

## *Retraction*

# **Retracted: Economic Market Fluctuation Model Based on Internet of Things Technology**

### **Scientific Programming**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] L. Zhai, "Economic Market Fluctuation Model Based on Internet of Things Technology," *Scientific Programming*, vol. 2022, Article ID 2296823, 11 pages, 2022.

## Research Article

# Economic Market Fluctuation Model Based on Internet of Things Technology

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In order to explore the impact of the Internet of Things technology on economic market fluctuations and the analysis effect of the Internet of Things technology on economic market fluctuations, this paper uses the Internet of Things algorithm to improve the economic fluctuation model. Moreover, this paper uses the Internet of Things algorithm to locate economic transactions and performs data processing to optimize the intelligent network system to improve the operating effect of the economic system. In addition, this paper improves the sensor node algorithm and proposes to use the weighted value of network node density to balance the positioning problem caused by the unbalanced distribution of network nodes in the detection area. Finally, this paper analyzes the market economy volatility model through the Internet of Things technology, combined with simulation experiments to explore the application of the Internet of Things technology in the economic market volatility model. Through experimental research, it can be known that economic market fluctuation models based on Internet of Things technology can play an important role in market economic analysis.

## 1. Introduction

In the face of the following development status: weak investment growth, lack of new consumption hotspots, poor international markets, and the existence of hidden risks in some areas, the extensive economic development model is no longer applicable. Therefore, the development of the national economy urgently needs to seek new economic growth points, and the transformation and upgrading of industries brooks no delay. The Internet of Things industry is just such a new economic growth point, which hides the impetus to reform the future economic form [1]. At the World Internet of Things Expo in November 2016, the Deputy Minister of Industry and Information Technology stated that China's economy is currently undergoing in-depth adjustments and reforms, and the manufacturing industry is accelerating toward mid-to-high end, and the Internet of Things will become a weapon to help Chinese manufacturing turn around. At present, China's manufacturing industry has completed a huge change from scratch and from a small path. It is currently becoming

bigger and stronger. This process requires the support of various forces including material technology, information technology, and artificial intelligence. The Internet of Things uses sensor technology to connect with objects to identify products, optimize production processes, change warehousing and sales models, and improve management. This new technology will open up a new growth point and boost the improvement of the company's core competitiveness. As the Made in China 2025 strategy continues to advance and the 5G era is getting closer, the Internet of Things application field will be wider and the economic value will be greater and greater, which provides a powerful means for the transformation and transformation of traditional enterprises. Therefore, the development of the Internet of Things industry has become the main thrust of my country's economy to leapfrog the L-shaped growth stage [2].

Under the contemporary political, economic, and cultural background, the development of the Internet of Things industry has shown great vitality and competitive advantages and has been valued by many countries and regions. As the result of a new revolution in information technology, it

further optimizes the production, distribution, exchange, and consumption of information resources, breaks through the time and space constraints of social production, and is a transformation from an industrial economy to a digital economy and an information economy. The Internet of Things technology penetrates into all aspects of the economy and society, which is conducive to the adjustment of the theoretical paradigm, existing mechanisms, policy trends, and actual operations of the original industry and is conducive to the emergence of new economic growth points and the formation of new economic forms of growth points on the basis of Internet of things [3].

The Internet of Things industry is a high value-added industry that is talent-intensive, knowledge-intensive, and technology-intensive, and its own development is in line with the advancement of the industrial structure. Vigorously developing the Internet of Things industry can achieve a higher level of industrial restructuring, optimization, and upgrading. At the same time, the Internet of Things industry occupies a higher position in the value chain with two core elements of information and technology and extends the industrial value chain through powerful radiation effects, penetrating and integrating with traditional industries. As a result, traditional industries have been given certain characteristics of the Internet of Things industry, which will help to improve the technical level, production efficiency, and product added value of traditional industries, so that the traditional industrial structure will continue to evolve to a higher level of industrial structure, and the industrial structure will be realized optimization and upgrade.

The development of the Internet of Things technology will cause mobile fluctuations in the economic market, so this paper analyzes the fluctuations of the Internet of Things technology on the economic market, and builds a corresponding intelligent model to provide a theoretical reference for subsequent economic forecasting and analysis.

## 2. Related Work

After combing through the research literature of the Internet of Things industry, it is found that due to the fact that the Internet of Things industry has not been standardized for a long time and related statistical data are relatively lacking, there has been no systematic research on the impact of the development of the Internet of Things industry on economic growth. However, the research on related aspects of the Internet industry has been relatively mature. Scholars have analyzed the mechanism of the Internet industry on economic growth from a theoretical and empirical perspective and measured the influence of the Internet industry on economic growth. The literature [4] empirically analyzed the pulling and supporting effects of the Internet industry on the national economy. The literature [5] conducted the cointegration test and the Granger causality test on the relationship between the information industry and economic growth and established a corresponding error correction model. Based on the unit root test and the cointegration test, the literature [6] used panel data of per capita real GDP to construct an individual time-point two-way fixed effect

model to conduct an empirical analysis of the relationship between the development of the Internet industry and economic growth. The literature [7] used the spatial weight matrix of inter-regional trade correlation to systematically measure the spillover effect of the Internet industry on the production level, export level, and wage level of other regions. The results show that the development of the Internet industry has a positive effect on the growth of this region and other regions.

