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# Design and Analysis of Region Centered Energy Proficient Approach for WSN

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**ABSTRACT:** The Wireless Sensor Networks (WSN) have very inadequate amount of power. To complete a sensing and monitoring procedure, The nodes communicate together and with the base station, exchanging control and data messages. We propose a region-centered routing strategy for mixed WSNs in this paper. Certain sensors provide information directly to the BS in the proposed study, whereas others use a clustering system to send information to the BS. We used the R-SEP protocol and compared it to the usual LEACH and SEP methods. R-SEP expands the longevity of WSNs, and the quantity of work completed in the network via R-SEP is substantially greater than the usual LEACH and SEP procedures, according to empirical results.

**KEYWORDS:** Region Management, Energy Draining, Transmission of Information

## I. INTRODUCTION

The research point of this study is to upsurge the accuracy of wireless sensor network, enlarge actual covering area and efficiently reduced energy consumption. It founded highly accurate region partition and optimum node election to attain the balance power consumption. Using this work, we have analyzed that power depletion is chiefly caused in the computing and transmission processes. Consequently, we have partitioned the area of WSN and designed the dynamic data collection and processing among sensor motes and base station (BS).Power reduction in Sensor Network reliesupon the changing location of a node with respect to space and time. Alternatively, the nodes nearby to the sinksusages their energy earlier than the nodes away from the sink and the nodes over the time transmit more messages based on its position. Therefore, in this study, we propose to investigate the issue of unbalanced energy diminution in the sensor network and enhance network lifespan, stability period and provide better coverage and connectivity by providing balanced energy consumption, load balancing and node deployment.

## II. RELATED WORK

The WSN is a scattered network of small, supply-limited nodes that can run without users [1]. Rapid advancements in MEMS technology have produced small, inexpensive sensor motes that can detect a range of environmental and physical variables. The WSN enhances people's capacity to monitor and manage physical locations at a distance [2-4]. The failure of a few sensors does not affect the functionality of the entire network because each sensor node can operate independently without the requirement for centralised control [6]. The WSN is more dependable and secure than other types of networks. One or more moderate power sensors, a microprocessor, storage, an energy supply, a transmitter, and an actuator are all included in each mote [7].

### DESIGN PROBLEMS OF WSN ROUTING PROTOCOL

WSNs profess numerous tasks in designing of a routing protocol. This part sum-up few chief problems tackled during processing of the WSN.

**Network Extensibility**:

The quantity of sensors positioned in the perception zone can be very huge in hundreds, thousands or even more. While a WSN has been organized, at some point new sensors required to be augmented in the network, therefore routing procedure should be proper scalable to react to such types of activities.

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**Movement**:
Wireless nodes have the characteristic of mobility which is an important problem MANET. Motes in MANET move from one network to another distinctly or in a set. In single mote movement arrangement each node functions registering separately in new MANET while in group movement system only one node in a group.

**Network Deployment**:
Node deployment in sensor-net is either stationary or arbitrary according to the objective where it can be employed. In stationary placement the network is organized on predetermined positions while in arbitrary placement the ensuing dissemination may be even or uneven. In this case, cautious handling of the network is essential in pursuance of warranty of complete zone coverage and moreover assures for the power depletion uniformly in the network.

**Communication Category**
The communication prototype of WSN can be produced as single-hop or multi-hop. Power depletion in wireless configuration is openly relative to the square of the distance; single-hop communication is expensive with regard to power depletion. Maximum routing procedures employ multi-hop communication prototype as it is extra power proficient with regard to Power depletion as contrary to multi-hop communication of the sensors which are nearby of the cluster head (CH).

**Proposed Method**
Our method is partially inspired from the SEP [8] Protocol. The SEP is a multimodal protocol with two levels of performance. It features 2 sorts of sensors: standard and advanced. The advanced have more energy than the regular ones. Both probes have a fair probability of being classified as CH. Advance sensors have a higher chance of being a CH than standard sensors. It does not ensure that sensors are placed correctly.
In instance of SEP,standard and advanced sensors are positioned arbitrarily. When a large number of typical sensors are located far-away from the BS, it consumes more power while transferring data, resulting in a loss in throughput and a restriction of the consistency epoch. SEP's competence has subsequently deteriorated over time. We've divided the network area into multiple regions to eliminate these flaws. To transport data to the BS, the distant area junctions require additional power. As a result, ordinary sensors are located close to the BS and can convey data straight to it.Advance sensors are placed far away from the BS because they havemore power. When advanced sensors send packet straight to the BS, they need more power. As a result, the clustering technique is used to save energy.
We hereby propose REGION BASED (R-Based) lifetime enrichment approach for the wireless sensor networks.

