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Smart Journalism Using Wireless Sensor Network and Optimization of Energy Consumption with Smart Routing

Abolfazl Danaei*[a], Amir Mehdiabadi[b], Mojtaba Akhlaghi[c]

a. Associate professor, Department of Media Management, Se.C., Islamic Azad University, Semnan, Iran.
b. Department of Management, Se.C., Islamic Azad University, Semnan, Iran.
c. Master of Science in Executive Management, Islamic Azad University, Science and Research Branch, Shahrood, Iran.

A R T I C L E I N F O

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Eneregy

A B S T R A C T

The aim of the present exploratory research is the optimal simulation of a smart journalism model using a wireless sensor network. Regarding the effect of routing information transmission, in the challenge of energy consumption and the idea of smart routing (proposed), the combination of VGDRA protocol and Cuckoo meta-heuristic algorithm has been employed. Therefore, in order to enhance the efficiency of the smart journalism model, the smart mobile sink collects news information from journalists' sensors based on the output of the two function optimizers of position and cost, through moving in a virtual dynamic route. The comparison of the simulation output in MATLAB displays compared to the VGDRA protocol, the proposed method reduces the convergence time of the network, the amount of energy consumed in the construction of the virtual backbone and reconstruction of the route, as well as increasing the lifetime of the wireless sensor network, and finally increasing the opportunity to collect news, by the journalists' sensors. The use of smart technologies in journalism is one of the solutions for competitive developments in the reconstruction of media and news agencies.

1. Introduction

In the 21st century, the journalism profession has entered an era where the digital world and audience participation serve as two determining factors (Veglis and Kotenidis, 2022): "humans in the role of communicators" and "machines in the role of mediator or facilitator" (Jamil,

* Corresponding author.
E-mail addresses: ab.danaei@iau.ac.ir (A. Danaei), amir.mehdiabadi@gmail.com (A. Mehdiabadi), Mojtabaakhlaghi.emba@gmail.com (M. Akhlaghi)

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2021). In these communications, journalists can obtain information through the interaction of human and computer, human and robot (cyber) and human agent (Guzman, 2018). In other words, in the discussion of digital processes, algorithms have become a factor of transformation in the production and dissemination of news, and in the human part, citizen journalists and the power of adaptation of the general society (Diakopoulos, 2019; Goksu and Cavus, 2019; Jamil, 2021). Although the emergence of ethical concerns caused by the lack of algorithmic transparency has led to innovation in evaluation criteria and a wider integration of digital data in news (Belda and Gonçalves, 2021; Chen and Chekam, 2021), again, the first concern of journalists and society's demand (McKernan and Hemsley, 2022) is access to first or rare news, especially in times of incidents and crises. This is because the lack of information or the fragile relationship between the stakeholders of the responsible organization and the news agents (Zafra and Maydell, 2018) paves the way for spreading rumors and fake news by cyber activists (Di Domenico et al., 2021).

Hence, it can be concluded that sometimes digital and interactive methods are not useful; Therefore, "maybe the solution is to take advantage of the new revolution of the media industry; that is, a journalist with smart capabilities, in such a way that no geographical or governmental or organizational restrictions become an obstacle to freedom of reporting news or access to information" (Alsamhi, 2021b; Chittoor et al., 2021). In this case, the technology leap in journalism can be considered beyond "the digital world of chatbots and recommender systems, along with the evolution of drones and sensors" (Thurman et al., 2019). The media, with the full use of smart technology, become observers of faster and more accurate access to news, relying on the latest satellites that penetrate more than a thousand megabytes (with the scale of Internet speed); drone cameras that capture clearer and more comprehensive images then can be seen with the naked eye; smart robots that monitor event information when natural disasters and human errors occur on top of skyscrapers or at the bottom of the oceans, or even in artistic, sports, etc. events; wireless sensor network nodes that, by collecting data, search for news information in environments where there is a risk of life for the human agent and a risk of destruction for quadcopters and drones (Almalki and Angelides, 2019; Alsamhi et al., 2021a; Stojanovic, 2022). In general, news coverage by technology is a new model of smart journalism that organizations use this new technology to record and share breaking news, and provide views of natural disasters. Smart journalism or smart media can be defined as "the ability to use smart types of technology, such as portable or automated devices like drones, video cameras, or even sensors to perform media storytelling, reporting, and transmitting multimedia content in more efficient and cost-effective ways" (Almalki et al., 2022).

The effectiveness of smart news media or smart journalism in crisis communication is more evident (Driedger and Westby, 2020). Because of possible damage to the communication infrastructure due to critical events (natural disasters, wars, etc.), it may not be possible to obtain information from citizen journalists or people who witnessed the incident and were present at the scene; therefore, access to exclusive information sources leads news stations in the field of media. In this way,"sensor nodes and drones can, as a journalist, collect all kinds of digital, visual and environmental data in hard-to-pass or dangerous areas for humans, such as battlefields, isolated environments, etc." (Almalki and Angelides, 2019; Almalki et al., 2022). High capacity of live broadcast, fast and flexible collection of short news, incremental scalability, wide angle of coverage, mobility when accessing difficult areas (rural or disaster), and providing media content from disaster and inaccessible areas, using a more secure and more cost-effective device for reporting and recording missions, especially in vulnerable coverage, can be seen as other advantages of setting up drones or wireless sensor networks by news organizations" (Almalki and Angelides, 2019; Almalki et al., 2022). Wireless sensor network or multimedia wireless sensor network is a network consisting of computing and communication devices used in many critical environments (Wang et al., 2012). Computing and communication devices or sensor nodes feed on battery energy, and after sensing the environment and processing data, they send the information to a central node called the Base Station or Sink for analysis, and the central node sends the information to the user via the internet or the satellite (Tunca et al., 2014; Fadel et al., 2015). These networks are used in critical environments to collect and control information and have applications in laboratory, medical, agricultural, tourism, educational, transportation and partially traffic control, pollutant control, forest fire detection, plant and animal counting, equipment monitoring applications and error prediction, pollution monitoring and pollution source detection, sea search, and more (Ali et al., 2020; Bhanu et al., 2019; Kandris et al., 2020; Shakya et al., 2021).

In these networks, due to the limitation of sensor devices in terms of battery, memory and data processing, if all nodes are close enough to the sink, direct routing and less energy use is possible (Zheyuan, 2015). However, in most networks, the random scattering of sensors in the environment makes multi-step routing unavoidable, and unequal energy consumption between nodes causes the occurrence of focal point (Liang et al., 2014). In order to reduce the focal point and the balance of energy consumption, appropriate methods should be considered to improve the movement of the sink (Di Francesco et al., 2011). Therefore, the most important challenge for wireless sensor systems can be considered low-cost routing to reduce energy consumption and enhance network lifetime. Although the impact of the wireless sensor network in the media is rarely mentioned in the research literature, a point of view regarding the link between this technology and the news research technique is explained. Therefore, in this article, a practical scenario is defined from the point of view of technology (simulation) for smart routing and optimal energy consumption. To achieve the aim of the research, first the wireless sensor network was implemented using the VGDRA algorithm, then in the proposed idea, the smart routing method was used with two different but related issues. These two issues are: creating a network of journalists' sensors and designing a virtual backbone for the optimal way of spreading news to sinks. Finally, the comparison of the simulated output in MATLAB shows that, compared to the VGDRA protocol, the proposed smart method significantly increases the lifetime of the network and collects and transmits more news reports by reducing the cost of backbone construction, route reconstruction, and energy consumption. In the following, using the exploratory and simulation method, after reviewing the literature and explaining the implementation of the proposed idea, the simulation results of the VGDRA algorithm are compared with the proposed method.

2. Literature Review

According to the interdisciplinary approach in this article, the review of literature is explained in two parts:

2.1. Research Related to Smart Journalism

The present research can be considered as one of the first smart journalism scenarios using wireless sensor networks. Few researches about smart journalism have been recorded across the world, and most of these cases are related to the field of aerial journalism, which will be explained below:

Many researchers have explored how drones can be used as a value-add to wireless communications or even any form of drone platform that requires a wireless budget for journalism. They have found that by increasing the throughput, the cost of communication can be optimized, increasing the capacity of live broadcasting, HD aerial imaging, and fast and flexible news gathering (Alsamhi et al., 2021b; Chittoor et al., 2021).

Almalki et al. (2022) combined UAV and an artificial intelligence technique called Radial Basis Function Network (NN-RBFN) to train the neural network in order to obtain an accurate broadcast channel model and enhance aerial journalism. They have been able to provide timely and cost-effective media and journalism services in hard-to-reach areas. The simulation results show that the proposed NN-RBFN achieves an accurate dissemination channel model in a three-dimensional scenario, with an accuracy rate of 99%.