Literature [8] discusses the development status and development trend of the key technologies of the Internet of Things and, based on this, divides the Internet of Things industry into 4 development stages. The first stage is the initial application of radio frequency identification technology in the logistics, retail, and pharmaceutical fields; the second stage is the connection of things; the third stage is semi-intelligence; and the fourth stage is comprehensive intelligence. Literature [9] conducts theoretical research on the business model under the conditions of the Internet of Things, the Internet of Things industry and its operations, and the impact of the Internet of Things on traditional economics. Literature [10] believes that: "Internet of Things Economics is a science that studies how to obtain greater economic, ecological, and social benefits with a small investment." Literature [11] takes the SCP paradigm in the theory of industrial organization as the Internet of Things in my country. The analysis framework of the industry analyzes the market structure of the Internet of Things industry from four aspects: overall market characteristics, market concentration, entry and exit barriers, and product differentiation. Literature [12] analyzes the competitiveness of the Internet of Things industry from the perspectives of industrial policy, current situation, industrial chain, capital operation, market share and development space, and industrial promotion model. Literature [13] makes a theoretical and empirical analysis of the driving factors affecting the development of the Internet of Things industry with the help of the "Diamond Model" based on panel data from eight major cities. Literature [14] shows that the main driving factors affecting the development of the Internet of Things industry are the Internet of Things Industry supply and demand factors, government support factors, scale factors, development potential factors, and related industry factors.

## 3. Application Improvement of Internet of Things Algorithm in Economic Fluctuation Model

This article uses the Internet of Things algorithm to improve the economic fluctuation model. Internet of Things algorithms can not only locate economic transactions but also perform data processing, while optimizing intelligent network systems.

In the economic fluctuation model, the random distribution of network nodes will cause the distribution of network nodes in the target area to not meet the expected effect, and the distribution of nodes in the network will directly affect the

positioning effect of DV-Hop in practical applications. The number of neighbors of a node in the network can reflect the local distribution of network nodes. From the local distribution of the network, the distribution of the entire network can be inferred. Furthermore, the distribution of neighbors of network nodes is also one of the factors reflecting the positioning effect. In general, the calculated value of the estimated distance between neighbor nodes can be reflected in two aspects: the total number of neighbor nodes and the total number of all neighbor nodes. The closer the nodes in the monitoring area are, the greater the number of nodes in common with each other, and the greater the ratio of the number of shared nodes to the number of nodes within the single-hop range of each other. On the contrary, the nodes within the single-hop range are more reliable. The farther, the fewer the number of shared nodes between each other, and the smaller the ratio of the number of shared nodes to the number of nodes within the communication radius of the two nodes. Based on the above analysis of the DV-Hop algorithm error, the DV-Hop algorithm will be further improved based on the previous research results of the researchers. The distribution of nodes in the target area in the network is used to assist in improving the positioning effect. The concepts of weighted value of network node density and distance correction factor are proposed. The weighted value of network node density refers to the ratio of the number of shared nodes between neighbor nodes in the network to the total number of nodes. The distance between neighbor nodes is calculated according to the weighted value of the node density of the node, and the distance between all nodes in the entire network is estimated through an iterative cumulative calculation method. Finally, the specific network node is obtained through an improved particle swarm algorithm.

In order to improve the positioning effect of the network and the accuracy of network node positioning as much as possible, this paper combines the existing improvement methods of traditional DV-Hop and the proposed network node density weighting value to improve the positioning effect of DV-Hop.

Since most WSNs are deployed in dangerous places, almost all large-scale WSNs use the method of randomly deploying nodes to initialize the entire network, and they are generally deployed by dedicated machines. The random deployment mechanism of the network creates a series of problems for the positioning of network nodes. In order to solve the problem of poor positioning effect caused by uneven distribution of network nodes, the network will calculate the node credibility of each beacon node. The credibility of anchor nodes is based on the actual number of hops between anchor nodes, the actual distance between anchor nodes, and the communication radius of the nodes to calculate the credibility between anchor nodes, and then all hop distances are weighted to obtain the final node credibility. The improved beacon reliability schematic diagram is shown in Figure 1.

The hop distances of all nodes to be located in the network are to be weighted based on the average hop distance of the beacon nodes. In order to reduce the error impact of the hop distance of the beacon nodes in the network on the network positioning, a further weighted

adjustment will be made to the average hop distance of the anchor nodes in the network. As shown in Figure 2, the actual number of hops from anchor node A to anchor nodes B, C, and D is 2, 3, and 3, and the actual distance from beacon node A to beacon nodes B, C, and D is a, b, and c. The formula for calculating the credibility of the beacon node A is shown in the below formula:

$$R(A) = \frac{(a/2 + b/3 + c/3)}{R}. \quad (1)$$

By analogy, the general expression of the credibility of anchor node  $i$  in the network is given in the following formula:

