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A Smart Medical Monitoring Systems using Cloud Computing and Internet of Things

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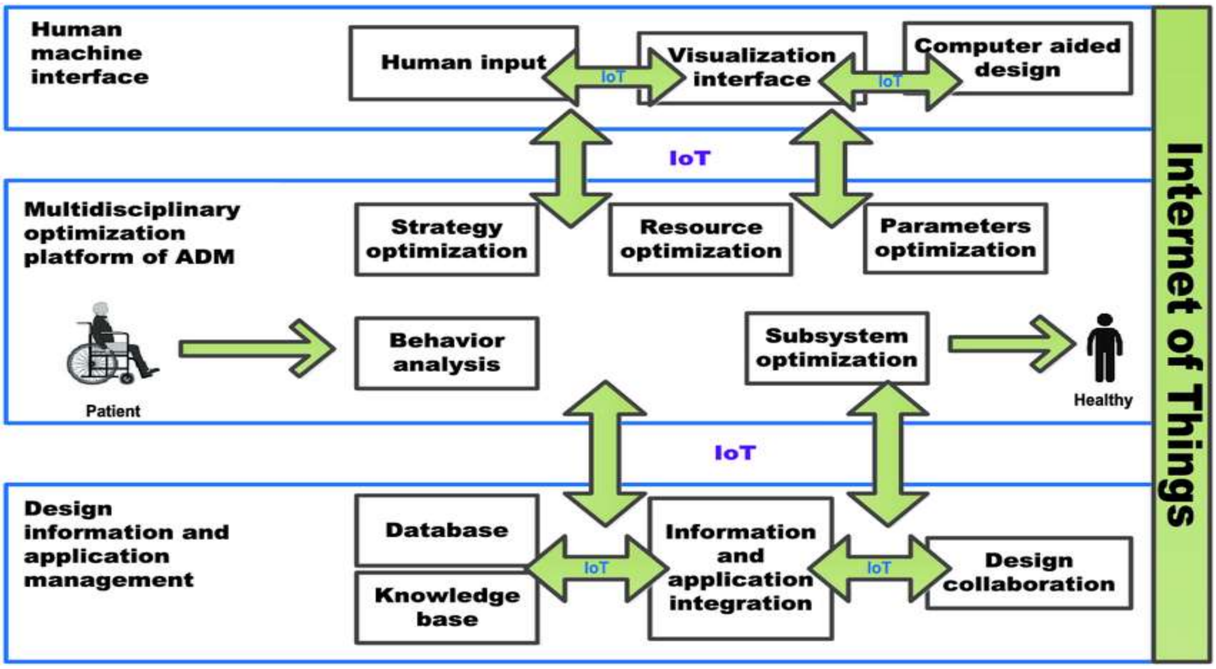
Abstract - With the ever-growing development of cloud computing and computer science technology, the amalgamation of IOT and cloud computing within the medical domain is urgently needed. The prior studies point to a greater on person development of the method, less research on the sector of medical monitoring and dealing with service software have been conducted. Therefore, on this paper, we look and examine the application of cloud computing and the Internet of Things in the field of medicine. Remote monitoring cloud platform architecture version (RMCPHI) set up scientific data within the first place and the RMCPHI architecture was analyzed. In the end, the effective PSOSAA algorithm proposed the hospital medical records service cloud system monitoring and management application. Experimental simulation shows that the proposed algorithm outperforms the alternative modern-day algorithms. Similarly, potential research areas are also discussed.