Moguel et al. (2017) presented the SkyMedia system, which aimed to provide a unique media perception for audiences during short-term and large-scale live events using a drone and a wireless sensor network. This architecture can provide two streams of information, namely: aerial images and HD videos by drones, and audio and video content from terrestrial WSN. In addition, SkyMedia can also support real maps that provide a wide view of the drone to obtain event information (Moguel et al., 2017).

2.2. Research Related to Routing in Wireless Sensor Network

In recent decades, many virtual infrastructures have been proposed for mobile sinks in wireless sensor networks. These infrastructures are proposed based on information release contracts. According to the movement pattern of the sinks, the data collection or dissemination pattern is divided into two categories, controlled and uncontrolled.

In the controlled model, the movement of the sinks is controlled by an external observer and according to the dynamics of the network; however, in the uncontrolled model, the movement is determined automatically by the way of orientation and displacement of the sink itself (Banerjee et al., 2010; Kinalis et al., 2014). In this research, the movement of uncontrolled sinks has been investigated. In the following, a summary of related works including methods, strengths and weaknesses is presented.

Chen et al. (2013) presented a convergent tree algorithm called "Virtual Combined Circuit Straight Routing" (VCCSR). This algorithm creates a virtual structure of virtual circuit and direct route and specifies a set of nodes as cluster heads. A set of cluster heads form a virtual backbone. To collect data, the sink must maintain its connection with the cluster head boundary. In order for the cluster heads to minimize the cost of re-routing to broadcast the latest sink location information, a set of communication rules must be observed. Although the VCCSR plan reduces the cost of the routes reconstruction in controlling the movement of the sink, the head of the cluster in the center of the sensor field faces the focal point problem in the process of resetting the routes, leading to a sharp decrease in energy (Yarinezhad and Hashemi, 2019).

Erman et al. (2012) have proposed the method of "Hexagonal cell-based Data Dissemination" (HexDD), in which a hexagonal grid structure is created for data addressing. HexDD defines questions and lines based on the six directions of a hexagon to avoid redundant distribution of sink data. Nodes send their information to the nearest boundary line, which after sending, is broadcast to the center of the cell. Then the nodes that are along the border lines store the data and repeat the sending (Erman et al, 2012; Yarinezhad and Hashemi, 2018).

The sink data is pushed to the network and approaches a boundary line node with specified stored data. Data transmission to the mobile sink is done using the reverse path. To deal with sink movement, when the sink moves from one cell to another, the central node must be notified. Moreover, border nodes along the route inform which new cell the sink is currently located .

The result of this work is high energy consumption due to the high speed of the sink. For this purpose, the nodes that are along the border line cell, and especially in the central cell, are vulnerable, because high energy consumption causes the focal point problem to arise.

Oh et al. (2010) have proposed an extension model called "Backbone-based Virtual Infrastructure" (BVI) which uses multi-step and single-step clustering. In this method, to minimize the total number of clusters and reduce the network overhead, the sink position information is sent to all cluster head nodes. The HEED algorithm is used for clustering nodes, which gives priority to the energy levels of the other nodes in the election of cluster head nodes (Oh et al., 2010; Priyadarshi et al., 2018).

This algorithm for following the route that has information about the position of the sinks, considers the network operator as the specified node of the cluster head and the root of the tree. When the mobile sink connects to the cell field, it records its information using the nearest cluster head. Based on this, the host node of the cluster head is updated. When a mobile sink in a cluster moves, the corresponding cluster head node only maintains the connection of the sink with the cluster and prevents the update location of the sink from being broadcast to the root. However, when a sink joins another cluster, another node registers this factor. Then, it shares its information with the root information and other cluster head nodes in the BVI part. Although multi-step clustering is a good plan to minimize the number of clusters and control network overhead, the existence of a focal point causes rapid energy depletion and shortens the network lifetime.

Tang et al. (2012) presented the MESS method. In this method, a virtual strip is created in the field of sensors. As a result, wireless nodes (sink subset) increase. A set of sub-sink nodes are available along the route, which are used for the rendezvous of mobile sinks and also for collecting and storing data from sensor nodes. A mobile sink places the query along a virtual strip to reach the nodes in the sink subset. Subgroups, after receiving the query from the mobile sinks, submit their data route to the mobile sink and use the geographical forwarding method (Tang et al., 2012; Vikneshkumar et al., 2020).

Mir et al. (2011) presented the QDD method. In this method, after discovering an event, a node calculates a set of rendezvous. Then, by successive partitioning, the physical space of the network is divided into four quadrants of uniform sizes. After network partitioning, the data routes that are closer to the central nodes are placed in one partition. The mobile sink disseminates the query packet in the same way as for packetizing nodes in the nearest primary RP. In static nodes, a set of identical nodes become RP over and over again, as a result of which the initial energy of the nodes is depleted and, thus, the lifetime of the network is generally reduced (Lenka et al., 2018; Mir et al., 2006).

Lin et al. (2010) presented the HCDD method. In this method, a hierarchical cluster architecture is proposed in which the second level of the mobile sink cluster head is elected as the routing agent. Routing agents have the ability to respond and keep information about the location of the route of the last sink, and all cluster heads gather their routes to the nearest routing agent. In this method, when the sinks are moved, the cluster heads inform the nearest routing agent. After that, as soon as the sink realizes the broadcast, information routing agents inform all other agents in the location of the next sink. Nodes tolerate high energy consumption by using HCDD during sink movement (Lin et al., 2010; Saravanan and Sasikumar, 2021).

At the end, Table 1 indicates the summary and comparison of data dissemination protocols based on virtual structure:

Table 1. Comparison of Data Dissemination Protocols Based on Virtual Structure

Model	Location-Aware	Overhead Network Control Cost	Convergence Time	Applicability
VCCSR	Yes	moderate	moderate	wide
HexDD	Yes	moderate	low	wide
BVI	No	moderate	low	wide
MESS	Yes	low	low	limited
QDD	Yes	high	low	wide
HCDD	No	low	low	wide

Source: (Khan et al., 2014)

2.3. VGDRA Algorithm Network Model

In this scheme, "virtual network based on dynamic route setting" for intermittent data collection improves energy by using mobile sink and distributing nodes in sensor field points. The structure of the virtual network and how new routes are maintained towards the final route to the mobile sink are among the details of the VGDRA scheme. The working steps of this algorithm include several parts:

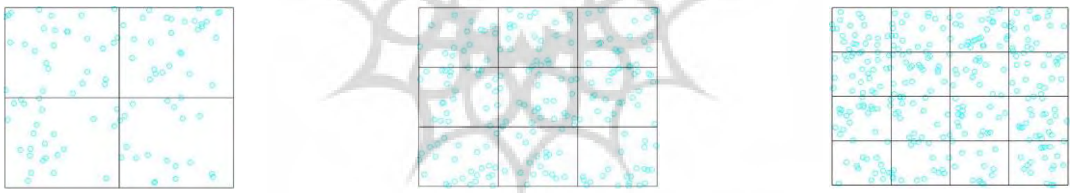
2.4. Virtual Structure Construction

In the virtual network structure, according to the number of cells, the sensor field is divided into several cells. The logic of partitioning is to spread the work capacity among the cell-header nodes and increase the network lifetime. To determine the number of cells and the cell-headers, LEACH (Heinzelman et al., 2002), TEEN (Manjeshwar, 2001), and APTEEN (Agrawal, 2015) initiatives have been used, with a 5% of the total number of sensor nodes being considered. According to the number of N nodes, in the VGDRA scheme and using equation (1), the sensor field is divided into K cells of the same size. Subsequently, a set of nodes is elected as a cell-header (Khan et al., 2014). In Figure 1, (a), (b), and (c) show the grid celling into cells of the same size for N = 100, 200, and 300, respectively.

Figure 1

Division of the Field into Cells Based on the Number of Nodes

$$K = \begin{matrix} 4 & N * 0.05 \leq 6 \\ 9 & 6 < N * 0.05 \leq 12 \\ 16 & 12 < N * 0.05 \leq 20 \end{matrix} \qquad (1)$$



(a) K=4, when N≤100 (b) k=9, when 100<N≤200 (c) k=16, when 200<N≤300

Source: (Khan et al., 2014)

In electing the cell-header, first in each cell, the nodes closer to the center are elected. In the first step, the nodes identify the dimensions of the sensor field and calculate the midpoint of their cell. To reduce the communication cost, all nodes volunteer, while the nodes whose distance from the center of the cell is less than the threshold are elected (Khan et al., 2014).