$$Re(i) = \frac{\sum_1^n Dis(n)/R/Hop_{AN}}{N}. \quad (2)$$

All beacon nodes in the network can rely on their own hardware advantages to achieve positioning. The distance between the beacon nodes can be the actual distance to each other according to the Euclidean formula. Then, the average hop distance HopDis of each anchor node in the network is obtained according to the calculation formula; that is, the actual distance is divided by each other's minimum hops. Finally, the modified average hop distance HopDis' of the anchor node is obtained according to the weighted value, and the calculation formula is shown in the following formula:

$$Hop\ Dis' = Hop\ Dis \times Re. \quad (3)$$

In the classic DV-Hop, the node to be located takes the saved last hop distance information packet as the average hop distance, and the positioning error caused by this value method is still relatively large. In order to improve this situation, in the section, the average hop distance of the node to be located does not use a single beacon node as the reference node to calculate the hop distance of the node. Instead, a weighted average of all average hop distances within 3 hops of the node is used to determine the final hop distance. In order to highlight the importance of beacon nodes within the single-hop range of nodes, in the weight ratio, beacon nodes that can communicate directly account for 50% of the average hop distance during the calculation process, and the remaining nodes also account for 50%. The jump distance expression is given in the following formula:

$$Hop\ Dis_A = \sum_1^n \frac{Hop\ Dis(n)}{2n} + \sum_1^i \frac{Hop\ Dis(i)}{2i}, \quad (4)$$

where Hop Dis<sub>A</sub> is the average hop distance of the node to be located, HopDis( $n$ ) is the average hop distance of the neighbor nodes of unknown node A, and  $n$  means the number of anchor nodes within the single hop range of unknown node A.

After optimizing the average hop distance using the credibility weight obtained by the packet data, in order to reduce the positioning error of the algorithm, the characteristics of random deployment of network nodes are taken into consideration.



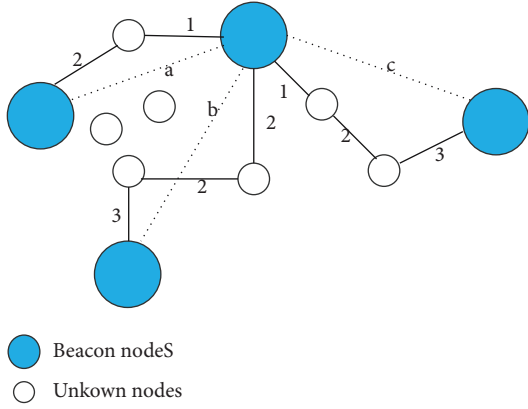


FIGURE 1: Route diagram from beacon node to each beacon node.

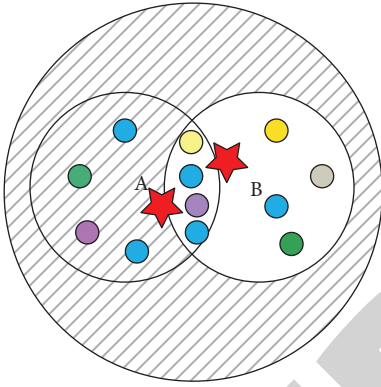


FIGURE 2: Distribution of neighbor nodes.

Node density represents the density of local nodes in the entire network. In the network, the area with the greater the density of nodes, the closer the broadcast path of the node is to a straight line, the higher the accuracy of the algorithm's positioning. In terms of node density, the classic DV-Hop also divides the node to be located and the nearest beacon node into the same type of node density. Their default node density is the same, and the hop distances derived from each other are also the same. It is proposed to use the weighted value of network node density  $De$  to balance the positioning problem caused by the unbalanced distribution of network nodes in the detection area. The weighted value of network node density refers to the ratio of the number of nodes that can be directly communicated in the network to the total number of nodes that can be directly communicated in the network Figure 2.

The node density-weighted value  $De(A,B)$  expressions of nodes A and B and the expressions of the distance correction factor are shown in equations (5) and (6):

$$De(A, B) = \frac{(N_A \cap N_B)}{\text{sum}(N_A, N_B)}, \quad (5)$$

$$De(A, B) = \frac{(1 - De(A, B))}{(1 + De(A, B))}, \quad (6)$$

where  $N_A$  and  $N_B$ , respectively, represent the number of nodes within the single hop range of nodes A and B,  $N_A \cap N_B$  is the common neighbor node between nodes A and B, and  $\text{sum}(N_A, N_B)$  represents the total number of neighbor nodes of nodes A and B. Neighbor nodes in the network can modify the estimated distance according to the weighted value of node density, thereby avoiding the same estimated distance between nodes in DV-Hop.

The nodes in the network are powered by batteries, and the limited energy of their own is taken into account. In the process of positioning, nodes should avoid complex calculations. When the energy of the node is limited, this calculation will greatly consume the energy carried by the node itself, thereby reducing the life of the node. The failure of a node will cause the topology of the network to change, and the routing of nodes between networks will also change accordingly. This change will lead to a change in the positioning effect, which is unacceptable for the entire network. In order to further reduce the energy loss caused by the node positioning, the linear calculation formula (7) with a smaller calculation amount is adopted when the inertia weight of the particle swarm algorithm is improved:

$$w = w_{\max} - t \times (w_{\max} - w_{\min}) \times (T_{\max} + t). \quad (7)$$

In the experiment, the inertia weight setting value is  $w_{\max} = 0.95$ , and  $w_{\min} = 0.4$  is the ideal setting. The relationship between  $w$  and  $t$  in the formula is shown in Figure 3. The inertia weight of the network is linearly positively related to the number of experimental simulations. The update speed of the particles during the entire optimization process is the same, but the linear method can reduce the energy consumption during the arithmetic operation of the nodes.

