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Green Hybrid Cloud Application: A Submersible Cloud Station For Monitoring Aquaculture

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ABSTRACT
One of the fastest-growing industries for delivering social and economic advantages to emerging and developing economies is Cloud computing. Cloud is spreading its wings across all areas, including medical, industrial, transportation, education, mining, and agricultural and aquaculture. It is now reaching ground level with its application in agriculture and aquaculture. Green cloud is an eco-friendly cloud infrastructure built to protect the aquatic environment from carbon footprints, excess thermal let-outs, pollutant hazards that bring an imbalance of aquaculture. A Hybrid cloud is a deployment model or structure that built an agile setup that enhances the existing setup rather than frequent construction, disturbing the serene aquatic culture. The cloud stations are on-premise monitoring systems that monitor the aquaculture OS (operating system) of a particular water boby.This paper deals with a hybrid cloud setup with an on-premise cloud station deployed in the water body and the private and public cloud anywhere on land. It enhances the monitoring and tracking of the aquatic culture of water from anywhere, anytime, any number of times with minimal cost and long durability.

Keywords: Green Cloud, Hybrid cloud, submersive cloud station, Aquaculture, ArcGIS, GIS

1. INTRODUCTION

In India's coastal regions, aquaculture is one of the essential activities. The main design concept is based on the criteria of safety, dependability, and expandable capacity. This study describes an underwater environment monitoring system that may be used with a Hybrid Green Cloud in-house in the sea and on offshore private and public clouds. The main design concept is based on the criteria of safety, dependability, and expandable capacity. In addition to collecting and transmitting data, modern underwater acoustic cloud stations can monitor signal propagation time and determine the distance between the transmitter and receiver. It depends on the amount of money made by aquaculture. The quality of the water has a significant impact on marine species' growth and development. Water quality degradation puts these species in peril and diminishes productivity. As a result, regular water quality monitoring is required and alerts aquaculture producers to take preventative measures. This

study looks at the design and construction of a water quality analysis for aquaculture. Aquaculture is a significant source of revenue for farmers in India's coastal region. India is the world's second-largest producer of total fish and home to more than 10% of the world's fish variety. In recent years, the quality of water in the country has a significant impact on the yield of aquaculture production. The water in lakes and ponds has deteriorated due to several factors, including human activities, rapid development of industries, environmental pollution, and agricultural waste. Such a decline is hampering the development and growth of marine species in the quality of water. Using physicochemical analysis, the current approach for determining water quality is taking a sample of water from a pond and getting it assessed in a neighboring laboratory. However, such a procedure is ineffective and time-consuming. Water's physical qualities alter as it travels from the pond to the laboratory. In the ponds, a legitimate quality of water monitoring system that balances aquaculture is required to take preventive measures quickly. It is now likely to provide alert messages and real-time monitoring to address social concerns because of improvements in information communication technology and the advent of ideas, including IoT devices, remote monitoring, and cloud services. The design process of a remotely and legitimate water quality analysis for aquaculture is described in this research. This research also includes a network analysis to ensure that the proposed water monitoring technique is executed efficiently and reliably.

2. RELATED WORK

The integration of technology such as cloud services and sensor networks has brought solutions to several challenges in both rural and urban settings. This section lists the work done in network analysis and discusses some of the models proposed in the aquaculture literature.

They developed a water quality system that relies on a wireless network. The authors created data management nodes, metadata unit nodes, and an intrusion detection centre. The data tracking nodes took temperatures & pH readings and passed them to the base station by means of the ZigBee network. The base station gathered the measured data and then transferred them to the control center via the GPRS network for more analysis and processing. Using the Raspberry Pi platform, I constructed a water quality monitoring system. The study assessed temperature, sedimentation, pH, chemical oxygen demand, and conductance. These data were sent to the IoTBridge server, a cloud platform, for further analysis through the Wi-Fi module.

In, a minimal system for tracking and assess the quality of freshwater at consumer locales was developed. The study takes temperature measurements, conductance, pH, ORP, as well as sedimentation. Through a Zigbee connection, the sensor data were recorded and was sent to the monitoring location. The readings were then transferred over the ethernet to the server. For subsurface surveillance, the authors developed wireless communication. The temperature in underground mine tunnels is measured using a system of mobile and static Zigbee nodes. For several cases, the authors explained network characteristics: received signal latency, intensity, and throughput.

The node was provided protective packaging to keep it safe from temperature, humidity, and dust extremes. The delay, obtained signal intensity, network quality indicators, and throughput of wireless links were all discussed. An experiment was carried out to see if there was a link between RSSI levels and node distance. All of the experiments were conducted at Osaka University's halls and conference rooms. The RSSI data were collected at

varying distances and averaged for each point using a packet delivered from the target node to the sink node.

In one environment, the design and implementation of a water quality monitoring system for aquaculture may be inappropriate, but not in another. This is due to changes in the environment, regional terrain, pond depth and size, and other factors that must be monitored.

3. RESEARCH IDEA

The primary purpose of this project is to develop and implement a system for assessing sea suitability for aquaculture that combines GIS software (ArcGIS) with an extensional matter-element model and the "platform plus plug-in" method. The evaluation system's three key areas of research and development. First, in ArcGIS Desktop10.2, the data needed for aquaculture marine evaluation will be formatted. Conversion, attribute editing, and uniform projection will be used to create a map plugin in ArcGIS, C #, and ArcGIS Add-in. Figure 1 illustrates the research topic.

