IMPROVEMENT IN VOLTAGE QUALITY OF SMART GRID SYSTEM BY USING OF THE WAVELET TRANSFORMATION BASED SYSTEM

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Abstract: Low nature of electric power is commonly caused by control line disrupting impacts, for instance, main thrusts, scores, glitches, passing interruption wave issues, voltage list, swell, consonant turning and flicker achieving disoperation or frustration of end use supplies. The power quality agitating impacts from the point of view of network perspectives and furthermore customers. It portrays the structure of forefront control framework. It shows the basic contemplations of vitality quality agitating impacts. In the earth of the present sharp grid circumstance thought of supportable power sources, control electronic contraptions, sorted out sensors and mechanized controls causes voltage rundown and swell which impacts control quality. This work proposes another method for hang and swell disclosure in perspective of wavelet change and its reconstructing. In this work we will endeavor to decrease the past issue of the voltage and try to improve the voltage idea of the power framework. In this paper we proposed a new system which is able to improve the quality level of the voltage signal which is facing the problem of sag, swell. Here we proposed a new Filter which is combination of two DWT filter and where one filter is approximate dwt and another one is continuous DWT. Here our generated result is batter than previous existing approaches in terms of quality and time consumption.

Keywords: Power System, DWT, Smart Grid, Voltage, Loss.

1.Introduction

Lately, framework clients have identified an expanding number of disadvantages caused by electric power quality (PQ) varieties and PQ issues have honed as a result of the expanded number of burdens touchy to PQ and have turned out to be more hard to fathom as the heaps themselves have turned out to be critical reasons for debasement of value [3]. The power framework blame has turned out to be regular because of expanded blockage on the system, combination of RE sources with matrix and utilization of nonlinear power electronic gadgets in the system. With the wide utilization of high power hardware switchgears, issues of energy quality are winding up more genuine step by step [4]-[5]. The power quality unsettling influences rely upon plentifulness or recurrence or on both recurrence and abundancy. In light of length of presence of PQ unsettling influences, occasions can be isolated to put it plainly, medium or long write. The arrangement and distinguishing proof of every unsettling influence are typically done from benchmarks and proposals relying upon where the utilities work. The end client related PQ issues broadly detailed in writing, there is have to research in to the effect of PQ unsettling influences on the execution of the utility system and build up another practical strategy for the minimization of impact of PQ aggravations on the end utilize types of gear and in addition the supplies introduced in the power arrange.

1.1 Power Grid:

Power framework has made initiating strides in passing on Smart Grid advancement to all highlights of vitality supply regard chain and made splendid system pilot reach out at Pondicherry through open participation covering all properties of clever cross section in dissemination. Indian mammoth power system is standing up to the distinctive issues. Due to these issues, the improvement of energy grandstand is direct. The present cross section system in this country is unfit to manage these irregularities. To manage these irregularities and other regular snags in charge system, there is a need to complete robotization. Audit these issue sharp Grid propels is to be available/introduced in charge course of action of our country. In these days Smart Grid is the panacea of most of the issues in the power structure. The sharp grid will check and devastate the distinctive bottlenecks and inconsistencies in the present

control grid system. The Indian power cross sections are not secure, tried and true and up to the check. To lessen these does not have, the advancement of "Sharp Grid" is required. The Smart Grid can be made by drive advancement, instruments and shrewd organization system .Smart Grid is a principal response to the normal, social, and political solicitations, set on imperativeness supply. The shrewd control lattice ends up being altogether more personality boggling than a standard power arrange as time-changing wellsprings of essentialness and new remarkable weights are fused into it. The sharp structure's multifaceted nature will progress after some time and require new advancements for compelling, tried and true and secure operation and control as the enthusiasm for control increases. The inspiration driving Smart Grid is to perceive and review supply ask for ponderousness quickly and recognize faults through a self-recovering" process that upgrades organizations quality, adequacy, enhances enduring quality and reduces costs . With the moved headways, the keen electric power grid will be secure, strong and bi-directional. The Smart Grid will give ecologically cordial power imperativeness, sublime supply of vitality and fuse of reasonable power source resources.

