of IoT and fog computing technologies appears as a ray of hope in this scenario. Through the utilization of these advanced technologies, a system for tracking and locating missing people can be developed. The foundation for quickly and reliably locating lost people is real-time data gathered from IoT devices that are purposefully placed throughout hiking excursions.

In addition to streamlining rescue operations, this data-driven strategy guarantees the prompt and safe return of individuals in need of aid.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⩰ Peer-reviewed & Refereed journal ⩰ Vol. 11, Issue 5, May 2024

DOI: 10.17148/IARJSET.2024.11575

In fact, the cooperative combination of fog IoT solutions tackles the urgent problem of people becoming lost while hiking. This integration not only makes search and rescue activities more efficient, but it also increases outdoor explorers' safety and security. It changes the terrain of outdoor discovery by guaranteeing that the spirit of adventure is paired with a feeling of security and safety, enhancing the outdoor experience in its whole.

II. RESEARCH GAP

The investigation of the real-world uses and consequences of proximity-based device-to-device computing across a range of industries is the research gap for "THE POWER OF PROXIMITY DEVICE TO DEVICE COMPUTING". While a lot of study has been done on the advantages of device-to-device communication, comprehensive studies that concentrate exclusively on proximity-based computing are lacking populations or environmental conditions.

Additionally, there is a lack of holistic solutions that combine machine learning-based pest detection with IoT based security measures to provide real-time monitoring and intervention.

Bridging this gap requires developing algorithms capable of adapting to dynamic pest behaviours, integrating sensors and actuators for automated pesticide spraying, and implementing robust security protocols to protect IoT devices from cyber threats. By addressing these challenges, researchers can enhance the resilience of agricultural systems against emerging pests and diseases while ensuring the security and integrity of IoT-enabled technologies deployed in farm environments.

III. BLOCK DIAGRAM

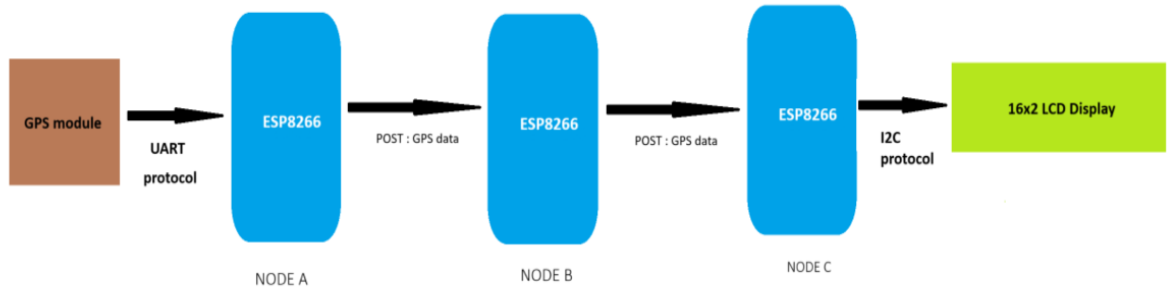

Fig. 1 Block Diagram

1.Normal Operation: Node-A: Connects to Node-C to serve as an access point and gathers GPS data via the NEO-6M module. Through a http post request, node A transmits the GPS data to node C.

Node-C: When Node-A is close by, Node-C shows the GPS data it has received on an LCD panel. It acts as the main hub through which GPS data from Node-A is received.

2.Emergency Situation:

When Node-A is unable to connect to Node-C because of distance or obstructions, Node-C connects to another access point, Node-B, after attempting to do so for 15 seconds.

Node-A starts an emergency procedure when an emergency button (SOS) connected to it is triggered.

Node-A transmits GPS data to Node-B via a POST request.

The data is sent from Node-B to Node-C, which then shows it on the attached LCD screen.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
Impact Factor 8.066 ⁒ Peer-reviewed & Refereed journal ⁒ Vol. 11, Issue 5, May 2024
DOI: 10.17148/IARJSET.2024.11575