After electing the initial cell-header, each cell-header announces its status to all existing nodes and neighboring nodes of its cell. Nodes only respond to the nearest cell-header and share the information of the secondary cell-header with the primary one. In this method, headers of neighboring cells use each other's information through the gateway node. A set of nodes representing the cells make a chain similar to the structure of the virtual backbone.

2.5. Setting Dynamic Routes

To deal with the dynamic network topology, the nodes need routes that have the latest information about the position of the mobile sink. Using the flood message sending mechanism to get the last position of the sink is the easiest method; however, it is not compatible with the purpose of saving energy.

In VGDRA, only a set of cell-headers that make up the virtual backbone structure maintain new routes to the last location of the mobile sink. To collect information from the sensor field, the mobile sink continuously rotates around the sensor field. As soon as the border nodes see the sink, they inform the cell-headers about the presence of the sink, and the cell-headers share this information with the rest of the headers in a controlled way. Then, the routes are changed to the sink, and the information from the change of cell-headers is sent to one another to reach the nearest cell-header to the sink, and that cell-header sends the information to the sink (Figure 2). In this algorithm, as a small number of routes are changed, energy consumption is reduced (Khan et al., 2014).

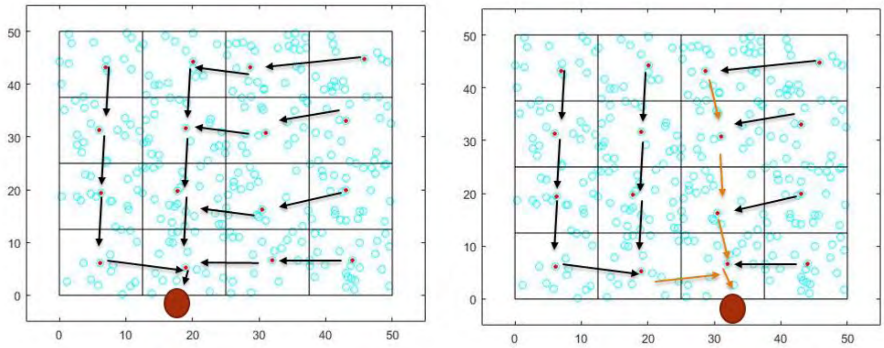


Figure 2. Formation of Virtual Routes to the Sink
Source: (Khan et al., 2014)

2.6. Cell-Header Rotation

The cell-header rotates in each cell and is responsible for data collection. Therefore, it consumes a lot of energy, such as the cluster head in clustering algorithms. In order to prolong the lifetime of the network, the cell agent needs to distribute the task among the nodes in the cell. Moreover, to achieve consistent energy loss, the amount of energy of the cell-header is checked; if it is less than a certain limit, the election of a new cell-header is started. In the election process, the node closer to the middle point of the cell and with a higher energy level is elected as the header of the new cell. If no suitable node is found, the search area is slightly increased around the midpoint of each cell. To maintain the virtual structure, the current cell-header shares the information of the new cell-header to all members of the cell and neighboring headers before leaving the task (Khan et al., 2014).

3. Implementation of the Proposed Model

3.1. Hypothesis

Consider a wireless sensor network with N consistent sensor nodes distributed in an environment and continuously monitored. Our assumptions about the principles of the network model and sensor nodes in this research are:

1. Nodes are randomly induced to collect news information.
2. All nodes have a consistent structure and are aware of their location.
3. The nodes adapt their transmission power based on the distance with the destination node.
4. The moving sink has an unlimited source of energy.
5. Nodes have similar capabilities and resources, each node is assigned a unique ID.
6. The sink communicates with media agency through internet or satellite.
7. The sink sends its information online and moment by moment.
8. Before the sensor runs out of energy, the message "I died" is sent to the sink.
9. If a sensor does not send information to the cell-header, it is not assumed to be dead; however, it is assumed to be destructed or destroyed.

3.2. Network Modeling

In order to divide the network into cells and elect the cell-header in the proposed method, the VGDRA algorithm is used. The parameters of energy, centre and search radius have been used to elect cell-headers. In this way, when the average energy of cell-headers is less than the threshold, the election process of the cell-header starts and the search radius in each cell is increased during four steps. Cell-header election is calculated based on equation (2).

$$\text{Cell-Header} = {}^{\text{Center}}/_{\text{Energy}} \quad (2)$$

Determining the optimal route for the movement of the sink is very effective in energy consumption, which is not possible to set in advance due to the dynamic conditions of the network. In the basic algorithm, the sink only moved around the ground, whie in this proposed algorithm, using the cuckoo's meta-heuristic search algorithm, the sink moves smartly in the middle of the ground. During several repetitions and movements in the problem space, this algorithm smartly approaches the best solution; in other words, the best and least expensive position for moving the sink.

4. Cuckoo Meta-Heuristic Algorithm

The cuckoo search (CS) algorithm is a meta-heuristic algorithm that was inspired by the parasitic and obliging behavior of the nestlings of a certain species of birds called cuckoo (Buaklee and Hongesombut, 2013). Recent studies show that CS is potentially more efficient than PSO and genetic algorithms (Yang and Deb, 2009). Like other evolutionary algorithms, Cuckoo starts with an initial population. This population of cuckoos has some eggs that will lay in the nests of some host birds. A number of these eggs that are more similar to the eggs of the host bird will have a better chance of developing into adult cuckoos. Other eggs are detected by the host bird and destroyed. The amount of grown eggs show the suitability of nests in that area. The more eggs that can survive in an area and are preserved, the greater the profit is allocated to that area. Therefore, the position in which the largest number of eggs are saved will be the parameter that the cuckoo algorithm intends to optimize (Wang et al., 2010).

Finally, after several iterations, the entire population of cuckoos reaches an optimal point with the maximum similarity of the eggs to the eggs of the host birds, as well as the location of the most food sources. This place will have the most overall benefit and the least number of eggs will be lost in it (Sadeghi and Moatar, 2015).

Yang and Deb (2009) considered three ideal rules for CS:

1. Each cuckoo lays one egg (answer) at a time and places its egg in a randomly elected nest.
2. The best nest with the best answer is transferred to the next generation (steps).
3. The number of available host nests is fixed, and the egg (answer) of the alien cuckoo is discovered by the host bird with probability [0, 1]P_a. In this case, the host bird can build an entirely new nest by dropping or discarding the eggs.

4.1. Simulation of the Proposed Smart Movement Model of the Mobile Sink

In the VGDRA algorithm, only one constant movement was considered for the sink. However, in the proposed method, a combination of two "fixed and circular" and "smart" movements is included in creating an optimal route for the sink. In constant movement, the sink first moves on a circular route with a radius of 0.20, then it smartly moves to the optimal location in each round by the cuckoo search algorithm. Fixed movement, after various smart movement tests, was determined by the impossibility of wandering around the entire environment (large dimensions) and getting stuck on a single route. Because the sink is continuously receiving and processing data, if the next position of the sink is the same as the current location, not establishing the constant movement increases the likelihood of stopping the sink in one place. According to Figure 3, the chosen position of the sink is not only a position with minimum multistep but also a position that smartly reduces the estimation of data transmission costs. In the following, the stages of smartization of the movement of the mobile sink will be explained.

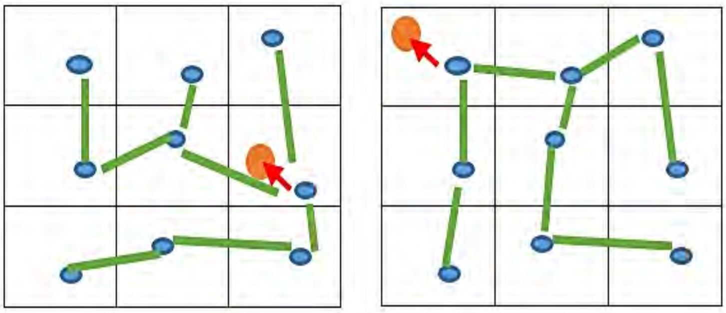


Figure 3. Elected Position of the Smart Well

Defining the Primary Population of Cuckoos

In the implementation of the cuckoo search algorithm, 15 nests or initial population of cuckoos are randomly defined. Only one cuckoo egg is placed in each nest, and each cuckoo egg and nest represents a solution that is determined by two parameters: cost and location. The cost of moving to positions is calculated by estimating the location of the cell-headers. According to the definition of the proposed algorithm, each egg or solution provides a position or a place for the movement of the sink. In the proposed model, first, by determining the size of the population and the number of repetitions of the algorithm, the initial parameters are set according to the cuckoos article (Rajabioun, 2011).