In the RDD positioning algorithm, the algorithm uses the communication radius of the node to locate the node. The weighting factor is determined according to the node density within one hop range of the node. The network first calculates the density-weighted value of neighboring nodes in the network, multiplies the communication radius by the node density-weighted value to obtain the estimated distance between all neighboring nodes in the network, and then calculates the number of hops between nodes in the network according to the formula and the optimal path estimated distance for 2 hops. Finally, it calculates the estimated distance of all nodes in the network according to the iterative accumulation method. The specific steps are as follows:

(1) Neighbor node model:

In order to further use the network node density to improve the positioning accuracy of the algorithm, this paper proposes an RDD distance model, as shown in Figure 4.

When the nodes can communicate directly with each other, the distance between nodes  $i$  and  $j$  is shown in Formula (8) [15]:

$$\text{Distance}(i, j) = R \times \frac{(1 - RDD(i, j))}{(1 + RDD(i, j))}. \quad (8)$$

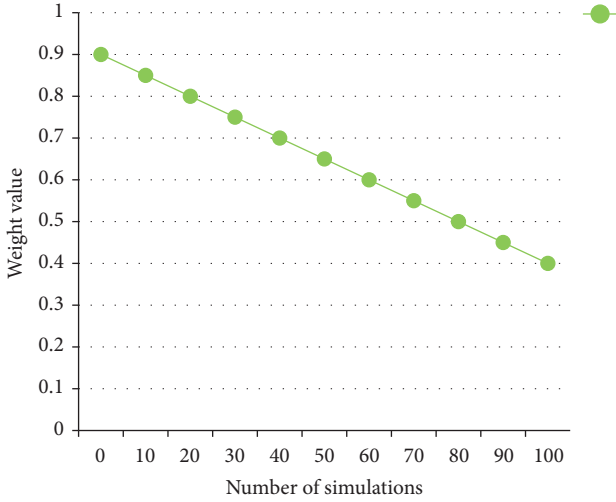


FIGURE 3: The relationship between simulation times and inertia weight.

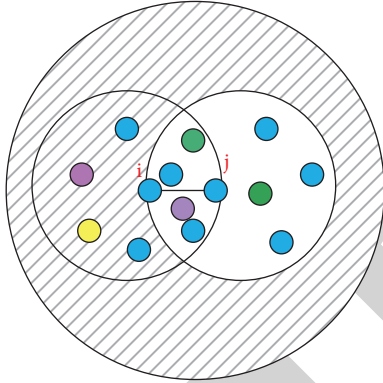


FIGURE 4: Neighbor node model.

Distance  $(i, j)$  is the distance between node  $i$  and  $j$ ,  $R$  is the communication radius of the node, and  $RDD(i, j)$  is the density-weighting coefficient of nodes  $i$  and  $j$ . The value of  $RDD(i, j)$  is equal to the number of public sensing units within the communication radius of  $i, j$  divided by the total number of nodes within the communication radius of  $i, j$ . The calculation formula is as shown in the following formula:

$$RDD(i, j) = \frac{(N_i \cap N_j)}{\text{sum}(N_i, N_j)}. \quad (9)$$

$N_i, N_j$  are the number of nodes within one hop of node  $i$  and  $j$ ,  $N_i \cap N_j$  is the number of public nodes within one hop of node  $i$  and  $j$ , and  $\text{sum}(N_i, N_j)$  is the total number of nodes within one hop of node  $i$  and  $j$  [16].

#### (2) Two-hop distance model between nodes:

When the distance between nodes  $i$  and  $j$  is two hops, this paper considers two distance calculation methods. The calculation formulas of the two methods are shown in formula (10). First, the intersection of nodes within one hop of node  $i$  and  $j$  is

used to find the relay node set  $a$ , but the two methods adopt different methods for the selection of relay node  $a$ . The analysis results are as follows:

$$\text{Distance}(i, j) = R \times RDD(i, a) + R \times RDD(a, j). \quad (10)$$

According to Figure 5(a), the number of hops between  $i$  and  $j$  is 2. The dotted line is a path where the distance between two hop nodes can communicate with each other, the relay node is  $a$ , and the circle of the dotted line is the range of the communication radius of the relay node set  $a$ . The first method is to select  $a$ . When there are multiple  $a$  in the shortest route of the network, the relay node  $a$  with the largest number of nodes  $(N_i \cap N_a + N_a \cap N_j)$  among the three nodes  $i, j$ , and  $a$  is selected.

According to Figure 5(b), the number of hops between  $i$  and  $j$  is equal to 2, and the relay node is  $a$ . When the second method is to select  $a$ , if there are multiple routing methods to choose from the network, the shortest route to  $i$  is selected.