- Our suggested protocol employs a hybrid technique, transmitting data to the BS both directly and through CHs. The following are certain relations that are used in the suggested protocols:
- **Permanence interval**: It is the timestamp between the starting of the network and the expiration of the first sensor.
- **Impermanence interval:** It is the time between the 1st sensor's expiration and the last sensor's expiration.
- **Throughput**: The total data exchanged in the sensor-net throughout its operation, such as data transfer from sensors to head of cluster then towards base station, or sensors to directlyto the BS.
- **Lifespan:** WSN's ability to function over an extended period of time.
- **Aggregation of Data**: Related types of data are combined and transported farther to reduce power consumption.

## III. NETWORK CONFIGURATION

We define a sensor network as an energy-harvesting sensor network with N sensor nodes and a BS distributed across a topographical area. These sensors are arranged at random in a rectangular area. As portrayed by Fig. 1, the BS is placed in the mid of the network area under consideration.

**LOGICAL DIVISION OF AREA INTO REGIONS**
The LEACH [9] protocol uses the clustering process and utilizes the energy in an efficient manner, but there are several loopholes associated with the LEACH. These loopholes may lead to energy holes (EH) issue in the network. In LAECH, the size of the cluster is not defined; clusters can be big as well as small in size. If big radius clusters are present adjacent to the BS, intra-cluster communication expenses will increase and a major part of the energy will be consumed adjacent to the BS. In proposed method; clustering procedure is efficient within the area and clusters are not huge in the region.

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The second problem with the LEACH is the direct communication (single hop) between the cluster head and the BS, if the gapamong the head and the BS is bigger, extrapowerwould be depleted in communication and holes will create in distant zones of the net. The proposed method reduces the communication distance between head and the BS by installing a gateway node among them. With reduced communication distance, power usagesis lesser and there is an enhancement in network lifespan.

It is also possible that the CHsexists in one part of the area and remain absent from another part. The nodes which are not member of any cluster, will directly communicate with the sink and this will affect severely the lifespan of the network. This problem can be solved by making sure that at least one cluster head is available in each part of the area. Therefore, the entire area has been divided into several regions and a distinct clustering procedure has been initiated in each region.

In order to stipulate uniform allocation of cluster heads in the entire area, protocol divides the field into multiple zones. According to the size, area is divided into multiple zones. In the protocol, number of regions is not static. If the area is huge, number of regions will be more as equaled to the number of regions in a small area.

The network zone has been separated into regions with the r width size where numerous sensors are organized. These sensors collect the data and transmit it to the BSand rely on the allocated routing procedure. Each sensor is planned to be equipped with a battery and appropriate stowage room to store some energy throughout transmission.The area has been divided into three regions (zero, one and two). The sink is located in the center of the network field. The data from all of the nodes should arrive at the BS. Aside from BS, there are two sorts of sensors: advanced (represented by a blue colored circle) and normal (indicated by a red colored circle) (shown by green colored circle). Let p be the total number of nodes and q be the number of advanced nodes. These p nodes have a tenfold increase in power over conventional nodes.