1.2 Power Quality

The term control quality (PQ) is by and large connected to a wide assortment of electromagnetic marvels happening inside a power framework arrange. Power quality is dominatingly a client issue. Power quality can be characterized as any issue showed in voltage, current, or recurrence deviation that outcomes in disappointment or mal-operation of electric hardware [6]. The electric power quality is additionally characterized as a term that alludes to keeping up the close sinusoidal waveform of energy framework transport voltages and streams at

appraised extent and recurrence. Along these lines electric power quality is regularly used to express voltage quality, current quality, dependability of administration, nature of energy supply and so on [7]. Power quality issue is likewise imperative for the service organizations. They are obliged to supply purchasers with electrical energy of satisfactory quality.

The use of WT has turned into a well known for quite a while under the different names of multirate-inspecting (Quadrature Mirror Filters) QMF in electrical building (Sarkar et al., 1998). WT has numerous attractive properties that are valuable in building, financial aspects and back. The capacity of wavelet investigation manages both the stationary and non-stationary information, their confinement in time and the breaking down and dissecting the accentuation in factor flag. While a survey of the conceivable future commitments of WT is given to the building discipline, there are investigated two manners by which wavelets may be utilized to improve the experimental toolbox of our calling in designing (Crowley, 2005). These are condensed in the accompanying: Time scale versus recurrence: An examination of informational collections to survey the nearness and ebb and the stream of recurrence parts is conceivably profitable (Crowley, 2005). Time scale deterioration: Recognition segments of the flag can be found at disaggregate (scale) level as opposed to a total level anticipating: disaggregate estimating, building up worldwide versus nearby parts of arrangement (Crowley, 2005).

2. Literature Review

Most of work on control quality is worried about the client related issues and grouping of energy quality unsettling influences in conditions, for example, exchanging of the types of gear or power framework operations. This work goes for to recognize control quality unsettling influences in the broken states of the power framework and change of energy quality in defective states of energy framework utilizing three stage single tuned and twofold tuned consonant channels and in addition by utilizing the proposed NPF. The four transport framework with two load and two generator transports is reenacted in MATLAB/Simulink condition. The power quality identification and change utilizing three stage symphonious channels associated at generator transport amid LG blame, LL blame, LLG blame, LLL blame and LLLG blame on the heap transport has been considered. The proposed NPF is utilized to enhance the power quality. The outcomes got after reproduction exhibit the execution of proposed NPF and demonstrate its viability over the three stage consonant channels in change of energy quality amid flawed states of energy framework.

Voltage occasions can be arranged by two parameters: greatness and length. For discovery and reclamation of these occasions wavelet Transform (WT) is utilized as a part of this paper. Presently a day it turn out to be exceptionally valuable apparatus since it has many points of interest contrast with different devices like Fourier Transform (FT), Short Time Fourier Transform (STFT) and so on. FT gives the data about the recurrence yet it can't give the data at what time this recurrence happens. Thus it is helpful just for stationary flag. Signs which happen in control framework is for the most part non-stationary, and for these signs WT is fitting [4]. STFT is better as contrast with the FT, however it has settled window measure. On account of this settled window estimate, the determination of framework can't be changed by our prerequisite. Every one of these downsides are overcome in WT. There are different investigations which demonstrate the utilization of WT for control quality aggravation characterization [5-9]. Wavelet change is utilized for some reasons in control framework, for example, consonant decrease, blame area and so forth. In [10] blame situating in outspread appropriation framework utilizing wavelet change and neural system is depicted in detail. For investigating the signs its element extraction is done which is given in [11]. Voltage list and swell can be reestablished by numerous strategies. Dynamic voltage restorer in [12] is utilized for the remuneration of voltage interferences. Kalman channel is likewise utilized for the identification of voltage droop. Fake neural system and fluffy rationale based voltage hang source area method is depicted in [13]

As indicated by [14] proposes another technique for list and swell recognition in light of wavelet change and its reclamation. For good precision of framework discrete wavelet change (DWT) with multi determination examination (MRA) is utilized. Highlight of info flag is removed by choosing Daubechies wavelet (Db4) as mother wavelet. Points of interest of Db4 wavelet contrast with different wavelets are depicted. The reenactment comes about for list and swell rebuilding are introduced. Piece chart, wiring outline and equipment plan of the created display is clarified.