After experimental simulation analysis, it is found that the first method is more suitable for the algorithm proposed in this paper, and the second method causes a greater positioning error. The possible reason is that the separation of one hop and two hops in the first method can reduce the accumulation of errors caused by multiple hops between network nodes. The second method has a greater impact on the subsequent multihop iterations in this paper.

#### (3) Multihop distance model between nodes:

When the distance between nodes is multihop ( $\text{Hop}(ij) > 2$ ), as shown in Figure 6. When the number of hops is equal to 3 hops, if it is assumed that the number of hops between  $a$  and  $i$  is one hop, and the distance between the relay node  $b$  and nodes  $a$  and  $j$  is one hop, this paper uses one hop plus two hops to find the three-hop distance. The calculation formula is shown in formula (11) [17]:

$$\text{Distance}(i, j) = \text{Distance}(i, b) + R \times RDD(b, j). \quad (11)$$

$RDD(b, j)$  is the density-weighted value from node  $i$  to node  $b$ , and node  $b$  to node  $j$ . When there are multiple relay nodes  $b$ , the minimum value of  $\text{Distance}(i, b) + R \times RDD(b, j)$  is selected as the relay node. For the case where the number of hops between nodes  $i$  and  $j$  is  $n$  ( $n > 2$ ) hops,  $\text{Hop}(i, b) = n - 1$  is selected and  $b$  with  $\text{Hop}(b, j) = 1$  is used as the transit unit. When the number of qualified transit units in the network is greater than 1, the minimum value of  $\text{Distance}(i, b) + \text{Distance}(b, j)$  is selected as the distance between nodes  $i$  and  $j$  [18].

The formula for the distance between each node is shown as follows:

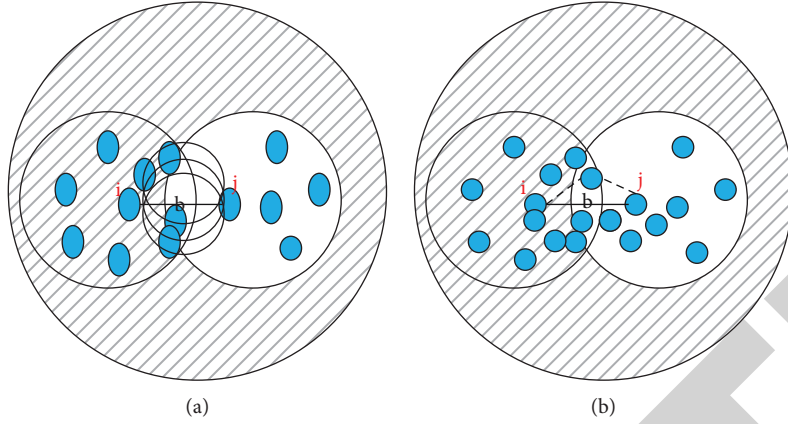


FIGURE 5: Two-hop routing selection method between nodes. (a) Two-hop routing mode a between nodes. (b) Two-hop routing mode b between nodes.

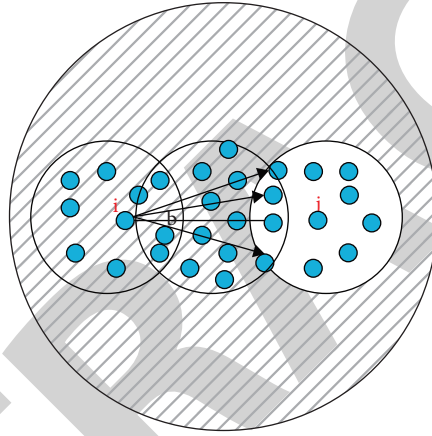


FIGURE 6: Multihop distance model between nodes.

$$\text{Distance}(i, j) = \begin{cases} R \times \text{RDD}(i, j), & \text{Hop}(i, j) = 1, \\ R \times (\text{RDD}(i, a) + \text{RDD}(a, j)), & \text{Hop}(i, j) = 2, \\ \text{Distance}(i, b) + R \times \text{RDD}(b, j), & \text{Hop}(i, j) \geq 3. \end{cases} \quad (12)$$

- (4) The anchor node is used to correct the estimated distance:

A node density correction factor  $\phi_{\text{rdd}}(i)$  is introduced, and the calculation formula for  $\phi_{\text{rdd}}(i)$  is given below:

$$\phi_{\text{rdd}}(i) = \frac{\sum_{i \neq j, i, j \in N} (D(i, :))}{\sum_{i \neq j, i, j \in N} \text{Distance}(i, :)} \quad (13)$$

In formula (10),  $i$  and  $j$  are beacon nodes,  $N$  is the set of beacon nodes, and  $D(i, :)$  and  $\text{Distance}(i, :)$ , respectively, represent the Euclidean distance and the estimated distance from  $i$  to each anchor node. The distance calculation formula is (14) [19]:

$$\text{Distance}(i, j) = \text{Distance}(i, j) \times \phi_{\text{rdd}}(i). \quad (14)$$

The third stage of DV-Hop algorithm and RND algorithm adopts the trilateration estimation method

for positioning, which depends on the accuracy of network ranging, while the least square method is affected by hardware conditions when determining the position of the node to be located. Intelligent algorithms are used to optimize positioning to avoid accumulation of errors and obtain satisfactory results. Compared with other intelligent algorithms, the particle swarm optimization algorithm has the advantages of low algorithm complexity, easy network implementation, and good optimization capabilities. At the end of this paper, an improved PSO is used to replace the trilateration estimation method to correct the positioning of network nodes.