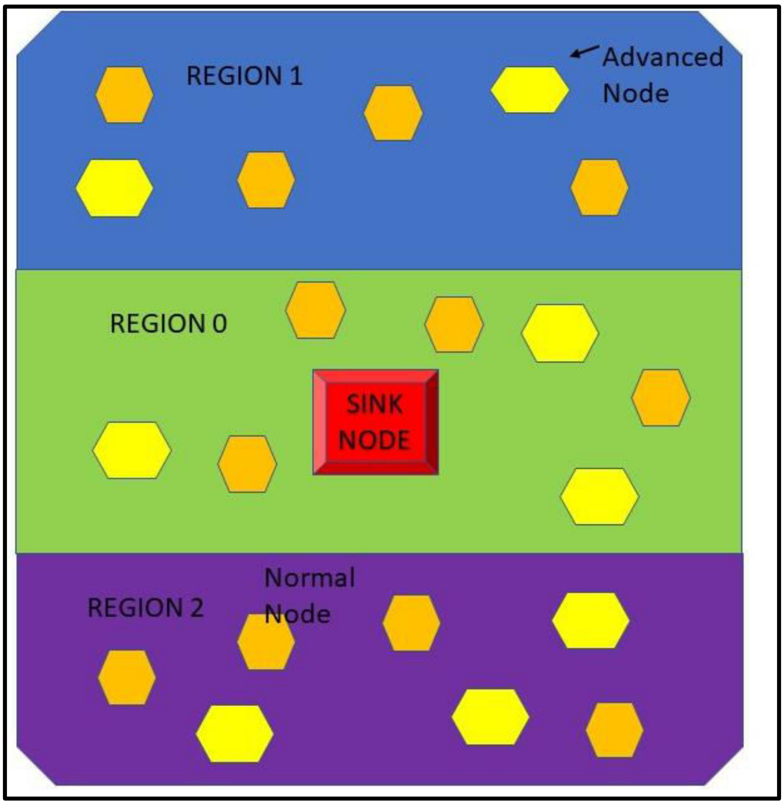


Fig 1: Separation of Network Area into 3 Regions

## TRANSMISSION SCHEME

The transmission scheme proposed in this research paper follows a hierarchical routing strategy where all sensor nodes are separated into 2 categories as head and member of the cluster whichare liable for perceiving the information from the monitoring atmosphere and this data is composed by CHs and data is combined to produce a packet. These data packets are then forwarded to the sink node by CHs. This sort of routing works in rounds, with each cycle having2 phases: setup and steady. The setup phase involves selecting cluster heads, while the steady phase involves sensors collecting data and transmitting it to the CH node. This method has various benefits, including evading energy loss due

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to massive packet transfercombination of composed data can be effective for lowering frequent data interchange; and intermittent CH assortment can assist in balancing the network's power depletion.For transferring data into many slots, we investigated a TDMA-based technique. Let's say there are a total of N slots available, each of which is assigned to a different node. The length of a time slot is given by t s, during which a packet of size P L bits is sent and a total of N F frames are accessible. Once all packets from cluster members have been received at the CH, the packets are forwarded to the BS if adequatepower is supplied for transmission.

**POSITIONING OF NODES AND TRANSMISSION OF INFORMATION**

The standard nodes are arbitrarily dispersed across the network, whereas the advanced nodes are strategically positioned. For example, advance sensors are put in the corners and in the center of Regions 1 and 2. Because the nodes in the corners are so far away from the BS station, they require additional power to send their data up to it. The middle sensor acts as a CH or gateway, allowing data from the left normal nodes to be transferred to the BS.

The basic nodes are disseminated across the network at random, but the advanced nodes are purposefully placed. Advance nodes, for instance, are placed at the corners and in the center of Regions 1 and 2. Because the nodes in the corners are so far away from the BS station, they need more power to send their data up. The middle sensor serves as a CH or gateway, allowing data from the BS to be transferred from the reaming normal nodes. For energy computations, we have used first order radio energy model [9].

We evaluated a WSN region of 100 X 100 m2 that needs to be monitored. A total of 100 nodes have been distributed in the field. The investigations were conducted out in a MATLAB environment. The constraintsutilised in the tests are listed in Table 1.

Table 4.1: Constraints and their Values

| Constraints | Value |
|---|---|
| $E_{init}$ | 0.5 J |
| $E_{elec}$ | 5 nJ/bit |
| $E_{fs}$ | 10 pJ/bits $m^2$ |
| $E_{mp}$ | 0.0013 pJ/bit/$m^4$ |
| $E_{DA}$ | 5 pJ/bit |
| **Preliminarypower of advanced nodes** | $E_{init}$ (1+β) |

At each round, normal sensor nodes of each region send data to their gateway node/ CH and similarly nodes in the sink region transfer their data packets to the sink node. In the cluster regions, the cluster members transfer data to their CH and then CH data accumulation. Next, all the cluster heads transmit data to the gateway node of their region, the gateway node combines data attained from all the CHs and from the normal nodes in its gateway region. After that gateways transmit data to the sink. Consequently, total packets expected by the sink from all gateway nodes and from immediate CHs are identified as *throughput* of WSN.The Permanence Stage is depicted in Figure 2 in terms of alive nodes till the network's termination. The persistence phase increases as the number of alive nodes increases. The network's Impermanence Phase is depicted in Figure 3. The WSN's throughput is depicted in Figure 4.