IV. HARDWARE REQUIREMENTS

a. NodeMCU

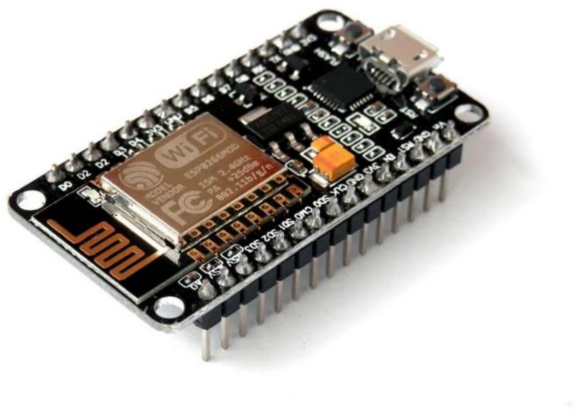

Fig. 2 NodeMCU ESP8266

The ESP8266 Wi-Fi chip is integrated into the open-source NodeMCU ESP8266 IoT platform. It makes it simple to connect to the internet and communicate with other devices. Lua scripting language is used to program NodeMCU, which makes developing Internet of Things applications easier. It supports interfaces including SPI, I2C, and UART and has GPIO pins for digital and analog input/output. NodeMCU is adaptable for a range of applications because it can be powered by an external battery or a micro USB. NodeMCU ESP8266 is well-liked by professionals, students, and hobbyists for IoT application and smart device prototyping because of its low cost and simplicity of usage.

b. neo-6m GPS

Compact and inexpensive, the NEO-6M GPS module is a GPS receiver that is frequently used for tracking and navigation purposes. It is equipped with the u-blox NEO-6M GPS chip, which offers quick and high-sensitivity satellite acquisition. The module uses UART serial connectivity to exchange data with computers or microcontrollers. It delivers precise position, velocity, and time data while concurrently receiving signals from up to 22 satellites.

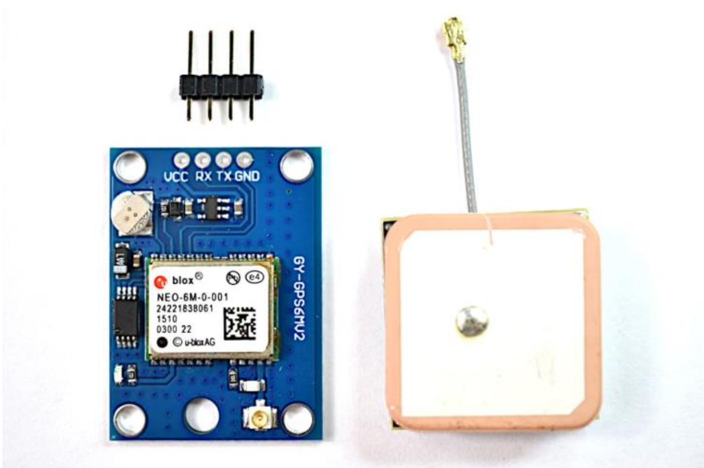

Fig. 3 neo-6m GPS

The NEO-6M module requires few external components to operate, making it simple to use. Because of its low power consumption, battery-powered applications can benefit from it. All things considered, the NEO-6M GPS module is a dependable and effective option for a range of GPS-based applications.

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁒ Peer-reviewed & Refereed journal ⁒ Vol. 11, Issue 5, May 2024

DOI: 10.17148/IARJSET.2024.11575

c. Single push Button

Fig. 4 Single push Button

A basic electromechanical component used to control or initiate operations in electronic circuits is a single push button. It has a button that, when depressed, momentarily completes an electrical circuit. Usually, this action is used to transmit a signal to a microcontroller or other circuitry so that it can carry out a particular task, like activating a motor, turning on a light, or communicating with a digital system.

Single push buttons are available in a range of sizes and forms, including latching and momentary versions. They are frequently utilized for user input and control in commercial products, DIY electronics projects, and prototyping.

d. 16X2 LCD Display

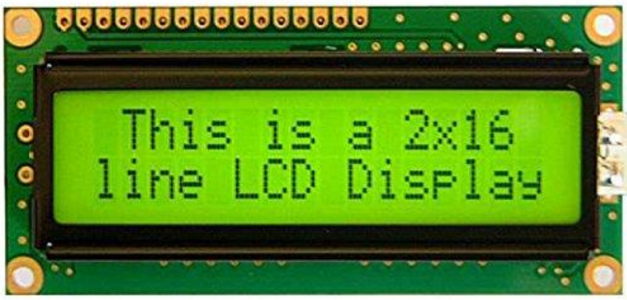

Fig. 5 16X2 LCD Display with I2C Communication

A common display module that combines a 16-character, 2-line display with an I2C serial interface adapter is the 16x2 LCD (Liquid Crystal Display) with I2C communication. This configuration simplifies the cabling by lowering the number of pins needed to link the LCD to a microcontroller or other device.