In the improved PSO used in this paper, if it is assumed that the number of particles is  $N$ , the search space dimension is equal to  $M$ , the position of the  $i$ th particle is  $x_i = (x_{i1}, x_{i2}, x_{i3}, \dots, x_{iN})$ , the velocity is  $v_i = (v_{i1}, v_{i2}, v_{i3}, \dots, v_{iN})$ , the historical optimal position of particle

$i$  is  $\text{pbx}_i = (p_{i1}, p_{i2}, p_{i3}, \dots, p_{iN})$ , and the global historical optimal position is  $\text{gbx} = (p_{g1}, p_{g2}, p_{g3}, \dots, p_{gN})$ . The

update formulas of the velocity  $v_{i,d}$  and position  $x_{i,d}$  of the particle  $i$  are Equations (15) and (16) [20]:

$$v_{i,d}(T+1) = w \times v_{i,d}(T) + c_1 \times r(N,2) \times (\text{pbx} - x_{i,d}(T)) + c_2 \times r(N,2) \times (\text{gbx} - x_{i,d}(T)), \quad (15)$$

$$x_{i,d}(T+1) = x_{i,d}(T) + v_{i,d}(T+1). \quad (16)$$

Among them,  $i$  represents the  $i$ th particle,  $w$  is the inertia weight, and  $r(N,2)$  is a random number uniformly distributed in the interval  $[0, 1]$ . At the same time,  $c_1, c_2$  are learning factors, and  $T$  represents the number of iterations.

(1) Improved inertia weight:

The proper inertia weight used by the algorithm can not only prevent the algorithm from falling into premature but also avoid falling into the local optimum. In order to obtain a better optimization effect, this paper uses an exponential decreasing function to improve the value of the inertia weight  $w$ , and the improved formula is as follows:

$$w = w_{\max} - 0.5 \times (w_{\max} - w_{\min}) \times e^{\left(\frac{\sqrt{T/T_{\max}}}{T_{\max}}\right)}. \quad (17)$$

Among them,  $T$  is the current iteration number,  $T_{\max}$  is the maximum iteration number, and  $w_{\max}$  and  $w_{\min}$  are the largest and smallest inertia weights, respectively. When the inertia weight is  $w_{\max} = 0.95$  and  $w_{\min} = 0.4$ , an ideal positioning range can be obtained. The relationship between  $w$  and  $T$  is shown in Figure 7.

(2) The process of particle swarm optimization for positioning optimization:

The process of particle swarm optimization to optimize the positioning of network nodes is as follows:

- (1) The network provides the coordinates of the beacon node, the distance from the node to be located to the beacon node, the number of hops from the node to be located to the beacon node, the number of beacon nodes, and the total number of nodes as the initialization parameters of the particle swarm algorithm.
- (2) The algorithm initializes the reference expressions of the particle  $i$ 's velocity  $x_i = (x_{i1}, x_{i2}, x_{i3}, \dots, x_{iN})$ , velocity  $v_i = (v_{i1}, v_{i2}, v_{i3}, \dots, v_{iN})$ , and the optimal position  $\text{pbx}_i$  of the particle itself (10). The fitness  $F$  value of the population particles is calculated, and  $\text{gbx}_i$  is set to the optimal position of the initial population,  $T=0$ .
- (3)  $T=T+1$ , according to formula (10), the velocity and position of the particles are updated.

- (4) The fitness  $F$  value of the particle is compared to update the optimal position of the particle.
- (5) If the particle position meets the set conditions, the optimal solution of the equation is output. Otherwise, it is judged whether the algorithm has completed the iterative process. If so, the algorithm outputs the particle coordinates. Otherwise, it returns to steps 3 to 5 and loops to find the best point of the network.

The RDD algorithm process is as follows:

- (1) The network performs flood broadcasting.
- (2) The network obtains the anchor node distance matrix and the minimum node hop matrix based on the information data of the flood broadcast in the first stage.
- (3) The node obtains the number of nodes and their labels within the single-handed range according to the broadcast data packet.
- (4) The algorithm calculates the distance within the single hop range of the node according to the radius  $R$  multiplied by the density-weighted value.
- (5) The algorithm finds the distance between nodes with a 2-hop distance.
- (6) The algorithm uses the iterative accumulation method to multihop the distance between nodes.
- (7) The algorithm calculates the distance between the node to be located and the anchor node and uses the improved PSO to obtain the coordinates of the further optimized node.

The RDD algorithm flowchart is shown in Figure 8.