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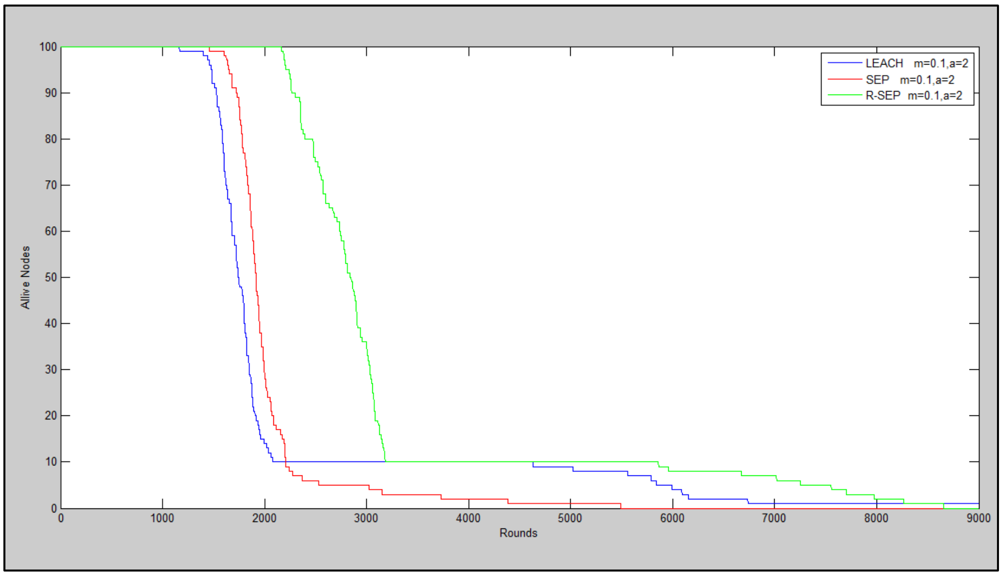