Thus, in equation (3), a set of solutions are defined as an array of xi's:

$$X = \{x1, x2, \dots, x\} \quad (3)$$

Each position, as the initial search space, includes two values for movement speed and movement angle, which are randomly calculated in the first step of running the algorithm. The upper limit of these two optimization variables is equal to the maximum distance value and 360 degrees. Finally, after executing the steps of repeating the algorithm, the best position based on the minimum amount of cost is determined and the sink is transferred to that place:

$$Xi = \{\text{Velocity}, \text{pi}\} \quad (4)$$

4.2. Cost Function

At each turn of implementation, routes called virtual backbone are formed for communication and information transfer between cell-headers, which are effective in calculating the cost function to choose the best location for movement of the sink. The sink can move to any location or position to receive the semi-processed data, while the cost of sending each route is different. The proposed method is to search for a cuckoo (position), using the cuckoo algorithm that creates a route with the lowest cost and the best efficiency.

In the implementation of the cost function, the closest cell (i) to the sink is first determined; then, the ratio of the total remaining energy parameters of the index cell-header to all cell-headers, the number of members of the index cell-header to all cell-headers, and the hypothetical cost of forming the virtual route of the index cell-header to the number of cells are calculated.

The output of the cost function is obtained by the sum of the value and the result of the ratio of the total distance of all cell headers to the new location of the sink, the degree of movement

of the sink towards the index cell header, and the median of all cell headers to the index cell, multiplied by 6 times the number of cells.
(equation 5).

$$\text{Cost Function} = \frac{\left(\sum_{i=}^{n} x_i^{(i+1)}\right)}{k} + \frac{\left(\sum_{i=1}^{n} iy_i\right)}{6k} \tag{5}$$

In this equation, X's is an array of $x_i's$, which $x_i's$ are respectively equal to:
Xi = {Energy, Cost_duty, Number} (6)
Furthermore, Y is an array of yi's which are respectively equal to:
Yi = {Distance, Moderation, Degree} (7)
To calculate the value of x and y array parameters, the cell where the sink is located is first considered as an index; then, the values are calculated as follows:

4.3. Energy

The more the residual energy of the cell-header is, the longer the network's lifetime increases. This is because when transmitting data from the nodes of its own cell and other cell-headers, the energy of the index cell-header does not run out when the network stops. If the energy of the cell-header is less than the total information collected from the network, the transmission is incomplete and the network is stopped.

Equation (8) calculates the remaining energy ratio of the index cell header.

$$\text{Energy} = \frac{\left(\sum_{i=1}^{k} E_{cell\_i}\right)}{E_{index}} \tag{8}$$

k signifies the number of cells, E_{cell} is the total energy of all cell-headers, and E_{index} is the energy of the current cell-header.

4.4. Hypothetical Cost (Cost_duty)

This parameter is the most influential value in determining the location of the sink movement. In this parameter, the communication cost of the cell-header index is calculated hypothetically with other cell-headers in order to receive information, so that finally the sink moves to the cell-header with lower communication costs. If the cell closest to the sink is the cell-header index, then the energy is zero; Otherwise, the cell-header index (the header of the new cell to which the well has moved) informs the header of the previous cell-header (the cell-header that the sink was close to in the previous position) and the communication energy is calculated. In the next step, with the movement of the sink, each cell informs the other cells about the move, so that the cells that need to change direction, towards the cell-header near the sink, are identified, and the new energy route is calculated according to their distance from the cell. Finally, the sum of these energies is considered as a cost. Algorithm (1) shows how to calculate the hypothetical cost:

```
Energy1 ← sum [N.E]
while  is not empty (Node)
  {
      for: j to Nodes
      {
         H ← Hops to Neighbors
              for i: 1 to length Neighbors
```

```
{
        N1 ← CellHeader
        N2 ← CellHeader (Neighbors)
        Distance ← N(N1) to N(N2)
        Calcute cost of Energy N(N1) and N(N2)
                if
                {
                        H(i) is not equal j  and Hop(j) is not equal Neighbors{j}(i)
                        and is not member (Neighbors{j}(i) and ChangedNodes)
                                then
                        N ←  NN Neighbors{j}(i)
                        Hop(Neighbors{j}(i)) ← j
                        ChangedNodes ←  ChangedNodes Neighbors{j}(i)
                }
    }
  }

    Nodes ← NN
    Nodes ← unique(Nodes)
  }
Energy2 ← sum [N.E]
E2 ← Energy1-Energy2
```

Algorithm (1) – Hypothetical Cost

4.5. Members of the Cell-Header (Number)

The more the number of cell-header index, the lower the energy consumption in the entire network, since the information is sent directly to the sink by the cell-header index. However, if the sink moves to a cell with a smaller number of members, the information must be sent through the virtual route and, in addition to the occurrence of multi-step communication, the participating cell-headers will have a high energy loss in transmitting the data of the cell-header with a large number of members.

The ratio of the number of cell header members to the total number of all cell header members based on equation (9) is equal to:

$$\text{Number} = \frac{N_{\text{cell\_index}}}{\sum_{i=1}^{k} N_{\text{nods}}} \tag{9}$$

In this equation, N_{cell_index} is equal to the number of the members of cell-header index, and N_{nods} represents the number of non-index node members.

4.6. Distance to the Sink

The smaller the distance between the cell-header and the sink, the less energy is consumed during the transmission of information in the entire network. With equation (10), the distance of all cell headers to the new location of the sink is obtained. Then, the ratio of the total distance to the sink and the distance of the cell header (index) where the sink is located is calculated:

$$\text{Sum\_all} = \sum_{i=1}^{k} \sqrt{((\text{NewSink}_x - N_{x\_j})^2 + (\text{NewSink}_y - N_{y\_j})^2))} \tag{10}$$

$$\text{Sum\_index} = \sqrt{((\text{NewSink}_x - N_{x\_index})^2 + (\text{NewSink}_y - N_{y\_index})^2))} \tag{11}$$

$$\text{Distance} = \frac{\text{Sum\_all}}{\text{Sum\_index}}$$

In this equation, Sum_all is the distance of all cell-headers to the sink, Sum_index signifies the distance of the cell-header index to the sink, $NewSink_x$ and $NewSink_y$ are the coordinates of the new location of the sink, N_x and N_y represent the location coordinates of all cell-headers, and N_{x_index} and N_{y_index} are the location coordinates of the cell-header index.

4.7. Moderation

Being closer to the route of movement of the sink towards the center of the network will increase single-step communications, reduce multi-step communications and, as a result, reduce the energy consumption of data transmission. This does not mean that the median parameter will create a focal point in the network, because with other parameters such as energy, cost, and degree, the best possible position for the smart movement of the sink is taken into account. However, assuming the same cost between two cell-headers, one in the boundary cell of the field and the cell-header index in the center of the field, to maintain the optimality, the sink must move towards the center cell of the field to reduce energy consumption by avoiding multi-step communication. This distance is obtained through the Euclidean distance formula calculated by the Pythagorean theorem in equation (12).

$$\text{Moderation} = \sum_{i=1}^{k} \sqrt{((N_{x\_cellindex} - N_{x\_j})^\wedge 2 + (N_{y\_cellindex} - N_{y\_j})^\wedge 2))} \tag{12}$$

$N_x$and$_y$_cellindex is the position of cell-header index while $N_x$and$_y$_j is the position of other cell-headers.

4.8. Degree

This parameter is used to not stop the sink in one area, maintain the dynamics of the network, and balance the energy consumption. In this way, every time the sink moves to the cell-header index, the number of moves for that cell is stored; therefore, if there are similar conditions in choosing to move to the cell-headers, the sink moves to the cell with a lower degree.

4.9. Updating Cuckoos

In this step, the cuckoo with the lowest cost (output of the cost function) is considered as the best location for moving the sink. Then, in order to change all the positions to the best cuckoo in each generation of the cuckoo population, their positions are updated in the next generation and the cuckoo algorithm is repeated for the size of the cuckoo population.