I2C interfaces are perfect for projects with few GPIO pins since they provide simple communication with the LCD using just two wires (SDA and SCL). The module can show unique patterns, symbols, and alphanumeric letters. Typically, it comes with a potentiometer for adjusting contrast. It is frequently utilized in do-it-yourself electronics projects and embedded systems.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 5, May 2024

DOI: 10.17148/IARJSET.2024.11575

V. SOFTWARE REQUIREMENTS

a. Arduino IDE

Fig. 7 Arduino IDE Application

The open-source Arduino IDE program is used to develop and upload code to microcontroller boards that are Arduino compatible as well as Arduino itself. It offers an easy-to-use interface, a set of libraries for dealing with hardware components, and a straightforward development environment for programming Arduino projects. Because it supports both C and C++, the IDE is used by both novice and expert programmers. It comes with tools to compile and upload code to the Arduino board, along with a text editor with syntax highlighting and auto-completion. All things considered, the Arduino IDE streamlines the code development and deployment process for Arduino-based projects.

b. HTTP Protocol

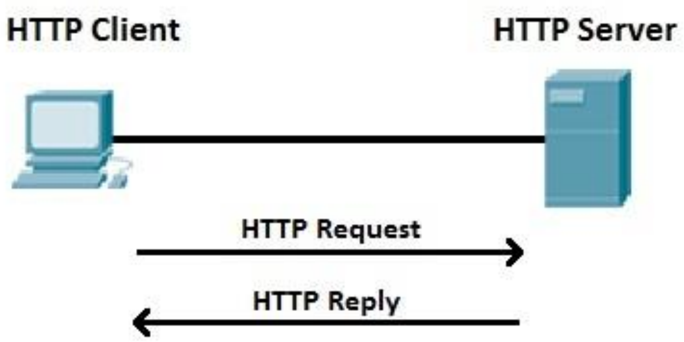

Fig. 8 HTTP Protocol

HTML and other hypermedia documents can be transmitted via the application-layer Hypertext Transfer Protocol (HTTP). On the World Wide Web, it serves as the cornerstone of data transfer. With HTTP, a client sends a request to the server, which processes it and responds to the client. This is known as the client-server model. Because the protocol is stateless, every request is made independently of the ones that came before it. HTTP normally runs on port 80 and use TCP as its transport protocol. It is compatible with multiple request protocols, including as GET, POST, PUT, and DELETE, allowing diverse kinds of communication.

VI. WORKING METHODOLOGY

1. Device Deployment for IoT:

Place wearable IoT devices with GPS sensors on hikers and/or their gear. Along with other pertinent information like temperature, altitude, and heart rate, these gadgets also record GPS locations.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 5, May 2024

DOI: 10.17148/IARJSET.2024.11575

2. Gateways and Edge Sensors:

Install gateways and edge sensors at key points along the trekking path. By gathering data from the IoT devices and transmitting it to the fog nodes, these devices serve as middlemen. Additionally, edge devices can filter and preprocess data to minimize the amount of information transmitted to the fog nodes.

3. Deployment of Fog Nodes:

Place fog nodes strategically along the trekking path. These fog nodes provide preliminary data analysis, aggregation, and storage in their capacity as local processing hubs. Trekkers and the rescue team can receive real-time information and anomaly detection via fog nodes. 4.
Data Processing and Analysis:

The GPS data is processed by fog nodes, which determine the separations between the trekkers' locations and the base station. In addition, they are capable of carrying out extra analysis on things like health tracking, terrain evaluations, and weather conditions. Planning a rescue and trekker safety depend heavily on this data.

5. Data Transmission:

Use low-latency, short-range communication protocols to send data from fog nodes to the base station, such as Bluetooth, Zigbee, or LoRa. This eliminates the need for long-range communication, which could have coverage problems or delays, and enables fast updates.

Base Station communication:

The base station functions as the main hub for coordination and command. It gathers information from fog nodes, analyses, it further if necessary, and gets in touch with authorities or rescue groups. In order to keep track of trekkers' whereabouts, it can also offer a real-time tracking interface.

Emergency Alerts:

Install a system that sounds an emergency alarm when a hiker's GPS data indicates that anything might be wrong, including straying from the intended route or being idle for an extended period of time. Quick action is made possible by the ability to send this alert straight to the rescue crew.

Data Storage and Analytics:

Save past GPS data from trekking activities for incident review, route optimization, and post-event analysis. When connectivity is available, fog nodes can also help with local data storage and the transfer of pertinent data to the cloud.
Through adherence to this methodology, the incorporation of Fog IoT into hiking GPS systems guarantees real-time tracking and safety monitoring, substantially augmenting the likelihood of prompt rescue and elevating trekkers' overall safety in isolated or demanding locations.

VII. RESULT & DISCUSSIONS

Enhancing trekker safety and rescue operations can be achieved by implementing the described process for incorporating Fog IoT in trekking GPS systems. Real-time position tracking is accomplished by attaching Internet of Things (IoT) devices with GPS sensors to hikers and their gear. This allows for the addition of vital environmental and health data. Smartly placed edge sensors and gateways reduce bandwidth consumption by enabling effective data collecting and preprocessing.