Fig 2:Permanence Interval

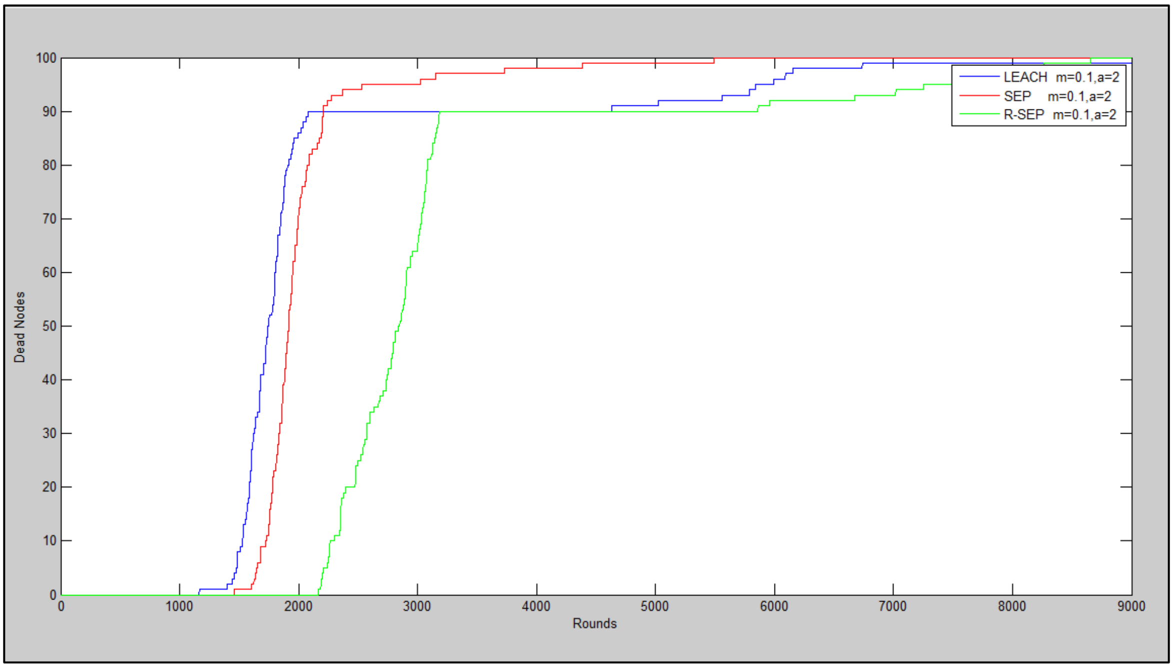


Fig 3: Impermanence Interval

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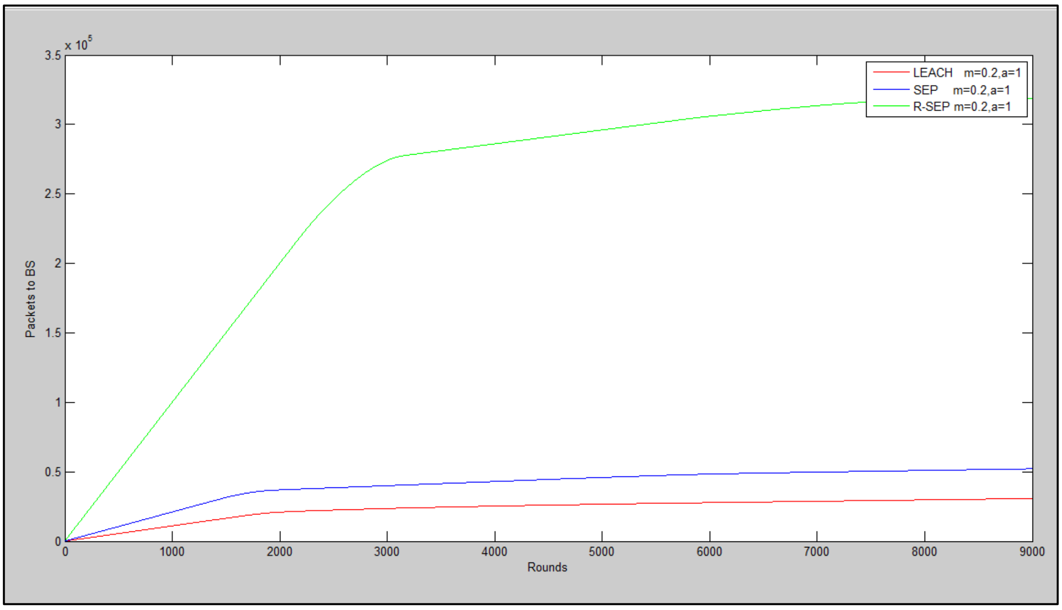



Fig 4: Throughput of Network

## IV. CONCLUSION

We propose the R-SEP technique for a diverse atmosphere with two-fold heterogeneousness in this work. The WSN is divided into 3 regions (0, 1, and 2). Normal nodes are dispersed haphazardly around the field, whereas advanced nodes are strategically placed. Nodes in Regions one and two use advanced nodes and the clustering process to transfer data, but nodes in Region zero can send data directly or through advanced nodes. The results reveal that by altering the placement of various types of sensors in various regions and rendering to their power requirements, the permanence phase is amplified by roughly 50%. In comparison to LEACH and SEP, R-SEP has increased throughput.

## REFERENCES

[1]Rohini Sharma, Energy Holes Avoiding Techniques in Sensor Networks: A survey, International Journal of Engineering Trends and Technology, Vol. 20, no. 4, 2015,Pages: 204-208.

[2] Rohini Sharma, D.K. Lobiyal, Proficiency Analysis of AODV, DSR and TORA Ad-hoc Routing Protocols for Energy Holes Problem in Wireless Sensor Networks, Elsevier Procedia Computer Science, Vol. 57, pp.1057-1066, 2015.

[3] Rohini Sharma, Impact of energy holes problem on ad-hoc routing protocols, World Review of Entrepreneurship, Management and Sustainable Development, Vol.16 No.1, pp.63 – 75, 21 Feb 2020.

.[4] Deepak Dahiya, Kirti Bhatia, Rohini Sharma, Shalini Bhadola, Development and Analysis of Enhanced Window Median Filter Approach of Image Denoising, International Journal Of Multidisciplinary Research In Science, Engineering and Technology, Volume 4, Issue 8, August 2021.