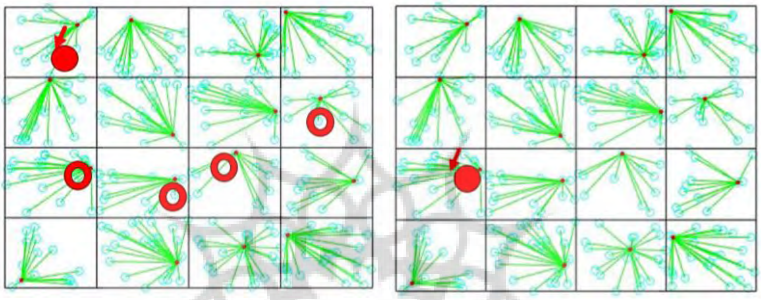
4.10. Choosing the Best Cuckoo and Discarding the Worst Cuckoo

The new position of each cuckoo is equal to the previous position of the cuckoo, which has moved to the best cuckoo by a percentage. The formulas in this part are obtained from the research conducted by Rajabioun (2011). If the values exceed the limits of the problem, they are reduced to the limits of the problem and the cost of the new position is calculated. If the cost of the new position is lower, the new cuckoo would replace the previous cuckoo, and if the new cuckoo is better than the best cuckoo, it is considered the best cuckoo.

Based on the output of the cost function, the cuckoo algorithm determines the probability of pa or the rate of discarding cuckoos. Initially, this value was set at 0.25, as in the basic article, but after various tests, it was changed to 0.6. A low value of pa causes more solutions to be discarded, thereby reducing the number of algorithm executions and the lifetime of the network.

In the implementation of the algorithm, first a situation is randomly elected and its quality is evaluated according to the probability of pa. In this way, with the probability of pa Î[0,1], inappropriate positions are discarded and in order to create a new position, the inappropriate nest is moved to a new location, using a new movement step (random). Then, the cost of the new cuckoo is calculated. If the cost of the new position is lower, the new cuckoo would replace the previous cuckoo, and if the new cuckoo is better than the best cuckoo, it is considered the best cuckoo.

In the proposed algorithm, the random positions smartly move towards the best state with the cuckoo method to reach the best solution by improving each solution after 150 times of running the algorithm. First, the number of repetitions of the cuckoo population was considered 10 times, but after the 10th implementation, the algorithm almost approached the optimal solution. Therefore, in order to achieve the best answer, 15 repetitions were considered for the population of cuckoos. Finally, in the last sequence of running the algorithm, the position of the best cuckoo (including the optimal amount of displacement and movement angle) is sent to the main function so that the movement of the sink is based on it. Figure 4 shows the image output of the smart movement of the mobile sink, and Figure 5 illustrates the flowchart of the proposed method.



A - Hypothetical displacement of the movement of the smart sink

B - Smart displacement of the sink

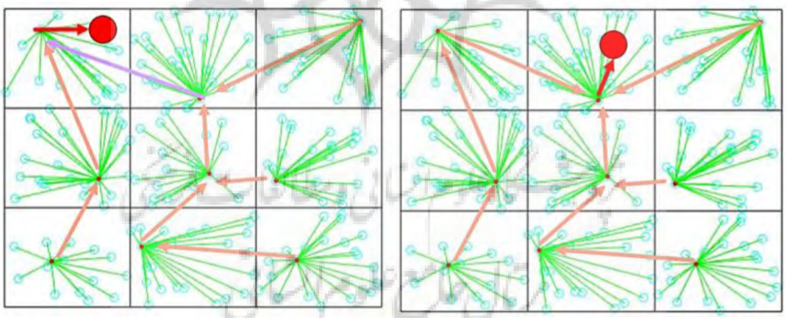


Figure 4. Pictorial Outputs of the Smart Movement of the Mobile Sink

C- Setting the dynamic route after smartly movement of the sink

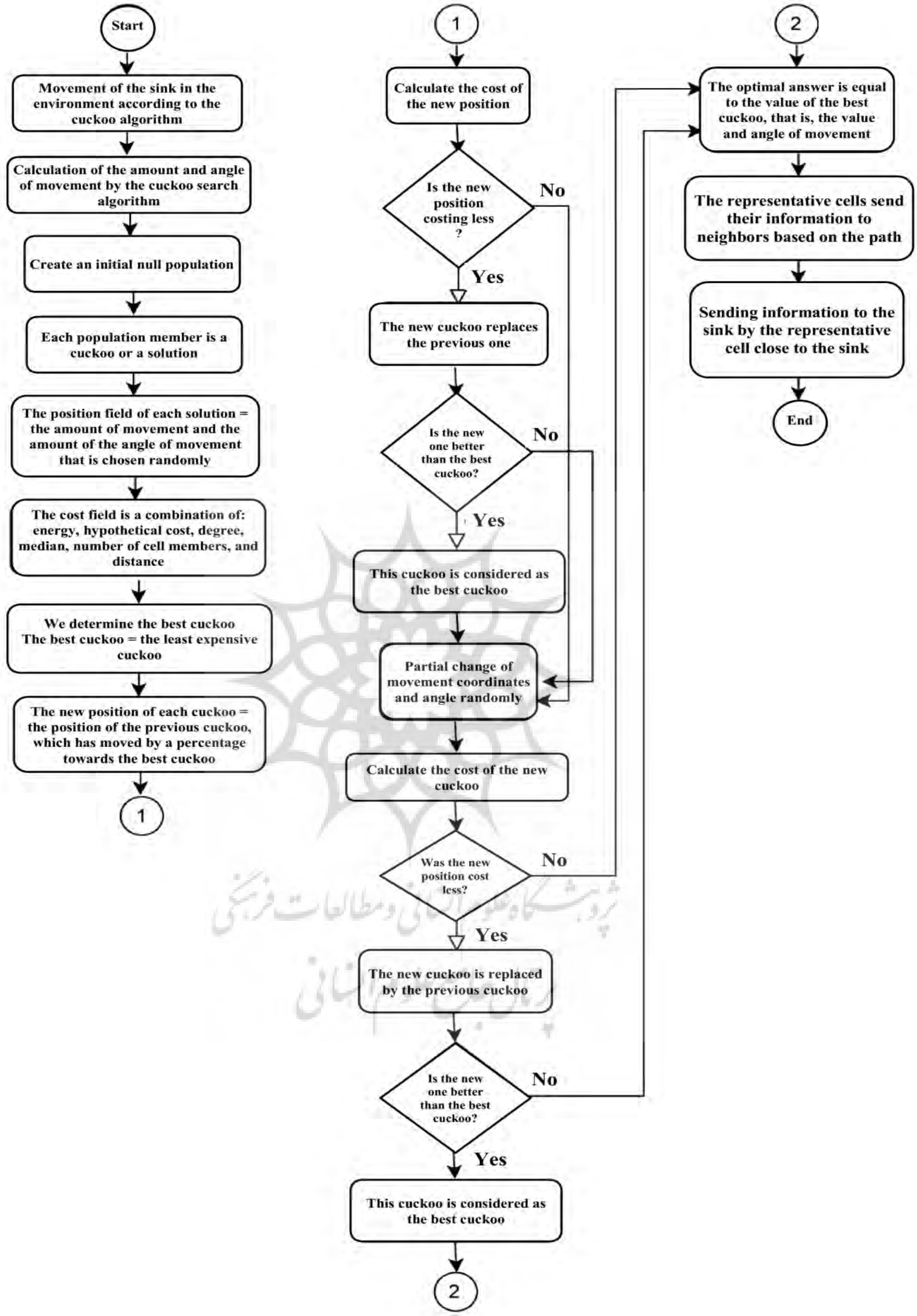


Fig 5. Flowchart of the proposed method

5. Evaluation of Results

In this research, focusing on reducing energy consumption and network lifetime, a number of sensor nodes in a fixed environment of 200 x 200 meters have been simulated using MATLAB software and compared with the basic algorithm. Initially, all the sensor nodes have a consistent energy storage of 1 mJ. In the implementation, the energy model used in VGDRA (Khan et al., 2014) and the free space radio dissemination model are used (d signifies the distance between the transmitter and the receiver). Moreover, the energy loss of nodes in transmission and reception has been obtained using equations (13) and (14), respectively:

$$T_x=(E_{elect} \times K) + (E_{amp} \times K \times d^2) \qquad (13)$$

$$R_x= E_{elect} \times K \qquad (14)$$

In equations (13) and (14), k is the message length and 8 bits. E_{amp} signifies the energy emitted by the receiver and transmitter to suppress channel noise, and E_{elect} represents the energy loss of the node to implement the electronic-radio circuit (Khan et al., 2014). In this simulation, the communication cost of the nodes is only considered in setting the data delivery routes to the sink, while the actual data delivery (via the Internet or satellite) is beyond the scope of this article.

The mobile sink in the sensor field starts to move randomly from a place on the ground, periodically releasing small packets of News. Every time the sink is implemented by the cuckoo optimizer algorithm, it smartly moves towards one of the cell-headers as the destination, and this process continues until the end of the network's lifetime.