By enabling local data processing, analysis, and anomaly identification, fog nodes positioned in strategic locations give hikers and rescue crews fast information. Quick data transmission to the base station, where centralized coordination and additional processing take place, is ensured by using low-latency communication protocols.

Serving as a command center, the base station allows for automatic alert systems to quickly respond to situations and allows for real-time tracking of trekker locations.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 5, May 2024

DOI: 10.17148/IARJSET.2024.11575

In addition, the integration makes it possible to store previous data, which facilitates route optimization and post-event analysis. Trekking GPS systems can considerably improve safety results and trip experiences by utilizing Fog IoT technology to reduce dangers connected with distant locations. This all-encompassing strategy not only raises the likelihood of a prompt rescue but also gives hikers a sense of security, which motivates them to explore more difficult territory.

Fig. 11 Final Model

VIII. CONCLUSION

Trekking GPS systems with integrated Fog IoT provide a strong foundation for improving trekker safety and distant rescue operations. Trekking routes can be made to have real-time position tracking together with environmental and health monitoring by placing IoT devices, edge sensors, gateways, and fog nodes there. This technology makes it possible to detect anomalies in real time and send out alerts, which speeds up emergency response.

Efficient data transmission to the base station, where centralized coordination and additional analysis take place, is ensured by the use of low-latency communication protocols. The ability to store historical data facilitates route optimization and post-event analysis, which improve overall safety results.

All things considered, the incorporation of Fog IoT technology greatly enhances hikers' safety results, encouraging a sense of confidence and permitting more exploration of difficult terrains. This all-encompassing strategy not only raises the likelihood of a prompt rescue but also inspires adventurers to confidently take on remote hiking expeditions.

REFERENCES

[1]. Jorge Pereira [a], Leandro Ricardo [a], Miguel Luís [a], Carlos Senna [a], Susana Sargento [a b]Volume 94, May 2019, Pages 317-332 "Assessing the reliability of fog computing for smart mobility applications in VANETs"
[2]. Prosanta Gope [a b] Volume 86, September 2019, Pages 223-237 "LAAP: Lightweight anonymous authentication protocol for D2D-Aided fog computing paradigm"
[3]. Juan Luis Pérez, Alberto Gutierrez-Torre, Josep Ll. Berral, David Carrera Volume 87, October 2018, Pages 198-212 "A resilient and distributed near real-time traffic forecasting application for Fog computing environments"
[4]. Pedro H. Vilela [a], Joel J.P.C. Rodrigues [a b c d], Petar Solic [e], Kashif Saleem [c], Vasco Furtado [f] Volume 97, August 2019, Pages 379-386 "Performance evaluation of a Fog-assisted IoT solution for e-Health applications"
[5]. M. Bani Yassein, A. Al-zou'bi, Y. Khamayseh, W. Mardini Volume 3, Number 2, June 2009, Page 13 "Improvement on LEACH Protocol of Wireless Sensor Network (VLEACH)"
[6]. Munish Bhatia [a], Sandeep K. Sood [b], Ankush Manocha[c] Volume 160, 1 July 2020, Pages 521-533 "Fog-inspired smart home environment for domestic animal healthcare"

DOI: 10.17148/IARJSET.2024.11575

[7]. Wanqing Wu [a b], Sandeep Pirbhulal [a b c], Arun Kumar Sangaiah [d], Subhas Chandra Mukhopadhyay [e], Guanglin Li [a b] Volume 86, September 2018, Pages 515-526 "Optimization of signal quality over comfortability of textile electrodes for ECG monitoring in fog computing based medical applications"
[8]. Raafat O. Aburukba, Taha Landolsi, Dalia Omer Volume 180, 15 April 2021, Page 102994 "A heuristic scheduling approach for fog-cloud computing environment with stationary IoT devices"
[9]. Hisham A. Kholidy Volume 117, April 2021, Pages 299-320 "Detecting impersonation attacks in cloud computing environments using a centric user profiling approach"
[10]. R. Rapuzzi, M. Repetto Volume 85, August 2018, Pages 235-249 "Building situational awareness for network threats in fog/edge computing: Emerging paradigms beyond the security perimeter model"
[11]. Tse-Chuan Hsu [a b],Hongji Yang [c] ,Yeh-Ching Chung [d], Ching-Hsien Hsu [e f] Volume 28, December 2020, Page 100285 "A Creative IoT agriculture platform for cloud fog computing"
[12]. Quang Duy La [a 2], Mao V. Ngo [a b 1], Thinh Quang Dinh [a 2], Tony Q.S. Quek [a 2], Hyundong Shin [a 3] Volume 5, February 2019, Pages 3-9 "Enabling intelligence in fog computing to achieve energy and latency reduction"