#### 4. Market Economy Fluctuation Model Based on Internet of Things Technology

At present, Internet of Things providers in the Internet of Things market distribute different data centers in different areas in order to provide the best Internet of Things to meet the needs of different groups of users. However, in order to better meet the service needs of users, it is necessary to coordinate the amount of service resources from different service providers in the market to balance market supply and demand. Therefore, it is necessary to coordinate market supply and demand. Figure 9 depicts a market transaction mechanism for the Internet of Things. In this mechanism, the cloud broker coordinates the service requirements of all parties and conducts reasonable allocation and balanced



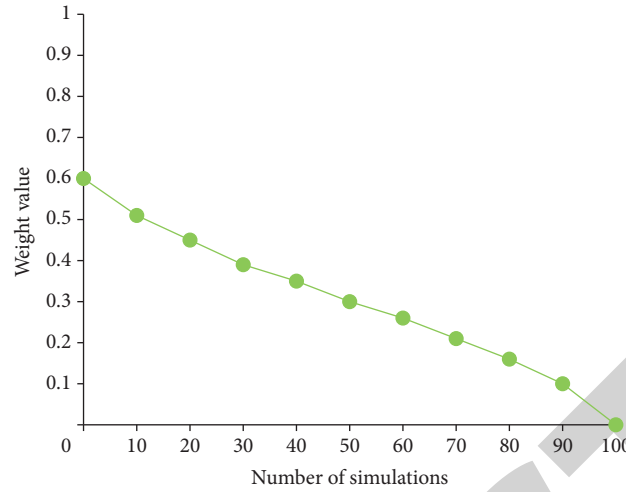


FIGURE 7: Weight value and simulation times.

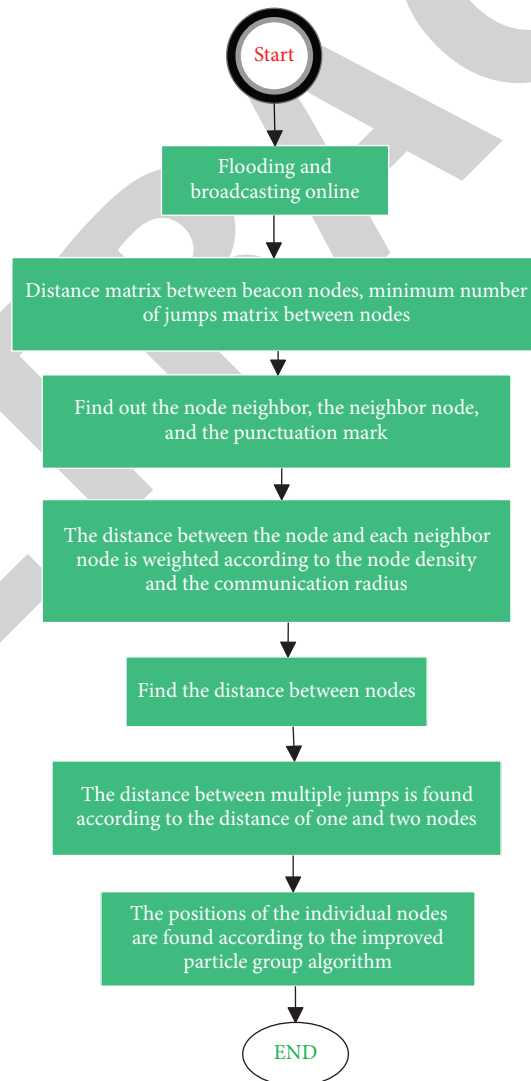


FIGURE 8: RDD algorithm flowchart.

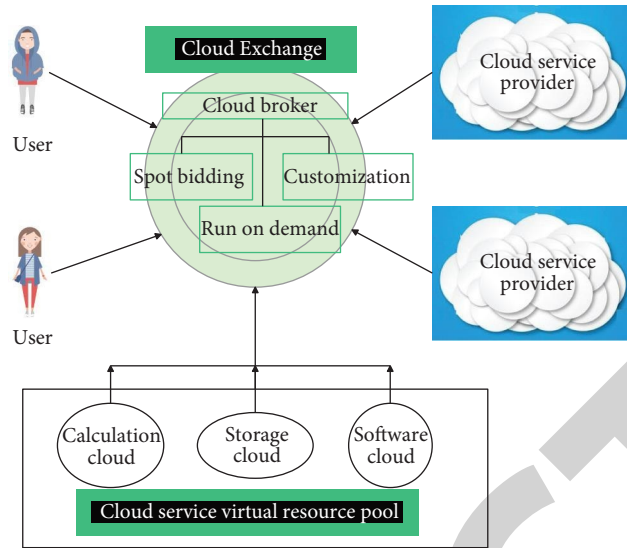


FIGURE 9: Market transaction system based on the Internet of Things.

TABLE 1: Data processing effect of market economy fluctuation model based on Internet of Things.