Our proposed method is scalable and it is possible to improve energy efficiency in networks with different sizes. To clarify this claim, the performance of the proposed method is investigated by VGDRA protocols of different sizes. Table 2 indicates the algorithm execution parameters.

Table 2. Algorithm Execution Parameters

Network size	Number of nodes	Initial energy	Sink speed	Eelect	Eamp	k
200*200	100 to 400	1 mj	۵۰ m/sec	50 nJ	10 nJ/bit/m2	B bits

(Khan et al., 2014)Source:

5.1. Lifetime

One of the most important criteria to check the energy efficiency is the lifetime of the network. There are various definitions of lifetime, including the time between the start of network operations and the time when the first node dies due to energy depletion. Based on this criterion, it is an optimal algorithm whose sensors die at a later time. As can be seen in Figure 6, the proposed method has increased the lifetime of the network by about 65%, compared to the VGDRA protocol. According to the results, in the proposed method, by increasing the number of sensor nodes in a fixed network environment, the lifetime of the network increases. This means that the number of nodes in a fixed environment has a direct relationship with the lifetime of the wireless sensor network.

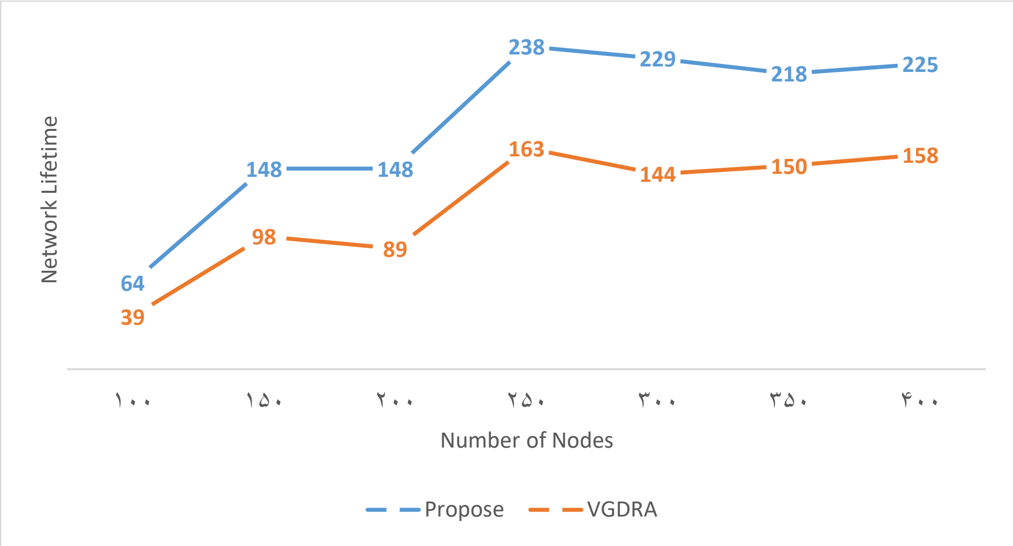


Figure 6. Comparing the Lifetime of the Proposed Method with VGDRA Protocols

5.2. The Cost of the Construction of a Virtual Route

It is an estimate of the energy loss of the nodes when choosing cell-headers and then forming a virtual route (backbone) between cell-headers. Figure 7 indicates the average energy loss of nodes in the proposed scheme and VGDRA during network construction. According to the route construction diagram in the VGDRA algorithm, higher dimensions of the network have a higher cost. In other words, a large population of sensor nodes participated in the election of the cell-header, while the cost in the proposed algorithm for the higher dimensions of the network is much lower, non-oscillating, and almost linear, due to the lifetime compared to the VGDRA algorithm.

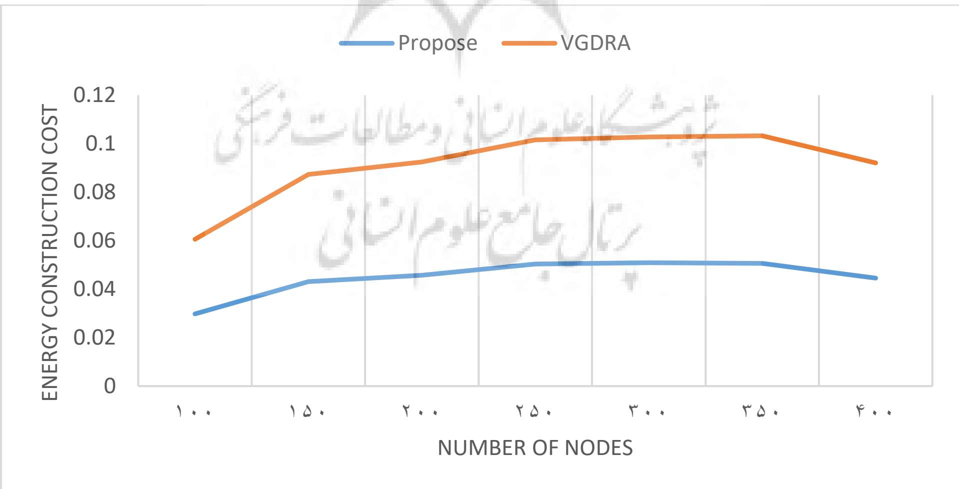


Figure 7 : Comparing the Cost of the Construction of a Virtual Structure

5.3. Convergence Time

This time is an indirect reflection of the efficiency of data transmission. Regarding convergence time, the faster the nodes converge to the last location of the mobile sink, the better they perform in data transmission mode. In other words, this time is an estimate of the elapsed time when a significant change of position of the mobile sink is performed by the nodes forming the virtual infrastructure (backbone). Based on Figure 8, the convergence time of the proposed design is highly fast, compared to VGDRA when the sink is moving at a speed of 50 m/s.

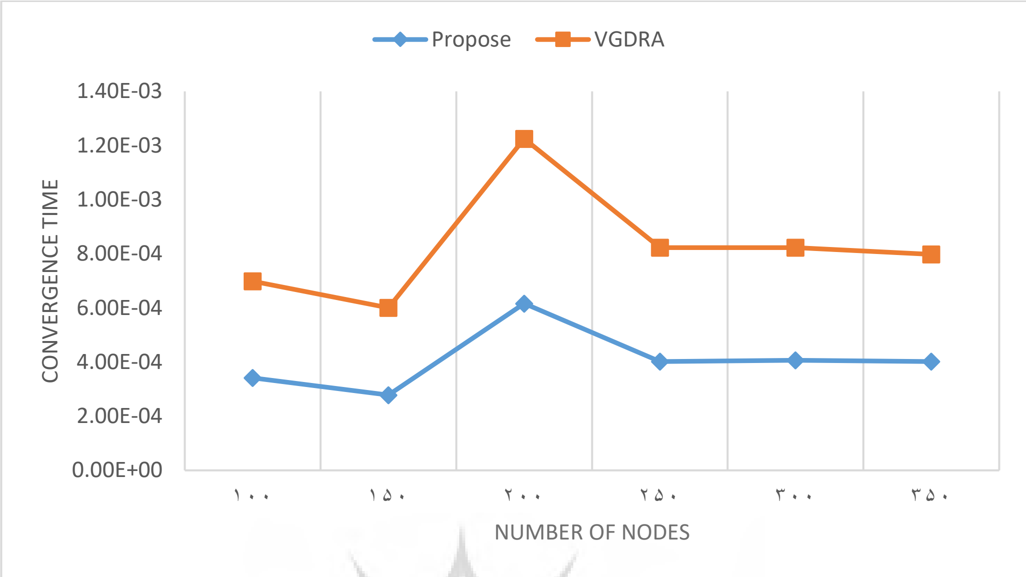


Figure 8. Comparison of Network Convergence Time

5.4. Reconstruction Cost Per Round

This parameter shows the cost of energy loss of nodes in resetting the data transmission routes, when the sink moves around the sensor field. As shown in Figure 9, in the proposed plan, due to the election of appropriate cell-headers as well as the participation of a subset of cell-header nodes in the route reconstruction process, the average energy loss of nodes in the reconstruction of data transmission routes towards the last location of the mobile sink is significantly less compared to the VGDRA design up to the limit of 300 nodes. However, beyond that point, the costs of the two algorithms become almost comparable. It should be noted that the lifetime of the VGDRA network is much shorter than that of the proposed algorithm, which is very effective in calculating the average costs.

