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# Medical Image Fusion using DWT and SWT Technique

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**Abstract:** Image fusion is a process of combining multiple images from a single or multiple input imaging into a single image, where it improves the quality of images and reduces the redundancy. The main application of image fusion is done in medical applications where it helps us to increase the clinical applicability of medical images for enhancement of diagnosis of medical problems. The image fusion technique can be done using discrete wavelet transform (DWT) and stationary wavelet transform (SWT). Normally images used in medical field are CT and MRI as a source images. These fusion methods are analyzed using different parameters like PSNR, RMSE and NAE to select the better method.

**Keyword:** Discrete Wavelet Transform, Fourier Transform, MATLAB, SWT.

## I. INTRODUCTION

The advancements within the field of detecting advances multi-sensor frameworks include twisted keen scheduled a actuality in a different fields, for example, remote detecting, restorative imaging, mechanism visualization plus the military application designed used for which they be created. The consequence of the utilization of these procedures be an expansion of the measure of information accessible. Picture combination gives a powerful method for lessening the expanding volume of data while in the meantime separating all the helpful data from the source pictures. Multi-sensor information frequently shows corresponding data, so image arrangement give a influential technique in the direction of authorize test plus examination of information. The point of picture combination, aside from lessening the measure of information, is to make latest pictures that are progressively sensible used for the motivation at the back human/machine observation, plus meant for additional image. The partition, objective position or target recognition inside application, for example, remote detecting and medicinal image used for instance, Multi-sensor pictures regularly contain diverse arithmetical portrayals, which must be changed to a typical portrayal for combination. This portrayal ought to hold the best goals of sensor. An essential for fruitful in picture combination is the arrangement of multi-sensor pictures.

Picture combination is the system where the data from different pictures is consolidated into a solitary picture, which incorporates the data comparing to the numerous pictures [1]. Hence acquired picture ought to contain more data than the first pictures. Picture combination method diminishes the excess and vulnerability by removing the helpful data from the source picture [2]. Before picture combination, the best possible arrangement of the pictures ought to be done so as to get the better imagined intertwined picture [3]. In instance of Medical picture combination procedure, we can join at least two medicinal pictures into single picture which gives supportive data to specialists in their treatment. Various kinds of combination strategies are clarified in writing [4]. Fusion dependent on wavelet change is utilized in the proposed work which is the pixel level picture combination strategy. Typically wavelet changes decays the picture into high recurrence band and low recurrence band at various dimension low recurrence groups which gives copy picture of the first picture and all the data relating to the first picture is incorporated into this band which is known as surmised coefficients. High recurrence groups give edge and framework data of the source picture in the melded picture and it additionally decides the luminance change with reference to the edge data which is known as definite coefficients. This paper further quantitatively examine the melded picture quality by utilizing execution parameters like entropy, standard deviation, PSNR, NAE and RMSE. The diverse wavelet changes utilized in combination of pictures. features the diverse presentation parameter utilized in combination strategy for the quantitative examination. Segment IV expounds the introduction and exchange of exploratory outcome.

## II. EXISTING SYSTEM

During the presence framework, they have utilized the spatial space combination strategy to accomplish an ideal consequence of intertwined picture. In spatial space strategies, picture pixels are thought about. Different tasks are performing on pixel esteems to accomplish wanted outcome.

### III. PROPOSED SYSTEM

Generation of electricity by combining three electricity generation methods such as solar, dynamo and piezoelectric sensor. Proposed system explains about effective power saving method by setting a power consumption limit to the load. The user can get the information about the power consumption cost of the load on his mobile phone by connecting to a web server.

### IV. FUNCTIONAL BLOCK DIAGRAM AND DESCRIPTION

The Functional Block diagram of the entire system is as shown in the Figure 1. The framework can be named monitoring and control units. Monitoring unit comprises of different parts including sun oriented boards, dynamo and piezoelectric sensor. These segments are principle utilitarian squares of the framework. Power produced by these three techniques are checked and constrained by the microcontroller (which is modified in ARDUINO IDE programming) and put away in a capacity unit. LCD is utilized to show the comparison estimations of electricity produced by three strategies.