Introduction

Computing capability extends to objects, sensors and everyday items not normally considered computers, The term Internet of Things generally refers to scenarios where network connectivity and allowing these devices to generate, exchange and consume data with minimal human intervention. There is, however, no single, universal definition. IOT implementations use different technical communications models, each with its own characteristics. Four common communications models described by the Internet Architecture Board include: *Device-to-Device, Device-to-Cloud, Device-to-Gateway*, and *Back-End Data-Sharing*. These models highlight the flexibility in the ways that IoT devices can connect and provide value to the user. IOT implementations use different technical communications models, each with its own characteristics. Four common communications models described by the Internet Architecture Board include: *Device-to-Device, Device-to-Cloud, Device-to-Gateway*, and *Back-End Data-Sharing*. These models highlight the flexibility in the ways that IoT devices can connect and provide value to the user.The concept of combining computers, sensors, and networks to monitor and control devices has existed for decades. The recent confluence of several technology market trends, however, is bringing the Internet of Things closer to widespread reality. These include *Ubiquitous Connectivity*, *Widespread Adoption of IP-based Networking*, *Computing Economics*, *Miniaturization*, *Advances in Data Analytics*, and the *Rise of Cloud Computing*.

The Internet of Things (IoT) paradigm is based on intelligent and self-configuring nodes (things) interconnected in a dynamic and global network infrastructure. It speaks to a standout amongst the most troublesome advances which make the omnipresent and unavoidable registering scene. Web of things is typically alludes to this present reality and seemingly insignificant details restricted capacity and preparing capacity, and the critical issues about dependability, execution, security and protection. Then again, distributed computing has the practically boundless limit of capacity and preparing power which is a progressively develop innovation in any event to a limited degree to tackle the issue of a large portion of the Internet of things [1-3]. Subsequently, a novel IT worldview in which Cloud and IoT are two integral advances combined is relied upon to upset both present and future world. We call it Cloud-IoT new worldview. This paper surveys the writing reconciliation of distributed computing and Internet of things promising subject research and industry. We have led a survey work to propose an incorporated utilization of Cloud and IoT. We delineate the two points picked up prevalence over the most recent couple of years and the aggregate sum of papers taking care of with these two subjects, individually. The Internet of things is the age of data innovation. This is a noteworthy advancement in the field of data and transformation opportunity [4].

The commission believes that development of the Internet of things application will solve the problems of modern society in the future, [5] make a big contribution. Modern logistics use modern information technology in modern logistics management instruction. The three basic requirements are: good service, low cost, speed faster. Health information technology has a wide range of function in modern applications [6].



The Necessaries of the Integration

Both cloud computing and IOT have seen an independent evolution. However, plenty of common advantage is the result of their integration have been identified in literature, predict the future From one perspective, the Internet of things can profit by cloud practically boundless limit and assets to compensate for the specialized imperatives. In particular, distributed computing can give a viable answer for acknowledge the board of Internet administrations and structure and utilization of things or information applications. Cloud computing can benefit from the Internet of things, on the other hand, by extending its scope to deal with things in the real world more distributed and dynamic way, and to provide new services on a large number of real life scenarios. The complementary characteristics of cloud computing and Internet of things is attractive because of the different proposals reported in literature and encouraging Cloud-IoT paradigm shown in Table. Essentially, the Cloud acts as intermediate layer between the things and the applications, where it hides all the complexity and the functionalities necessary to implement the latter. Below, we summarize the problem and gain the advantage when using Cloud-IoT paradigm.

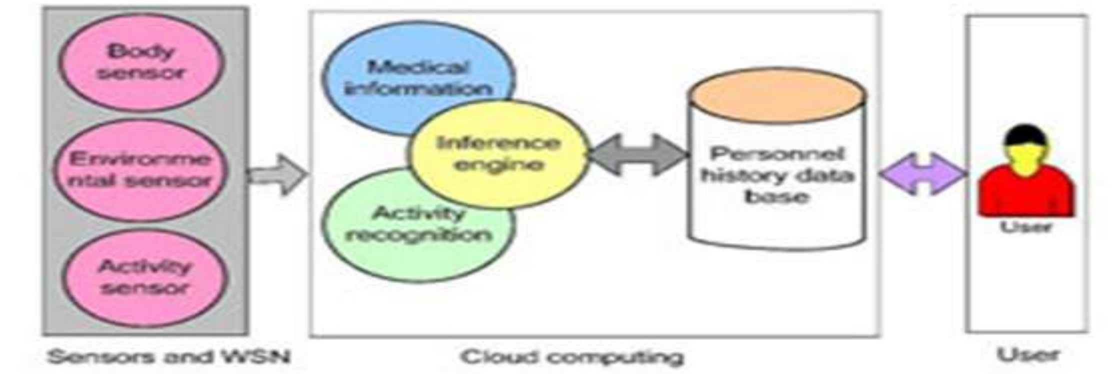
Internet of Things	**Cloud Computing**
Pervasive	Ubiquitous
Real world	Virtual resources
Limited computational	Unlimited computational
Limited storage	Unlimited storage
Point of convergence	Service delivery
Big data source	Means to manage big data