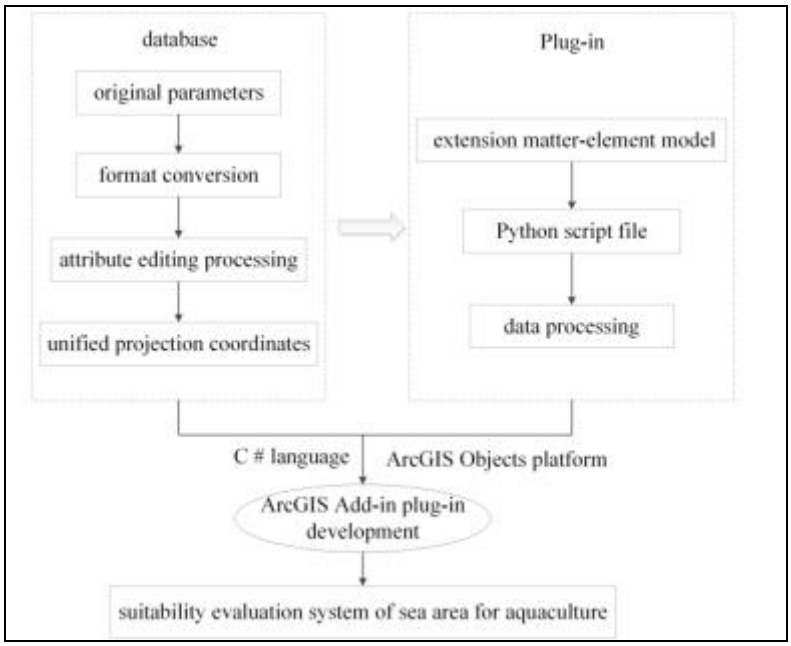

Fig.1 System design flow chart

Setting the working space, the input of evaluation index, custom evaluation technique, and the evaluation result output are the four main function modules of the software. The primary functions of each module are as follows:

1. **Creating a Working Environment:** Create the output path and Python path to realize the result graph's function and display different hierarchical evaluation types.
2. **Input for the path index, name index, weight index, and appropriateness level index:** This module enables the flexible addition and deletion of the parameter information such as path index, name index, weight index, and appropriateness level index.
3. **An evaluation system that is Customized:** The appropriateness evaluation model is built on top of this system. The software generates a marine suitability grade distribution map for aquaculture using an enhanced matter-element model and a preset assessment index system.

4. **Recommendations based on the evaluation findings:** The final suitability evaluation findings and the regional distribution of different levels of marine appropriateness are generated using a model. Aquaculture is represented in the evaluation area by a form. After that, the data is placed into a grid distribution map.

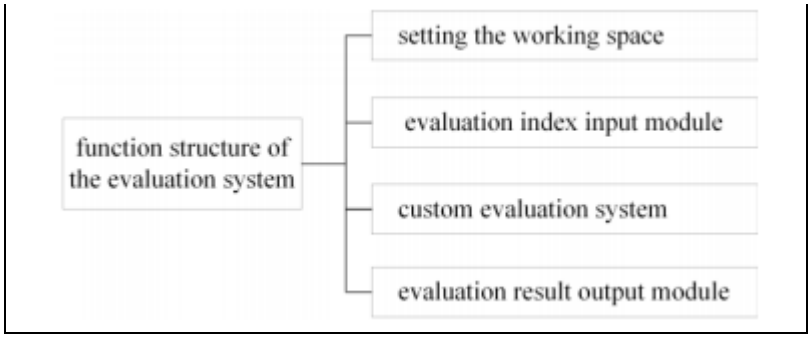

Fig.2 Module For Software Function

4. SYSTEM DESIGN AND EXECUTION

The green hybrid cloud has gained popularity in Gis project development in recent years as a way to optimize product design efficiency, refactoring, and system scalability.This technique streamlines the GIS system's secondary development process and makes it more flexible and expandable[12], opening new possibilities for creating aquaculture sea suitability evaluation plug-ins.

A. System development method selection :

Based on the system development demands analysis, this study opts for a development approach based on Python programming and ArcGIS Add-in. Python is a scripting language that works well with ArcGIS software. It has various advantages, including ease of use, lack of limitations, cross-platform compatibility, etc. The extended matter-element analysis model is implemented in the study using the Python programming language. Based on this foundation, using libraries third-party like GDAL & Numpy to handle raster data computations of key findings has a good calculating impact and efficiency. The extension matter-element evaluation model calculation programme is implemented as a system plug-in in ArcGIS desktop application ArcMap, using a C #+ ArcGIS Add-in development approach.

B. Implementation technologies that are critical:

1.) The extension matter-element analysis model is implemented on a computer.
2.) Plugin development for add-ins.
3.) Design of the evaluation factor input window.
4.) Calculation of the model and storing of the results.

SYSTEM APPLICATIONS

This article established a marine suitability evaluation method for aquaculture, as per the technical plan. The system interface is straightforward and user-friendly, with a high level of interaction and ease of use. The system has been used to evaluate the appropriateness of the sea for aquaculture. According to the verification results, the degree of conformity between the sampling values obtained and the assessment of the system findings is 86.33 percent, and The evaluation's fitness findings for aquaculture oceans are consistent and precise.

5. CONCLUSION

A "Green Hybrid Cloud" system framework is constructed utilizing plug-in technology in this study to aid in the building assessment system for the sea that is suitable for aquaculture keeping the base on the matter-element model extension, which is customized to the needs of the evaluation of the aquaculture suitable for Green Hybrid clouds are the future, we need to deploy an in-premise unit to enhance the monitoring system into a hybrid cloud deployment model. The following things are achieved through this model: firstly, agile structure for aquatic culture—secondly, high gain and effective monitoring. Thirdly since submerged in water, the cooling effect lowers stations heat elimination and enhances ecolabeling. Fourthly, it features more solar and energy absorption for effective functioning. Finally, it is cost-effective and enhances high reusability.

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