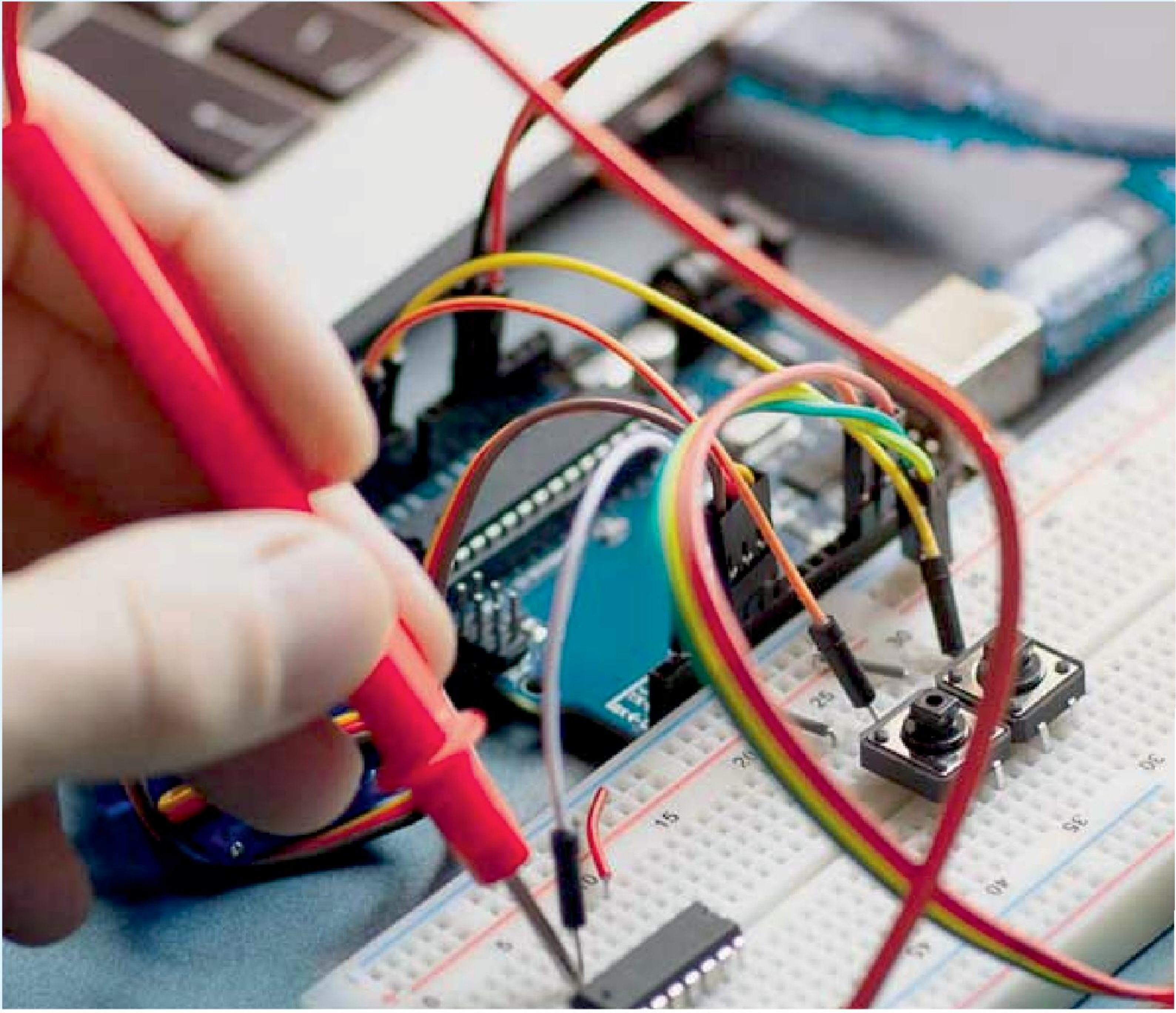
[5] Rohini Sharma and D.K. Lobiyal,Intelligent Water Drop Based Coverage- Connectivity and Lifespan Maximization Protocol for Wireless Sensor Networks, Recent Patents on Computer Science, Volume 13, Issue 3, 2019.

[6] Kamakshi, Kirti Bhatia, Shalini Bhadola, Rohini Sharma, A COMPREHENSIVE ANALYSIS OF WSN ROUTING PROTOCOLS, International Research Journal of Modernization in Engineering Technology and Science, Volume:02/Issue:08/AAugust-2020.

[7] Akash Bhardwaj, Kirti Bhatia, Rohini Sharma, Shalini Bhadola, Development and Analysis of HeuristicClustering of Mobile Sensor Networks, International Journal of Innovative Research in Computer and Communication Engineering,Volume 5 Issue 5, July-August 2021.

[8] Smaragdakis, G., Matta, I. and Bestavros, A.(2004). SEP: a stable election protocol for clustered heterogeneous wireless sensor networks, in proceeding of 2nd International Workshop on Sensor and Actor Network Protocols and Applications (SANPA'04), 2004.

[9] Heinzelman WB, Chandrakasan AP, Balakrishnan H. (2002). An application-specific protocol architecture for wireless microsensor networks. IEEE T WirelCommun 2002, 1: 660-70.

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