The Applications of the Integration

IOT includes by definition a lot of data sources. It creates a lot of unstructured or semi-organized information of the three major qualities of the information: volume, speed and assortment. Subsequently this implies the gathering, securing, preparing and representation, chronicle, share, seek a lot of information. Give practically boundless and on-request stockpiling limit, minimal effort, cloud is the most advantageous and cost-efficient answers for arrangement with the information created by the Internet of things [15]. This integration realizes a new convergence scenario, where new opportunities arise for data aggregation, integration, and sharing with third parties [16]. IoT and multimedia technologies have made their entrance in the healthcare field thanks to ambient-assisted living and telemedicine [17-20]. The adoption of Cloud in this scenario leads to the abstraction of technical details, eliminating the need for expertise in, or control over, the technology infrastructure. In addition, it makes the implementation of security (cloud) multimedia health services, to overcome the problem, on the device running a large number of multimedia & security algorithm with limited computing power and small batteries.

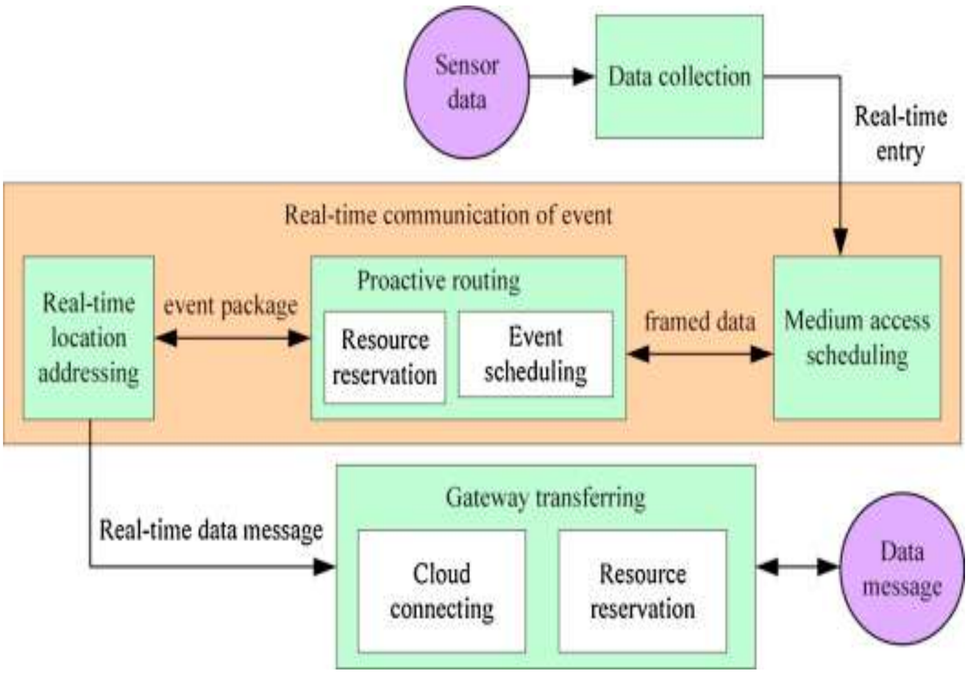
RMCPHI Architecture

The Remote Monitoring solution accelerator implements an end-to-end monitoring solution for multiple machines in remote locations. The solution combines key Cloud Computing services to provide a generic implementation of the business scenario. You can use the solution as a starting point for your own implementation and customize it to meet your own specific business requirements. Remote monitoring cloud platform of medical information includes body sensors, sensor networks, communication module, family gateway, medical information analysis and processing platform, the medical staff and so on.