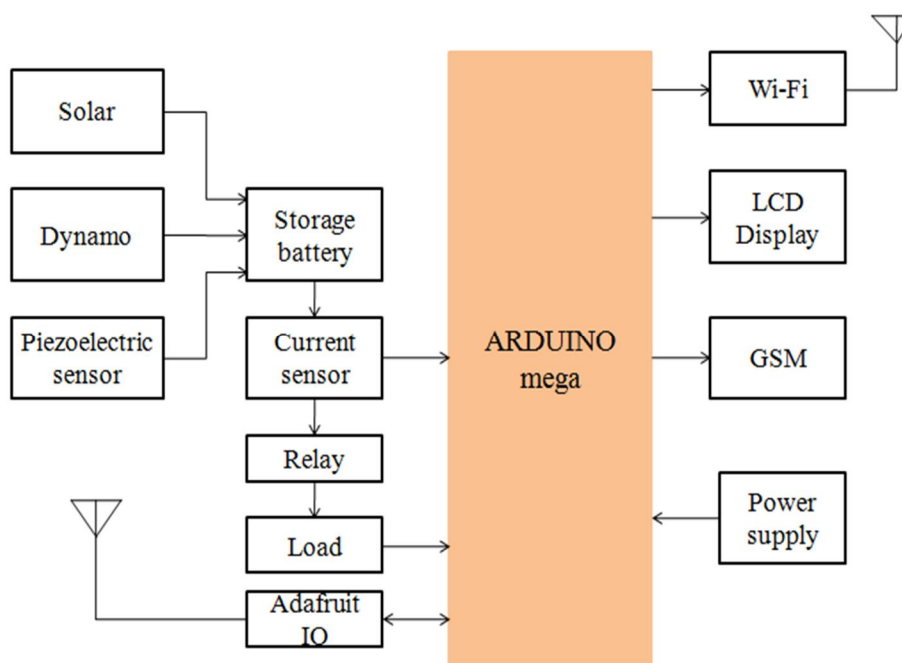


Fig 1: Functional block diagram

### V. WORKING METHOD

Above fig-1 shows sunlight, dynamo and piezoelectric sensor based electricity generation system. At the point when the framework is turned on it will begin producing the voltage by making daylight to fall on the sunlight based cell, by giving mechanical pivots to dynamo and by applying the mechanical vibrations on piezoelectric sensor. The voltage created by three techniques is put away in a capacity battery. The three sources those are sunlight based board, dynamo and piezoelectric sensor are associated with both battery and the controller.

Each power sources are associated with the microcontroller through a transistor driver circuit, these driver circuits are utilized to produce the voltage signals from power source and it is given to the microcontroller analog pin where the controller changes over this simple analog value to computerized and show the relating voltage esteems on the adafruit io site page. A nodeMCU 8266 module is utilized to convey or exchange the information to the website page by interfacing it to a web association. From battery positive, voltage is given to the current sensor & current sensor's certain yield voltage is given to the load through transfer. A similar positive voltage is first given to the relay's NC pole. The NC pole of the relay is associated with the load so the load will be in a consistent on condition, when the load is turned off it is associated with the NO pole of the relay. Subsequently we can say that the relay is utilized to switch the load among ON and OFF condition. A current sensor will examine the present esteem current going through the load. The yield of the current sensor will be in simple structure which will be changed over to computerized values by ADC present in the controller as the current sensor is associated with the controller.

To save the power, a power usage limit is set to the load. Here the load may be considered as user. A GSM is serially interfaced with the microcontroller to send the SMS to the user. To send the SMS through GSM, first the controller will send the information to the



GSM than the GSM will send the corresponding SMS to the specified phone number. The data transfer between controller and GSM will happen through the attention command. Whenever the user consumes 50% of its power limit an alert message is sent to the user saying that "more power consumption" have limit on the power consumption. When the user crosses the power consumption limit again the GSM module will send a ,message to the user saying that "power limit exceeded power cut off and automatically it will cut the power line and the load will be turned off.

All the power utilization esteems and voltage estimations of three sources are shown and checked on the adafruit io page with the assistance of NodeMCU 8266 module. Then again these qualities are shown likewise on the LCD. Indeed, even the power bill dependent on the power utilization is shown on the website page. After resetting the entire framework the load will be turned on once again. By utilizing this strategy or approach we can accomplish greatest power sparing.

