Optimum Reception of Templates in Wireless Sensor Networks by using Shannon Fano Source Coding System

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Abstract— A rising category of Wireless Sensor Network (WSN) applications involves the acquisition of enormous amounts of sensory data from battery powered, low computation and low memory wireless sensing element nodes. The topology of the WSNs will vary from a straightforward star network to a sophisticated multi-hop wireless mesh network [3]. The propagation technique between the hops of the network are often routing or flooding. In engineering science and telecommunications, wireless Sensor Network an active analysis space with numerous workshops and conferences organized annually, that's why I even have chosen this subject. The aim of this paper is to boost the performance of the network by using the Adaptive Delta & Shannon Fano Codes using fraction 2 or 3. The lossless Compression Codes instead of Automatic Repeat Request (ARQ) are used to get high Signal to Noise ratio and additional reduced data size.

Key words: WSN, ARQ, Shannon Fano Code

I. INTRODUCTION

One of the most applications of Wireless sensing element Networks is observation remote and isolated areas, and collection data concerning sudden development sort of a hearth in Forest, volcano eruptions or enemy movement within the battle field. In these applications the channel state is anticipated to be varying due to the dynamic changes in environmental factors. Additionally vehicles and rocks movements will crash some nodes which can be the separate components of the network. During this context it's laborious for the network to deliver the collected data, even once sending at the utmost power, while not robust error correction techniques [4].

Using ARQ to tackle inaccurate packets in such surroundings is inefficient, due to the high variety of retransmissions required in ARQ. Additionally ARQ techniques introduce high latency, wherever the recurrent retransmission consumes extended time, that ends up in a high delay between detection moment of an incident at the sensing nodes, in order that the informing the base station that event could also be terribly late. Retransmission additionally consumes great deal of energy from each sending and receiving nodes. Whereas energy saving is that the main aspect here [6].

Fig. 1: Wireless Sensor Network

Energy conservation in wireless sensor networks (WSNs) is that the primary performance parameter, due to their restricted energy resources. Thus, some energy saving technologies ought to be applied. One among these technologies for WSNs is distributed source coding (DSC).

II. DATA INTEGRATION & SENSOR WEB

S. Aruna Deepthi, E. Sreenivasa Rao and M.N. Giri Prasad, obtained the compressed image by quantizing "R.G.B". Here high frequencies unit of measurement [0.01, 0.1, 0.1] and thus the image is of very good quality and compression is nice. currently the compressed image data is hold on throughout a file therefore on sent in WSN and compressed file is of size 482 K and thus the compression format is CIC clearly depicts that it's color compression. Presently the image is compressed with 2 totally different quantization values. By practice the quantization values [0.05 0.1 0.1] and [0.05 0.2 0.2] 2 compressed files unit of measurement obtained. A budget values of PSNR square measure of 20- 25 decibel [1].

The image is compressed in MATLAB that file is shipped through nodes in WSN practice NS2 machine. NSG is used to get TCL script to create WSN scenario. The ripple remodel being the sole of its kind was so quite helpful find out compression. The Haar ripple alongside Hadamard DCT is typically accustomed compress varied pictures at varied quantization values practice cryptography. As compared to DCT, the compressed file practice Hadamard remodel is giving wise wonderful superb} compression with smart image quality and thus the compressed file sent from node is taking min. time to reach destination. The compression algorithmic program has been successfully designed and verified. Currently the compressed file has been sent through nodes with success [1].

IMG	Img Size	Compressed Size	CR (%)	PSNR (dB)	MSE
HILL	1158kb	482kb	59	28	108
HILL	1158kB	325kb	72	26	150
HILL	1158kb	274kb	77	26	149

Table 1: Performance Metrics of Algorithm using DCT and Haar Transform

IMG	Img Size	Compressed Size	CR (%)	PSNR (dB)	MSE
HILL	1158kb	284kb	76	22	400
HILL	1158kB	239kb	80	22	408
HILL	1158kb	209kb	82	21	411

Table 2: Performance Metrics of Algorithmic Program using Haar and HADAMARD Transform

Presently the Wireless sensor Network in India uses the high resolution Image cameras within the node stations that are ready to capture an image nicely so transmit the image towards the home office or Server base station. The information gathered from wireless sensor networks is typically saved a central base station (Server) [12]. If a centralized design is employed in a sensor network and therefore the central node fails, then the whole network can collapse, but the reliability of the sensor network are often increased by using distributed management design. This design includes a disadvantage that there's heaps of energy consumption throughout the propagation of information.

The most rigorous demand of wireless sensor hierarchy is to extend the life of the design as they're ready with important battery power. Wireless sensor design has wide applications and its insecure battery power is employed in sensing, processing, routing and sending data to the bottom station. Such a large amount of protocols were projected to with critical use the battery power to increase the life of the wireless sensor design. Once wireless sensor design is deployed in disaster areas, contaminated environments or high radiation region, battery recharge or replacement is not possible for human and wireless sensor design works till battery power of the whole sensor node get die [1, 5].

III. PROPOSED WORK

The main problem is however we tend to convert the captured image into the model or in data streams. This problem is resolved by finding out the subject digital image process given in the syllabus of RGPV. According to this theory-

X= Pixel value in Horizontal direction
Y= Pixel value in Vertical direction
Θ= Orientation from Origin

Generally Shannon Fano code with M=3 gives more efficiency as compared to Shannon Fano code with M=2. But for M=3 it would be complicated.

Now we calculate the Shanno Fano code for M=3.