The figure indicates the information flow chart from sensor information to statistics transferred by means of gateway. A few important research issues include real time location, routing, medium access scheduling, and so forth. Communication device can be soft real-time or difficult real-time. Real-time verbal exchange module is to create a real-time abstraction layer wishes to be disbursed real-time computing and real-time communication strategies inside the dynamic network topology.

Cloud assistance offers user applications, such as social networking, environment data analysis and monitoring the patient's health etc. Cloud computing plays an important role in support of different types of operating system platforms and provides high-performance computing technique.



The analysis of huge data sets produced by these sensors (*Big Data*) could allow quick and accurate decision making. For example, productivity improvements can be achieved by analyzing device performance and degradation for real-time feedback on configuration and optimization. This work proposes a Cloud-based architecture for Internet of Things (IoT) applications to improve the deployment of smart industrial systems based on remote monitoring and control. By using RMCPHI architecture we demonstrate the usage of the proposed subsystem. This approach includes layers for sensor network data gathering, data transformation between standard protocols, message queuing, real-time data analysis, reporting for further analysis, and real-time control. Particularly, by using the proposed architecture, we remotely monitored, controlled and processed data produced by the sensors.

Proposed Algorithm for monitoring

In the PSO algorithm, a particle is an independent agent which can search the problem space according to the experience of its own and its companions. As mentioned above, the former is the cognitive part of the particles update formula, and the latter is the social part. Both parts play keyrole in guiding the particles' search. Therefore, choosing the appropriate social and cognitive guide (g B e s t and p B e s t) is the key problems of the MOPSO algorithm. Selection of the cognitive guide conforms the same rule as that of the traditional PSO algorithm, and the only difference is that the guide should be determined in accordance with Pareto dominance.

In the PSO (particle swarm optimization) algorithm, a particle is an independent agent which can search the problem space according to the experience of its own and its companions. As mentioned above, the former is the cognitive part of the particles update formula, and the latter is the social part. Both parts play key role in guiding the particles' search. Therefore, choosing the appropriate social and cognitive guide is the key problems of the MOPSO algorithm. Selection of the cognitive guide conforms the same rule as that of the traditional PSO algorithm, and the only difference is that the guide should be determined in accordance with Pareto dominance. It is based on the idea of distributing the search procedure among a large number of "agents", which act independently of each other. Each agent moves through the search space with a simple dynamics, reacting to fictitious forces drawing it towards its own current best solution and the global best solution for the whole swarm. In this way, when an agent finds a better solution than the current global best, it becomes the new global best and all the other agents react instantly, the swarm is directed towards the new solution. For a set of n particles represented by their positions the velocity for the particle and the step is denoted as the following, and the position is denoted in

$$V_i^k = wV_i^{k-1} + c_1 r_1^k (X_B - X_i^{k-1}) + c_2 r_2^k (X_G - X_i^{k-1})$$