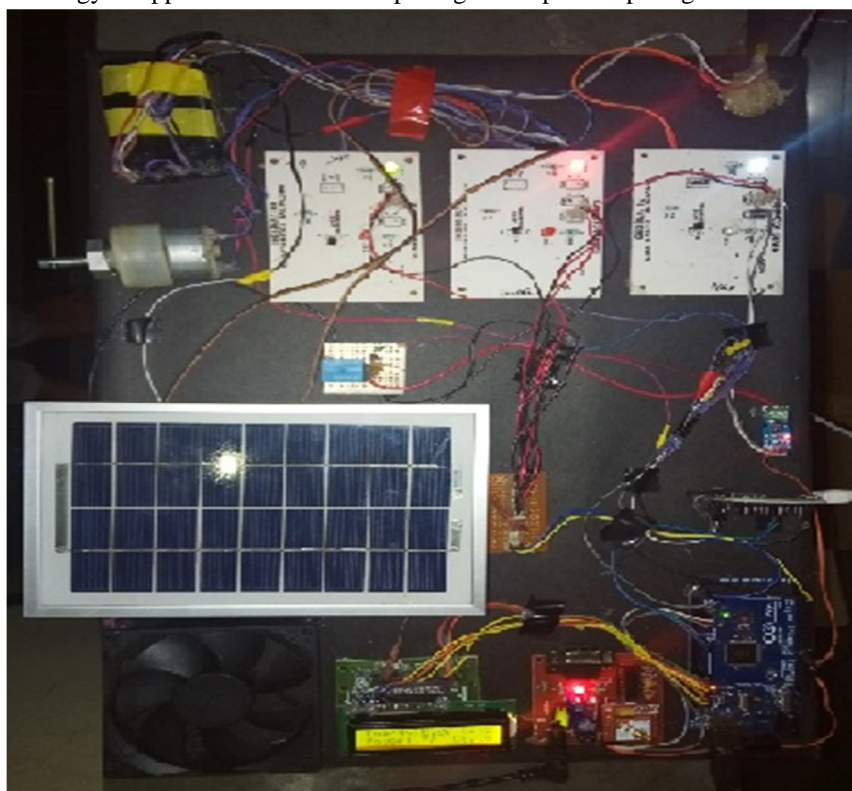


Fig 2: Picture of Implemented Hybrid power generation system

### VI.RESULTS

The system is implemented by programming in arduino IDE software and the corresponding output values are displayed on LCD as well as on adafruit web page as shown in the fig 3 and fig 4 respectively. As the power usage limit is set for every user we can achieve an effective power saving.



Fig 3: All monitored data displayed on LCD

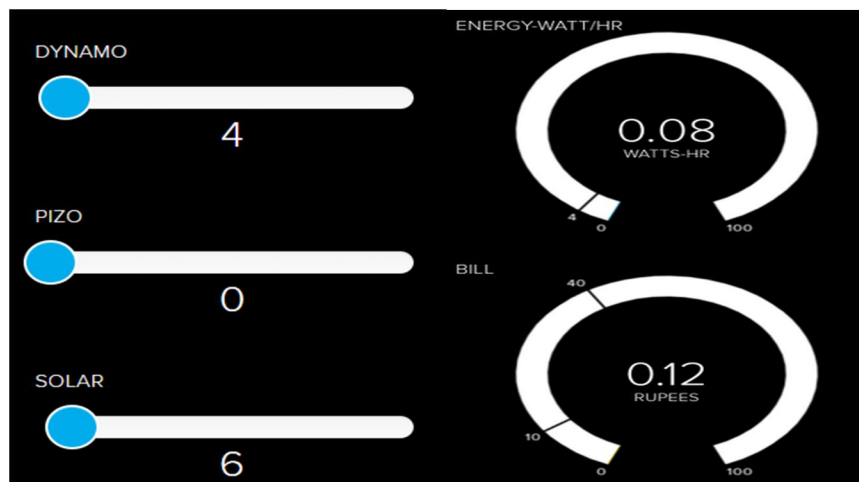


Fig 4: Three voltage, energy and cost values displayed on Adafruit web page

## VII. COCNCCLUSION AND FUTURE WORK

Electrical power demand be expanded within everyday. Hybrid power generation is the answer for compensate forthcoming interest. This system is better and effective answer for power generation than traditional power assets, It has bigger effectiveness. It can provide to remote the spots where government is unfit to reach. With the goal that the power be capable of being used where it is created, so it will reduce the communication misfortunes plus charge. By expanding the manufacturing of the supplies reduces the expense of the framework. It is cost effective solution for power-generation. Just the initial investment is required. Overall it is good, predictable and cheap answer for power generation. The proposed technique assumes a crucial job in power generation as well as successful sparing of that produced power.

Utilizing sun oriented power, mechanical turns and pressure energy together helps in most extreme power generation. In future this hybrid system can be implemented in large occupied zones, for example, railroad stations, shopping centers, transport stops, and occupied pathways with the goal that a greatest productivity in the power generation can be accomplished. In future we can likewise improve this framework by making it double sun following sun based boards so as to increase the yield.

## VIII. ACKNOWLEDGMENT

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