As per [15] the essentials of WT, its qualifications from Fourier change and the consequences of a broad writing audit of distributed examinations are introduced. The consequences of the writing survey uncover that the location of PQ unsettling influences utilizing WT is a capable strategy and has been utilized as a part of PQ alleviation gadgets viably (that is, Custom Power, Flexible AC Transmission System, Flexible, Reliable and Intelligent Energy Delivery System).

3. Research Gap & Objective

The paper carried out during the course of this research is focused mainly on the utility network aspects of PQ during faulty conditions. In the past decade, the grid users have detected an increasing number of drawbacks caused by electric power quality (PQ) variations and PQ problems have sharpened because of the increased number of loads sensitive to PQ and have become more difficult to solve as the loads themselves have become important causes of degradation of quality. In spite of having impact of consumer loads, the PQ disturbances are also propagated in the utility network and produces negative impacts on the performance of the power network. In power quality voltage is the most important factore so here lots work are done in the feild of voltage quality improve for batter PQ. But still there is lots of issues on all those previous approaches are those are followings:

- Quality of filter approach is not sufficient to improve the quality of voltage level.
- There is lots of time require for the improvement of voltage quality by using of all previous existing approaches.
- Still there is lots glitch are available after the filtering approaches.
- In terms of cost factor most of the previous existing approach are not cost efficient due to large way of filtering process.

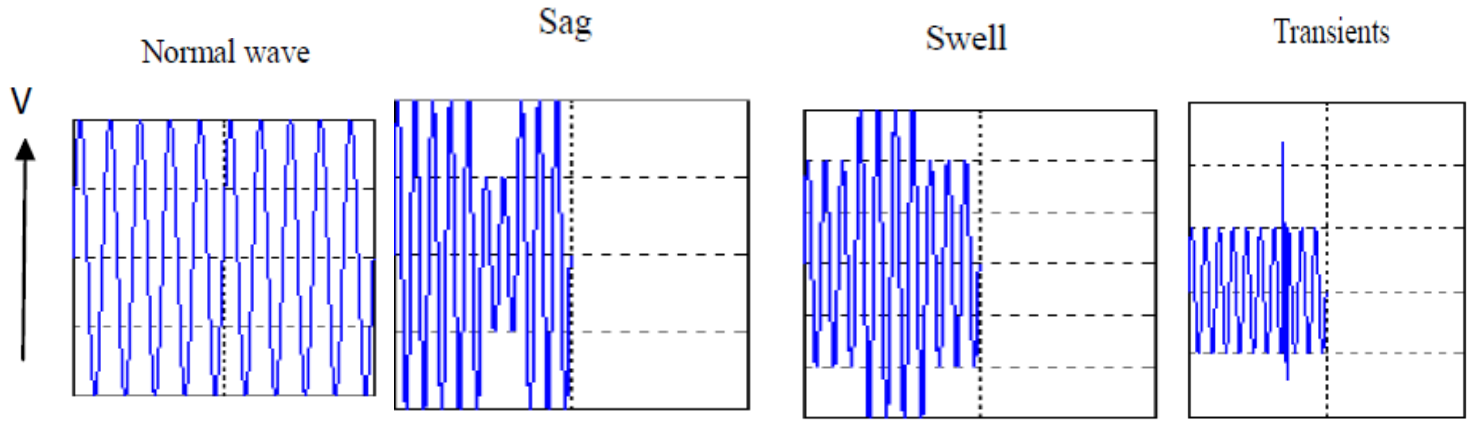
Objectives:

This paper presents some future research area for detection and restoration of voltage sag and swell. Here all are our main future objectives:

1. Improvement in voltage quality with the smart filtering system.
2. Here we are targeting to reduce the cost issue which is the main drawback of previous existing approaches
3. Here we are try to improve the quality of voltage in less time because time is also a big factor which are not solve by the previous existing approaches.