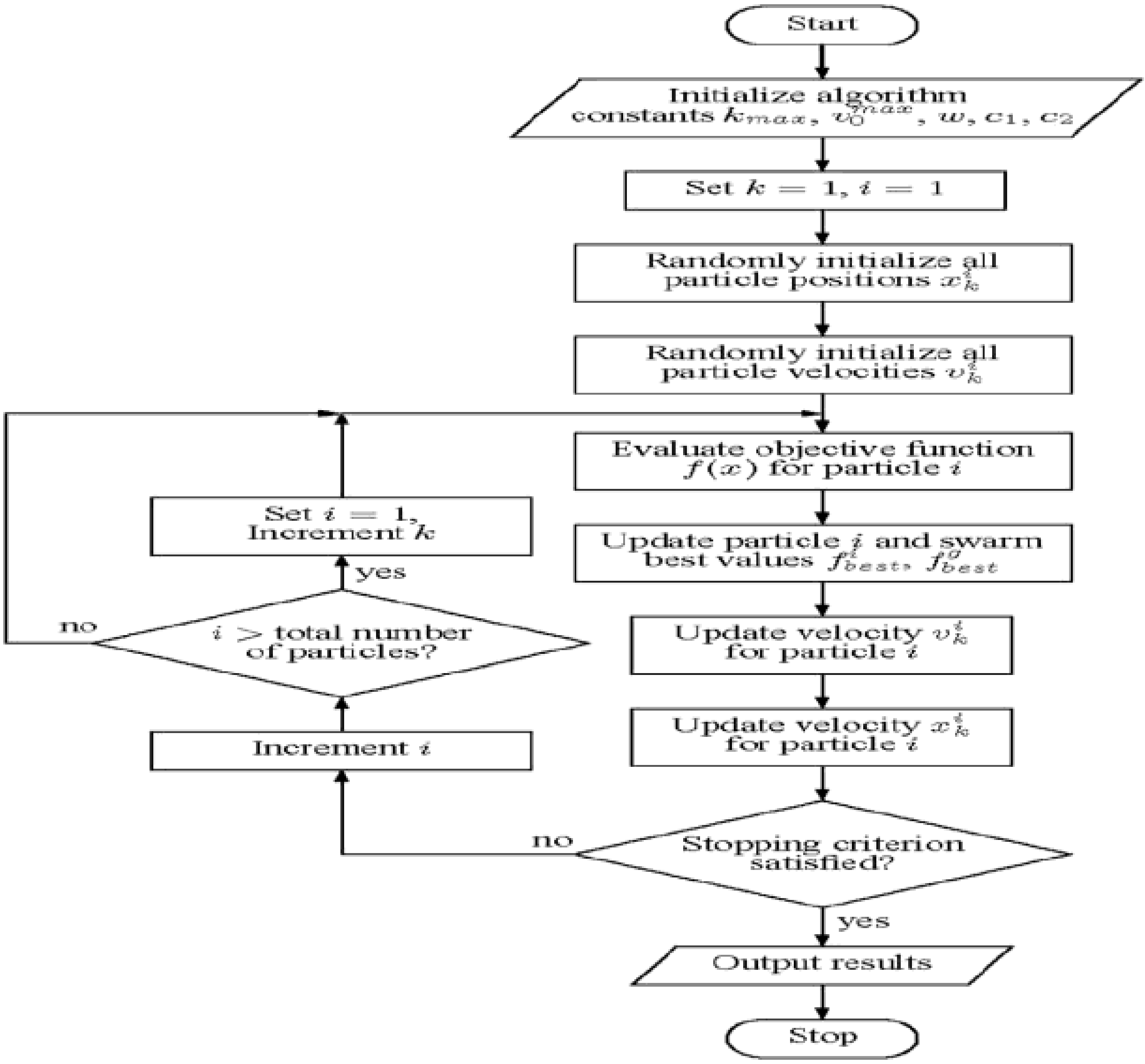
$$X_i^k = X_i^{k-1} + V_i^k$$

In the initial speed and position of each particle set random search space. In the process of evolution, the particle evaluation is according to its present location. If the present be replaced by the current solution that includes the position and fitness. Then, each particle's speed and position using the following two equations will be updated:

$$x_{in}(t) = x_{in}(t-1) + v_{in}(t)$$

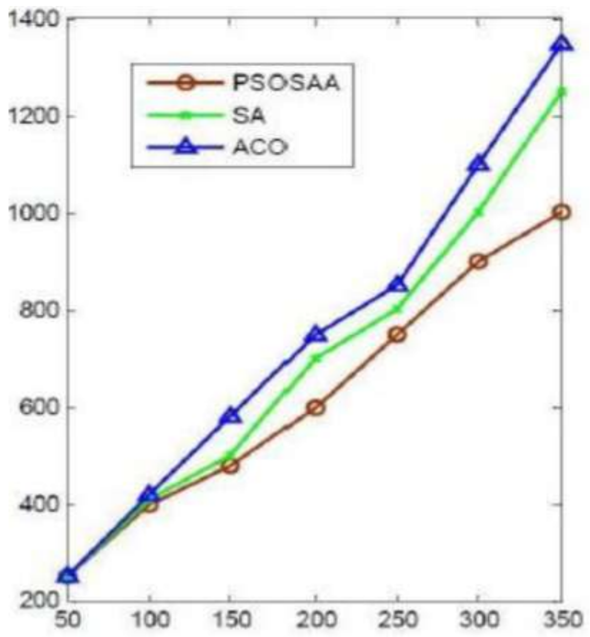
$$v_{in}(t) = q\, v_{in}(t-1) + k_1 r_1 (p_{in}^{best} - x_{in}(t-1)) + k_2 r_2 (G_{in}^{best} - x_{in}(t-1))$$