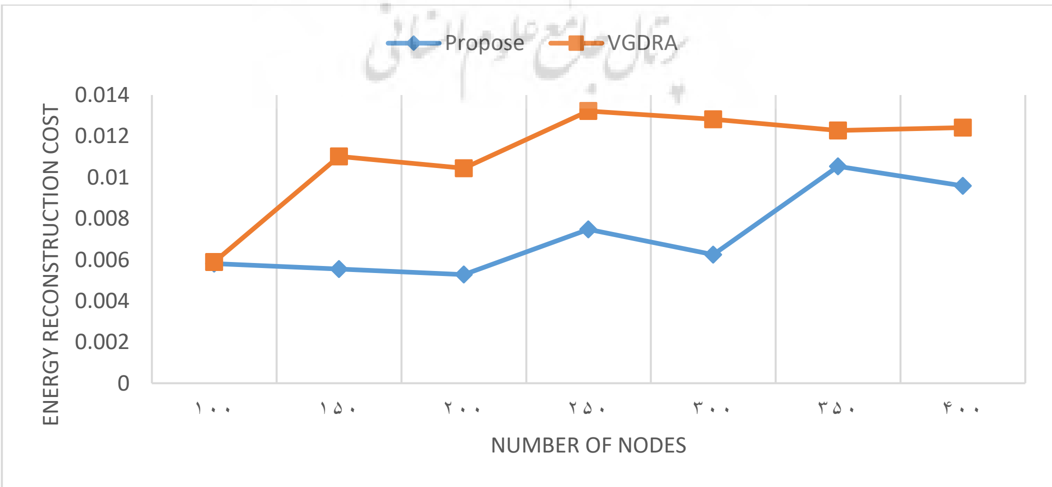


Figure 9. Comparison of the Cost of Route Reconstruction in Each Round

6. Conclusion and Recommendations

Since nowadays citizen journalists sometimes fall ahead of professional journalists, smart journalism can create a sustainable competitive advantage for the world's media and news leaders, especially in communication crises. Although new researcher has mostly relied on aerial journalism, news coverage by other technological tools, such as wireless sensor network (depending on the environment and access level), will also be a safe and fruitful model. This is because in the model of aerial journalism, the destruction of the aerial structure may lead to the cessation of smart news preparation operations. However, in the wireless sensor network model, due to the existence of a large number of reporter sensors, a wider variety of information will be discovered in a short time. On the other hand, if one node is destroyed, other sensors can continue to operate until the network's lifetime ends, provided that the node runs out of energy. Therefore, in this research, efforts were made to significantly optimize the energy challenge by simulating the smart movement of the mobile sink and avoiding multi-step communication, border and linear mobility, as well as hypothesizing costs before moving..

Future research may focus on the necessity of replacing the reporter with technology in order to protect human resources, redefining the news industry as a luxury and competitive product, using the Internet of Things in news preparation, and organizational policy making to use smart tools in news provision.

7. References

Ali, A., Jadoon, Y. K., Changazi, S. A., and Qasim, M. (2020, November). Military operations: Wireless sensor networks based applications to reinforce future battlefield command system. In 2020 IEEE 23rd International Multitopic Conference (INMIC) (pp. 1-6). IEEE. https://doi.org/10.1109/INMIC50486.2020.9318168

Almalki, F. A. (2019). Comparative and QoS performance analysis of terrestrial-aerial platforms-satellites systems for temporary events. International Journal of Computer Networks and Communications (IJCNC), 11(6), 111-133. https://doi.org/10.5121/ijcnc.2019.11607

Almalki, F. A., and Angelides, M. C. (2019). A machine learning approach to evolving an optimal propagation model for last mile connectivity using low altitude platforms. Computer Communications, 142, 9-33. https://doi.org/10.1016/j.comcom.2019.05.017

Almalki, F. A., Aljohani, M., Algethami, M., and Soufiene, B. O. (2022). Incorporating drone and AI to empower smart journalism via optimizing a propagation model. Sustainability, 14(7), 3758. https://doi.org/10.3390/su14073758

Alsamhi, S. H., Afghah, F., Sahal, R., Hawbani, A., Al-qaness, M. A., Lee, B., and Guizani, M. (2021a). Green internet of things using UAVs in B5G networks: A review of applications and strategies. Ad Hoc Networks, 117, 102505. https://doi.org/10.1016/j.adhoc.2021.102505

Alsamhi, S. H., Almalki, F., Ma, O., Ansari, M. S., and Lee, B. (2021b). Predictive estimation of optimal signal strength from drones over IoT frameworks in smart cities. IEEE Transactions on Mobile Computing, 22(1), 402-416. https://doi.org/10.1109/TMC.2021.3074442

Banerjee, T., Xie, B., Jun, J. H., and Agrawal, D. P. (2010). Increasing lifetime of wireless sensor networks using controllable mobile cluster heads. Wireless Communications and Mobile Computing, 10(3), 313-336. https://doi.org/10.1002/wcm.789

Belda, F. R., and Gonçalves, J. (2021). News industry perspectives: An analysis of innovation trends in media management. Revista Observatório, 7(4), a3en-a3en. https://observatorio.ufmg.br/index.php/observatorio/article/view/31424

Bhanu, K. N., Reddy, T. B., and Hanumanthappa, M. (2019). Multi-agent based context aware information gathering for agriculture using wireless multimedia sensor networks. Egyptian Informatics Journal, 20(1), 33-44. https://doi.org/10.1016/j.eij.2018.07.001

Buaklee, W., and Hongesombut, K. (2013, May). Optimal DG allocation in a smart distribution grid using Cuckoo Search algorithm. In 2013 10th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (pp. 1-6). IEEE. https://doi.org/10.1109/ECTICon.2013.6559596

Chen, C., and Chekam, G. A. (2021). Algorithms and media ethics in the AI age. In Handbook of Global Media Ethics (pp. 301-328). Springer, Cham. https://doi.org/10.1007/978-3-030-84816-5_16

Cheng, J., and Xia, L. (2016). An effective cuckoo search algorithm for node localization in wireless sensor network. Sensors, 16(9), 1390. https://doi.org/10.3390/s16091390

Chittoor, P. K., Chokkalingam, B., and Mihet-Popa, L. (2021). A review on UAV wireless charging: Fundamentals, applications, charging techniques and standards. IEEE Access, 9, 69235-69266. https://doi.org/10.1109/ACCESS.2021.3078244

Di Domenico, G., Sit, J., Ishizaka, A., and Nunan, D. (2021). Fake news, social media and marketing: A systematic review. Journal of Business Research, 124, 329-341. https://doi.org/10.1016/j.jbusres.2021.02.005

Di Francesco, M., Das, S. K., and Anastasi, G. (2011). Data collection in wireless sensor networks with mobile elements: A survey. ACM Transactions on Sensor Networks (TOSN), 8(1), 1-31. https://doi.org/10.1145/2140990

Diakopoulos, N. (2019). Automating the news: How algorithms are rewriting the media. Harvard University Press. https://www.hup.harvard.edu/catalog.php?isbn=9780674976408

Driedger, C. L., and Westby, E. G. (2020). USGS cascades volcano observatory news media management guide—General protocols and templates (No. 1462). US Geological Survey. https://pubs.usgs.gov/sir/2020/5062/sir20205062.pdf

Erman, A. T., Dilo, A., and Havinga, P. (2012). A virtual infrastructure based on honeycomb tessellation for data dissemination in multi-sink mobile wireless sensor networks. EURASIP Journal on Wireless Communications and Networking, 2012(1), 1-27. https://doi.org/10.1186/1687-1499-2012-22

Fadel, E., Gungor, V. C., Nassef, L., Akkari, N., Malik, M. A., Almasri, S., and Akyildiz, I. F. (2015). A survey on wireless sensor networks for smart grid. Computer Communications, 71, 22-33. https://doi.org/10.1016/j.comcom.2015.08.006

Goksu, M., and Cavus, N. (2019, August). Fake news detection on social networks with artificial intelligence tools: Systematic literature review. In International Conference on Theory and Application of Soft Computing, Computing with Words and Perceptions (pp. 47-53). Springer, Cham. https://doi.org/10.1007/978-3-030-24817-1_6

Guzman, A. L. (2018). What is human-machine communication, anyway. Human-Machine Communication: Rethinking Communication, Technology, and Ourselves, 117, 1-28. https://www.routledge.com/Human-Machine-Communication-Rethinking-Communication-Technology-and-Ourselves/Guzman-Lewis/p/book/9781138486768

Heinzelman, W. B., Chandrakasan, A. P., and Balakrishnan, H. (2002). An application-specific protocol architecture for wireless microsensor networks. IEEE Transactions on Wireless Communications, 1(4), 660-670. https://doi.org/10.1109/TWC.2002.804190