4. Proposed Methodology

Here basically we proposed a technique which is able to reduce the issues of sag, swell on generated power. Here we can generation of all types of noise which will effect the power signal and those noise are:



Generation Of Noise Signals:

PQ disturbances	Model
Normal	x = amp*sin(2*pi*f/Fs*t)
Sag	v=(1-A*(u(t-t1)-u(t t2))).*sin(2*pi*f/Fs*t)
Swell	z=(1+A*(u(t-t1)-u(t-t2))).*sin(2*pi*f/Fs*t)
Transients	r=0.5*((1-A1*(u(t-t1)-u(t-t2))).*sin(2*pi*f/Fs*t)+(1-A2*(u(t-t3)-u(t-t4))).*sin(2*pi*f/Fs*t))

So as per our proposed approach here we are presenting a new filter which is combination of two DWT filter and where one filter is approximate dwt and another one is continuous DWT. So according to our proposed approximate filter is combination of new coefficients:

Approximate DWT: According to approximate DWT filter here our proposed mother wavelet is basically follows db4 wavelet but in our approach we change that coefficients value and convert those values in to fixed point. Original db4 values: For Daubechies wavelet transform, a pair of linear filters is being used. This pair of filters should have a property which is called as quadrature mirror filter. Solving the coefficient of the linear filter 's using the quadrature mirror filter property results in the below solution for the coefficient values for filter of **order 4**.

So this Ld and Hd value is original coefficients but according to proposed approach we change the coefficient values in to the fixed point. In our approach generated Ld value is equal to hd because as per the approximation point there is no any effect on output quality.

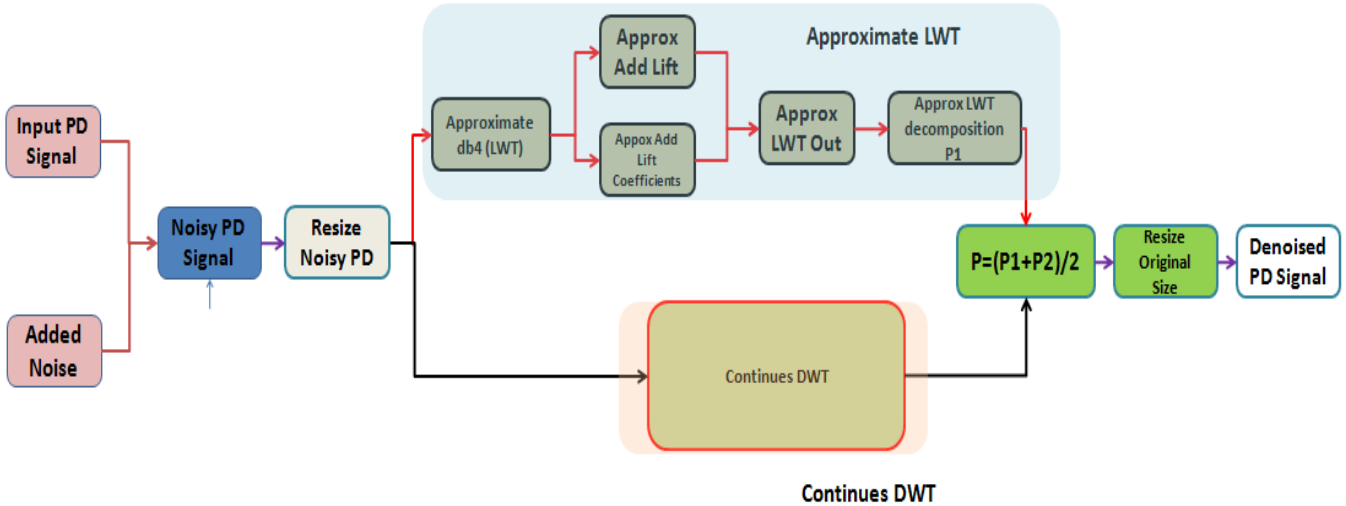
Proposed coefficients:

Hd_1=0.1294=0.125 Hd_20.2241=0.2187

Hd_30.8365=0.875 Hd_4=0.4830=0.5

Ld= Hd

Here we will take Hd and Ld both in equal way that's why time consumption will be less. Now our second DWT is based on continues DWT where basically we follows Reverse Biorthogonal.