Parameter q is weight which improves the overall performance. Small weight value tends to promote local exploration and encourage global exploration. Suitable generally provides a balance weight selection asked local and global exploration and reduces the iterative search for the optimal solution of average number. In order to achieve good performance, we asked linear increase the value of the weight from about 0.5 to 0.9 during the operation. From the point of evolutionary process, particle swarm optimization algorithm (PSO) has fast convergence speed in initial phase, but through several iterations, particles tend to the same and the convergence speed becomes slow. Simulated annealing (SA) algorithm for fast random global search ability and is easy to implement.

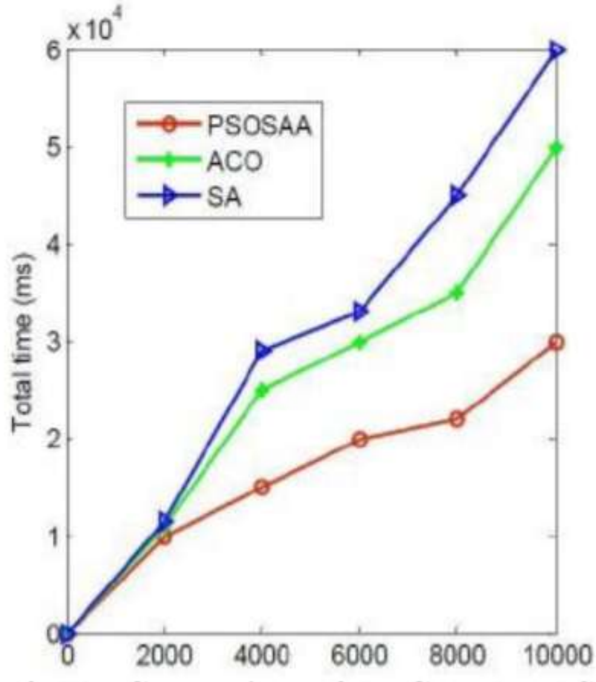


Result

The execution time of each task is shown in the Figure. As a whole, the ant colony optimization algorithm and the simulated annealing algorithm spend more time as the number of tasks increases. Ant colony optimization algorithm to perform a task slowly at first, but later when the increase is less than the improved simulated annealing algorithm, because the positive feedback. The experimental results show that the PSOSAA algorithm execution time than other two algorithms. The main reason is that PSOSAA algorithm combines the fast searching ability of simulated annealing technique, which not only can improve the convergence speed, but also avoid falling into local optimum conditions. Thus PSOSAA algorithm shortens the average operation time of tasks.



Average Execution Time



Comparison of service applications

oT-based healthcare systems can be applied to a diverse array of fields, including care for pediatric and elderly patients

Conclusion

In this paper we focused on the the model of medical information remote monitoring cloud platform architecture (RMCPHI) was founded in the first place. Then RMCPHI architecture is analyzed. Finally an efficient PSOSAA algorithm was proposed for the medical monitoring application in the hospital information system. The simulation results show that the proposed algorithm is superior to the analog anneanling algorithm and ant colony optimization algorithm and our proposed scheme can improve the efficiency of about 50%. Some further modifications can be made such as (1) Apply our method to non-coordinate system; (2) Find out more solutions to the scattering and optimization. (3) Conduct more in-depth research on mathematical analysis of our method, is our potential research basis.

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