60	7	1		
180	6	0	1	
150	5	0	0	
120	2	-1	1	
90	2	-1	0	
210	1	-1	-1	1
30	1	-1	-1	0
0	0	-1	-1	-1

Fig. 2: Shannon Fano Code Formula to Reduce applied Samples of Y- Finer Points for M=3

Value	Probability	Shannon Fano Codes			Bit Lengths
60	7	1			1
180	6	0	1		2
150	5	0	0		2
120	2	-1	1		2
90	2	-1	0		2
210	1	-1	-1	1	3
30	1	-1	-1	0	3
0	0	-1	-1	-1	3

Table 3: Calculation of Shannon Fano Code to Reduce Y-Field for M=3

S. No.	Y-Field	Break Numbers (a + b)	Shannon Fano Coding (a)	A-Delta Coding (b)
1	44	30 + 14	-1 -1 0	1110
2	85	60 + 15	1	1111
3	70	60 + 10	1	1010
4	83	60 + 23	1	10111
5	80	60 + 20	1	10100
6	88	60 + 28	1	11100
7	157	150 + 7	0 0	111
8	90	90	-1 0	1011010
9	209	180 + 29	0 1	11101
10	196	180 + 16	0 1	10000
11	203	180 + 23	0 1	10111
12	148	120 + 28	-1 1	11100
13	198	180 + 18	0 1	10010
14	199	180 + 19	0 1	10011
15	116	90 + 26	-1 0	11010
16	171	150 + 21	0 0	10101
17	176	150 + 26	0 0	11010
18	168	150 + 18	0 0	10010
19	91	90 + 1	-1 0	1
20	86	60 + 26	1	11010
21	161	150 + 11	0 0	1011
22	206	180 + 26	0 1	11010
23	147	120 + 27	0 0	11011
24	230	210 + 20	-1 -1 1	10100

Then we have created Shannon Fano code for those groups according to probabilities of the group. This code is assigned to first value of group. Then the Y - field value and θ - field value is break according to the first value of group. For example 85 is a member of 60 – 90 groups. Therefore it can be break as (60 + 25). And then we will represent the 60 by its Huffman code and for 25 we will use its binary equivalent.

IV. RESULTS & DISCUSSION

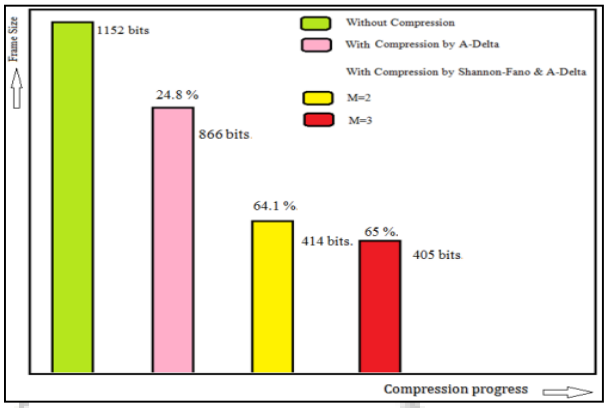
Storing of Finer Points Data without Compression:
= Bits required for storing X-field + Bits required for storing Y-field + Bits required for storing Θ – field
= 1152 bits..... (1)

A. Storing of Finer Points Data with Compression

For M=2
= 98 bits + 162 bits + 154 bits
= 414 bits..... (2)
Now from equations (1) and (2) –
The Compression Ratio of data is:
= (1152 – 414) *100 %
1152
= (738) *100 %
1152
= 64.1 %..... (3)
From equation (3) it is clear that with the technique of Compression by Shannon-fano code and Adaptive - Delta codes approximately 64 % Compression Ratio can be achieved.

For M=3
= 405 bits.....(4)
Now from equations (1) and (4) –
The Compression Ratio of data is:
= (1152 – 405) *100 %
1152
= (747) *100 %
1152
= 65 %.....(5)

From equation (5) it is clear that with the technique of Compression by Shannon-fano code and Adaptive - Delta codes approximately 65 % Compression Ratio can be achieved.



V. CONCLUSIONS & FUTURE WORKS

The aim of this dissertation work is to improve the performance of the network by using the Adaptive Delta & Shannon Fano Codes using fraction 2 or 3. One of the main applications of Wireless Sensor Networks is monitoring remote and isolated areas, and collecting information about unexpected phenomenon like a Fire in Forest, volcano eruptions or enemy movement in the battle field. In these applications the channel state is expected to be continuously varying because of the dynamic changes in environmental factors. Also vehicles and rocks movements can crash some nodes which may be the separate parts of the network.
There may be some conclusions:

1) If the reading of X- field is decreasing it means the Object is moving towards left.
2) If the reading of X- field is increasing it means the Object is moving towards right.
3) The shape and size of the Object is determined by the reconstructed image received in the central base station.
4) If the reading of Y- field is decreasing it means the Object is moving back.
5) If the reading of Y- field is increasing it means the Object is moving ahead. It is doubtful and need to be monitor carefully. Hence the processor or PLC (Programmable Logic Controller) switches ON the Image cameras. Only in this case the Images are transmitted.
6) All the Image cameras are in idle mode in the case described in point 5. It means the remaining Image Cameras are open circuited within the network. Therefore the Congestion problem is not occurred. It prohibited the time delay in the transmission of the data.
7) Hence there is the requirement for ARQ is reduced.
8) Power consumption is lower because the frames are successfully delivered usually in first trial. It increases the life time of the Batteries.

This method of compression will be very useful for reducing the frame size to increase the transmission (data) rate. With the proposed method we can also store the templates in the sensor nodes with less number of bits. Hence we can reduce the memory size and hence size of the sensor nodes. Depending on the data with the proposed technique always more than 50% compression ratio can be achieved. In the future I will try to use the combination of more compression methods such as Shannon fano code, Huffman code, Convolution code, linear block code or Hamming code.

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