Number	Positioning effect	Data processing	Number	Positioning effect	Data processing
1	91.82	88.14	19	91.31	88.79
2	94.55	92.21	20	96.90	88.79
3	95.10	88.20	21	93.75	92.60
4	94.03	94.46	22	92.50	92.57
5	95.38	92.37	23	93.71	94.65
6	94.29	88.74	24	95.80	88.03
7	93.62	91.44	25	92.45	89.73
8	95.60	91.70	26	96.64	92.54
9	95.80	94.81	27	93.77	90.03
10	91.56	89.40	28	93.03	93.96
11	91.27	88.30	29	91.82	94.65
12	94.98	89.02	30	92.25	94.25
13	92.08	91.70	31	93.58	92.59
14	92.14	90.28	32	91.19	90.00
15	96.68	92.69	33	92.75	91.31
16	96.17	88.50	34	92.95	92.44
17	95.70	89.64	35	92.44	91.04
18	94.16	88.35	36	95.00	92.40

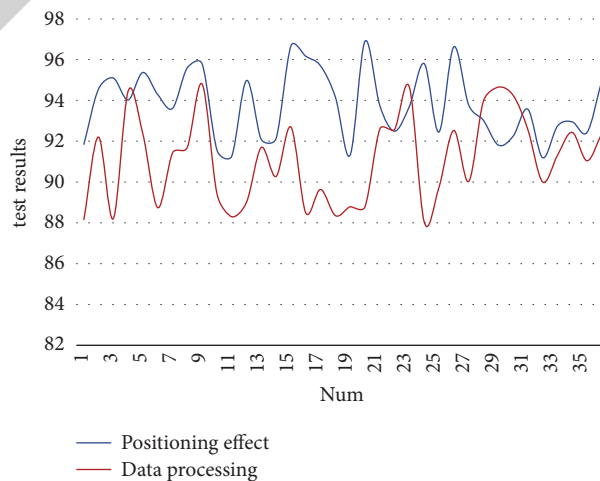


FIGURE 10: Statistical diagram of the data processing effect of the market economy fluctuation model based on Internet of Things.

TABLE 2: Market fluctuation analysis effect of market economy fluctuation model based on Internet of Things technology.

Number	Evaluation results	Number	Evaluation results	Number	Evaluation results
1	90.95	13	82.34	25	82.58
2	81.48	14	80.64	26	82.73
3	89.45	15	81.28	27	89.63
4	85.68	16	91.10	28	90.61
5	90.36	17	85.53	29	85.05
6	86.93	18	81.04	30	89.08
7	90.76	19	81.10	31	83.79
8	89.86	20	82.33	32	83.68
9	83.06	21	89.09	33	84.39
10	86.33	22	88.69	34	89.64
11	83.06	23	91.38	35	90.92
12	84.84	24	88.74	36	86.42

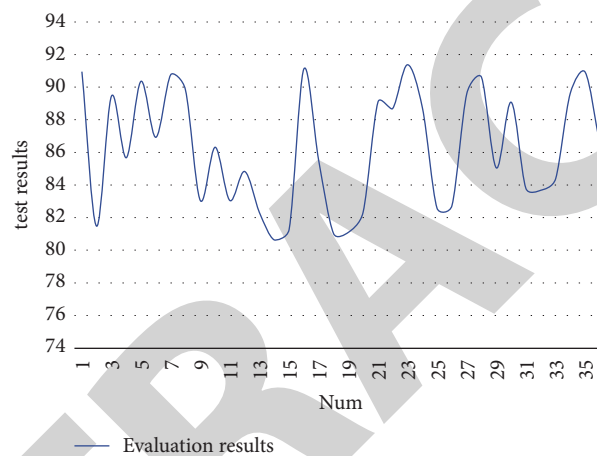


FIGURE 11: Statistical diagram of the model's practical effect.

coordination of market demand services. Figure 9 describes the distribution of a collaborative development type of Internet of Things transaction system. It can bring considerable economic benefits to market transaction participants.

This article analyzes the market economy volatility model through the Internet of Things technology, combined with simulation experiments, and explores the application of the Internet of Things technology in the economic market volatility model. First, this paper explores the effect of market economy fluctuation model based on Internet of Things technology through simulation experiments, and the results are shown in Table 1 and Figure 10.

From the above research, we can see that the method proposed in this paper can realize accurate positioning of the economic market transaction location, and can process economic data at the same time. On this basis, this paper judges the effect of the Internet of Things technology in the analysis of market economic fluctuations and presents the results by scoring, as shown in Table 2 and Figure 11.

From the above analysis, it can be seen that the market economy fluctuation model based on Internet of Things technology can play an important role in market economy analysis.

## 5. Conclusion

The Internet of Things has a long industrial chain and forms a wider coverage. In the process of penetration and integration with different industries, it will expand the space for economic development and stimulate economic growth. The manufacturing industry represented by the manufacturing of chips, sensors, and terminal equipment in the upstream of the IoT industry chain has formed a forward relationship with the secondary industry, especially the manufacturing industry. The downstream information transmission, software industry, cloud computing technology application and the financial industry, transportation industry and information communication industry and other tertiary industries have formed a backward relationship. It can be said that the application field of the Internet of Things extends almost to all categories of existing national economic industries. For example, industries such as smart transportation, environmental monitoring, public safety, smart logistics, precision agriculture, industrial safety monitoring, entertainment and education, and medical and health care all involve the use of IoT technology. Relying on the advantages of the Internet of Things industry, a new profit growth space has emerged in all walks of life in the national economy, which has

promoted the prosperity and development of the market economy. This article analyzes the fluctuation of the Internet of Things technology on the economic market and builds a corresponding intelligent model to provide a theoretical reference for subsequent economic forecasting and analysis.

## Data Availability

The labeled datasets used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The author declares that there are no conflicts of interest.

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