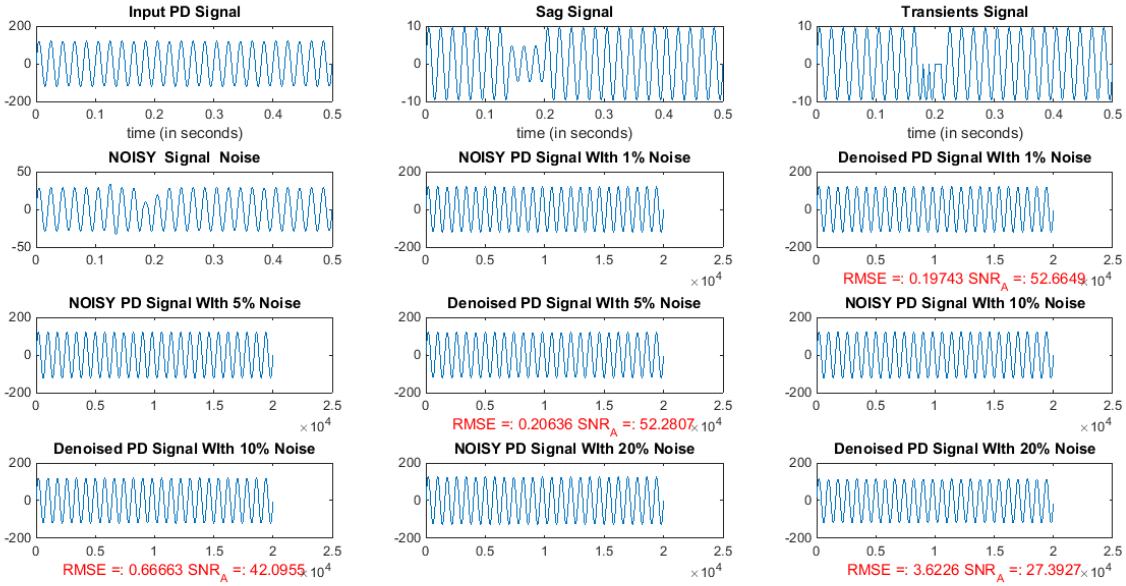


5. Result Analysis:

So as per our proposed approach we will deisign an system which is able to reduce the power loss and it increase the quality of generated signal. Here we will compare our proposed work with all exsisting power quality improvement techniques and we will do analysis in terms of quliaty and time complexity so according to analysis here is our generated result:

Table 5.1: Quality Level Analysis for Random Noise with Different % of Noise Level

APPROCH	SNR_1%	SNR_5%	SNR_10%	SNR_20%	RMSE_1%	RMSE_5%	RMSE_10%	RMSE_20%
FFT Based	46.99	33.01	26.99	20.97	0.379	1.89	3.79	7.58
DWT Mother db9	51.43	37.45	31.43	25.41	0.227	1.137	2.274	4.541
DWT Mother db8	50.51	36.54	30.52	24.50	0.25	1.26	2.52	5.05
DWT Mother db3	48.93	34.95	28.93	22.91	0.3033	1.51	3.03	6.06
DWT Mother Haar	44.18	32.34	25.49	20.41	0.523	2.0489	4.5075	8.0934
Gaussian Based	32.40	29.77	25.93	20.69	2.03	2.75	4.28	7.83
FIR Based	33.93	30.83	26.71	21.33	1.70	2.43	3.91	7.27
Proposed	52.66	52.28	42.09	27.39	0.19	0.20	0.66	3.62



6. Conclusion

The diminishment in control quality is extremely a major issue when we are discussion about the savvy brace or power network framework. In the event that our created voltage quality isn't adequate so naturally our whole framework confront a test which is known as power misfortune. In this paper fundamentally we display the near examination between all current power quality change framework. Here we got bunches of future extension for this zone which is require to illuminate the current framework issue. Here we also propose a new technique which will give good result as compare to previous existing approaches. Here we did improvement of more than 20% in terms of quality as compare to previous existing approaches.

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