Jamil, S. (2021). Artificial intelligence and journalistic practice: The crossroads of obstacles and opportunities for the Pakistani journalists. Journalism Practice, 15(10), 1400-1422. https://doi.org/10.1080/17512786.2020.1857864

Kandris, D., Nakas, C., Vomvas, D., and Koulouras, G. (2020). Applications of wireless sensor networks: An up-to-date survey. Applied System Innovation, 3(1), 14. https://doi.org/10.3390/asi3010014

Khan, A. W., Abdullah, A. H., Razzaque, M. A., and Bangash, J. I. (2014). VGDRA: A virtual grid-based dynamic routes adjustment scheme for mobile sink-based wireless sensor networks. IEEE Sensors Journal, 15(1), 526-534. https://doi.org/10.1109/JSEN.2014.2349337

Kinalis, A., Nikoletseas, S., Patroumpa, D., and Rolim, J. (2014). Biased sink mobility with adaptive stop times for low latency data collection in sensor networks. Information Fusion, 15, 56-63. https://doi.org/10.1016/j.inffus.2012.09.003

Lenka, R. K., Rath, A. K., Tan, Z., Sharma, S., Puthal, D., Simha, N. V. R., ... and Triroutei, S. S. (2018). Building scalable cyber-physical-social networking infrastructure using IoT and low power sensors. IEEE Access, 6, 30162-30178. https://doi.org/10.1109/ACCESS.2018.2844238

Liang, J., Liu, M., and Kui, X. (2014). A survey of coverage problems in wireless sensor networks. Sensors and Transducers, 163(1), 240. http://www.sensorsportal.com/HTML/DIGEST/P_2890.htm

Lin, C. J., Chou, P. L., and Chou, C. F. (2006, July). HCDD: Hierarchical cluster-based data dissemination in wireless sensor networks with mobile sink. In Proceedings of the 2006 International Conference on Wireless Communications and Mobile Computing (pp. 1189-1194). DBLP. https://doi.org/10.1145/1143549.1143787

Manjeshwar, A., and Agrawal, D. P. (2001, April). TEEN: A routing protocol for enhanced efficiency in wireless sensor networks. In IPDPS (p. 189). https://doi.org/10.1109/IPDPS.2001.925197

McKernan, B., Stromer-Galley, J., Korsunska, A., Bolden, S. E., Rossini, P., and Hemsley, J. (2022). A human-centered design approach to creating tools to help journalists monitor digital political ads: insights and challenges. Digital Journalism, 11(3), 411-430. https://doi.org/10.1080/21670811.2022.2054241

Mir, Z. H., and Ko, Y. B. (2006, September). A quadtree-based data dissemination protocol for wireless sensor networks with mobile sinks. In IFIP International Conference on Personal Wireless Communications (pp. 447-458). Springer. https://doi.org/10.1007/11853365_39

Moguel, J. E., Conejero Manzano, J. M., Sánchez Figueroa, F., Hernández Preciado, J. M., Preciado Rodríguez, J. C., and Rodríguez Echeverría, R. (2017). Towards the use of unmanned aerial systems for providing sustainable services in smart cities. Sensors, 18(1), 64. https://doi.org/10.3390/s18010064

Oh, S., Lee, E., Park, S., Jung, J., and Kim, S. H. (2010, April). Communication scheme to support sink mobility in multi-hop clustered wireless sensor networks. In 2010 24th IEEE International Conference on Advanced Information Networking and Applications (pp. 866-872). IEEE. https://doi.org/10.1109/AINA.2010.29

Priyadarshi, R., Singh, L., and Singh, A. (2018, February). A novel HEED protocol for wireless sensor networks. In 2018 5th International Conference on Signal Processing and Integrated Networks (SPIN) (pp. 296-300). IEEE. https://doi.org/10.1109/SPIN.2018.8477853

Rajabioun, R. (2011). Cuckoo optimization algorithm. Applied Soft Computing, 11(8), 5508-5518. https://doi.org/10.1016/j.asoc.2011.02.033

Saravanan, T., and Sasikumar, P. (2021). Assessment and analysis of action degeneracy due to blackhole attacks in wireless sensor networks. In Proceedings of 6th International Conference on Recent Trends in Computing (pp. 345-355). Springer. https://doi.org/10.1007/978-981-16-0906-4_30

Sadeghi Chuinelli, Z and Moatar, S. M. H. (2016). Flexible job shop scheduling using improved cuckoo search Algorithm by Markov clustering and Levy flight. Tabriz Journal of Electrical Engineering, 46(4), 185-193. https://tjee.tabrizu.ac.ir/article_5269.html

Shakya, R., Dhakal, P., and Sharma, G. (2021). Future trends of wireless sensor network. International Research Journal of Applied Sciences, Engineering and Technology, 7(7), 1-6.https://www.irjaset.com/upload-issue/Future%20Trends%20of%20Wireless%20Sensor%20Network.pdf

Stojanovic, N. (2022). The future of journalism in the robotic age. In Redefining Journalism in an Age of Technological Advancements, Changing Demographics, and Social Issues (pp. 71-91). IGI Global. https://doi.org/10.4018/978-1-6684-8447-3.ch004

Tang, B., Wang, J., Geng, X., Zheng, Y., and Kim, J. U. (2012). A novel data retrieving mechanism in wireless sensor networks with route-limited mobile sink. Int. J. Grid Distrib. Comput, 5, 133-140. https://www.sersc.org/journals/IJGDC/vol5_no4/14.pdf

Tashtrian, F., Rouhani, S. M., Yaghoobi-Moghadam, M. H., and Hamed. (2014). A Hopfield Network-Based Method for Optimizing Mobile Sink Path in Wireless Sensor Networks. *Journal of Advanced Defense Science and Technology*, 2(1), 1-12. https://doi.org/10.22061/jadst.2014.301

Thurman, N., Lewis, S. C., and Kunert, J. (2019). Algorithms, automation, and news. Digital Journalism, 7(8), 980-992. https://doi.org/10.1080/21670811.2019.1681572

Tunca, C., Isik, S., Donmez, M. Y., and Ersoy, C. (2013). Distributed mobile sink routing for wireless sensor networks: A survey. IEEE communications surveys and tutorials, 16(2), 877-897. https://doi.org/10.1109/SURV.2013.082713.00105

Veglis, A., and Kotenidis, E. (2022). Employing chatbots for data collection in participatory journalism and crisis situations. Journal of Applied Journalism and Media Studies, 11(3), 309-332. https://doi.org/10.1386/ajms_00044_1

Vikneshkumar, D., Kaleeswaran, D., and Yuvaraj, D. (2020). Analysis on performance comparison of virtual grid-base dynamic route adjustment in wireless detector networks. ICTACT Journal on Communication Technology, 11(1), 2138-2142. https://ictactjournals.in/papers/IJCT_V11_I1_pp2138-2142.pdf

Wang, X., Gao, L., Zhang, C., and Shao, X. (2010). A multi-objective genetic algorithm based on immune and entropy principle for flexible job-shop scheduling problem. The International Journal of Advanced Manufacturing Technology, 51(5), 757-767. https://doi.org/10.1007/s00170-010-2661-7

Wang, X., Vasilakos, A. V., Chen, M., Liu, Y., and Kwon, T. T. (2012). A survey of green mobile networks: Opportunities and challenges. Mobile Networks and Applications, 17(1), 4-20. https://doi.org/10.1007/s11036-011-0316-6

Yang, X. S., and Deb, S. (2009, December). Cuckoo search via Lévy flights. In 2009 World Congress on Nature and Biologically Inspired Computing (NaBIC) (pp. 210-214). IEEE. https://doi.org/10.1109/NABIC.2009.5393690

Yarinezhad, R., and Hashemi, S. N. (2018). A cellular data dissemination model for wireless sensor networks. Pervasive and Mobile Computing, 48, 118-136. https://doi.org/10.1016/j.pmcj.2018.06.004

Yarinezhad, R., and Hashemi, S. N. (2019). An efficient data dissemination model for wireless sensor networks. Wireless Networks, 25(6), 3419-3439. https://doi.org/10.1007/s11276-018-1767-8

Zafra, N., and Maydell, E. (2018). Facing the information void: A case study of Malaysia Airlines' media relations and crisis communication during the MH370 disaster. Asia Pacific Public Relations Journal, 19. https://ro.uow.edu.au/apprj/vol19/iss1/5

Zheyuan, X. (2015, December). A spectrum efficient node clustering method for WMSN. In 2015 4th National Conference on Electrical, Electronics and Computer Engineering (pp. 284-289). Atlantis Press. https://doi.org/10.2991/iceec-15.2015.56.