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ESTIMATION AND CONTROL OF REAL-TIME JUNCTION TEMPERATURE OF A MOTOR DRIVE USING THERMAL CAMERA

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Abstract—Defects detection in industrial productsplays an important role now a days. Many methods are involved to find defects in the products like motor faults. Infrared thermography is used to identify the cracks or defects present in metal surfaces, electronic PCBs etc., Infrared thermography detects flows more accurate than normal image processing schemes Using FST algorithms the thermal images are analyzed and plotted for the control of motor temperature and as well as to control load.
Keyword: Thermal camera, Junction temperature, Microcontroller

I.INTRODUCTION:

To analyse the motor temperature through thermal camera by using FST(Fractional Spline Transfer)algorithm . This may seem to be usual, but in the existing system, we have drawbacks like the phase of these methods of heat conduction, joule heating and heat diffusion has been conducted and proved the efficiency for cracks analysing in external surface. As already said "heat evolves ina sparse pattern " and there have been several test conducted like theNDT(Non Destructive Testing) and ECPT(Extreme Cold Pressure Test) to evaluate this existing methods.The scattering pattern extraction method is used to emphasis sparse unique pattern which have already been cracked to be automatically extracted for the enhancement of flawing contrast.
Infact the proposed method both artifiicial and natural defects prevailing is also tested the industry.It is so clear that, whenever there is an existence of a new system or method, the previous method might have drawbacks, in order to overcome those drawbacks usually new methods are proposed.Similarly in the existing system, we have drawbacks like it cannot tell about samples with complexity in surface condition.The best examples are rooughness and emissitivity variation .One more thing is that complex means it is
used to defect the detection –some of the examples are sub surface detection in all metallic material ,impactual damage and de-lamination taking place mainly in carbon fibre structures in brushes.Now ,lets get into our proposed system ,here we manily concentrate on the physical characteristics changes and also the defects that is extremely complex to identify .In order to

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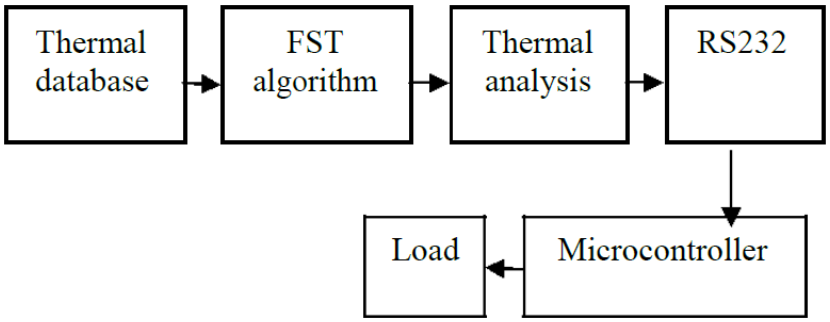
solve this, we use FST (fractional spline transfer) technique to analyse the load accordingly to the control received from the microcontroller

II. BLOCK DIAGRAM:



THERMAL DATABASE:

Some of the basic details of a thermal database are

- Database format = 8 bit gray scale bit map.
- Image size = 640*480
- Sampling rate = varying
- Lens size = 75mm

FRACTIONAL SPLINE TRANSFER:

Splines have a significant impact on the early development theory of wavelet transform. In fact, they constitute a case apart for they yield the only wavelets that have an explicit analytical form. An infinite recursion defined indirectly by this all other wavelet or an infinite product in Fourier domain. Todate, Four sub-famil of splines wavelets have been characterized Explicitly; .The Battle-Lemarie, Semi, ShiftBiorthogonal Spline Wavelets. The first two types ofspan are same spline multiresolution subspaces. It based on an orthogonal projection. In a two multiresolution involved the two remaining subtypes analyses instead of one and implement an oblique projection. The shift-orthogonal wavelets are more constrained ones which are orthogonal with respect to shifts but not to dilation. Notable property is that these splines irrespective of their type among all known wavelet properties appear to have the best approximation families: the smallest asymptotic approximate error can be yield for a given order L.

THERMAL ANALYSIS:

Thermal analysis is a part of science. Here the material's properties will change according to the temperature.Its main use of thermal analysis is to improve accuracy, sensitivity, and performance, therefore it is used in nano material, coatings, polymeranalysis. MAX232:The dual driver/receiver is the MAX232 device . the capacitive voltage generator is included for

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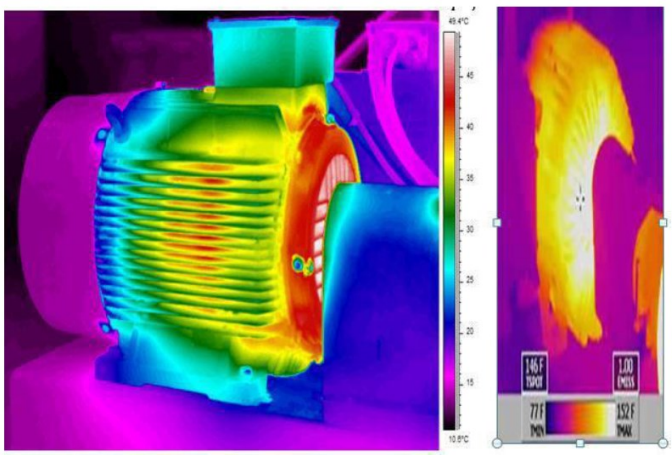
supply. From TIA/EIA-232-Fvoltage levels is a single 5-V supply. Each receiver converts these reciver to 5-VTTL/CMOS levels. These receivers have a typical threshold, hysteresis of 1.3 V,0.5 V, and can accept (+ or -)30V i/ps. Each driver converts TTL/CMOS i/p levels into TIA/EIA-232-F levels.

MICROCONTROLLER:

PIC stands for Peripheral Interface Controller. It encodes and decodes the data. It has flash memory so we can rewrite up to 100,000 times. It is a 28 pin DIP package. The architecture of the PIC is HARVARD. It has three ports for the input/output operation. The analog signal can be directly given to the PIC hence there is no need for external analog to digital converter.

THERMAL CAMERA:

THERMAL IMAGE OF MOTOR:



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FST Algorithm:

In this paper, we propose to generalize these spline constructions to obtain new wavelet bases with a continuous order parameter. For this purpose, we first extend the construction of B-splines to fractional degrees. These functions will be indexed by a continuous parameter α + which represents the Holder exponent of the fractional spline. They interpolate the conventional B-splines which correspond to the special case where α is integer. We will show that these new fractional splines share virtually all the properties of the polynomial splines with the exception of compact support when α is non-integer. Most importantly, they satisfy a two-scale relation which is the key to construction of wavelet bases. This will allow us to construct wavelet bases parametrized by the continuously-varying regularity parameter α . We will see that these new spline wavelets have some remarkable properties. In particular, they have a fractional order of approximation, a property that has not been encountered before in wavelet theory. They also behave like standard wavelets in the fractional differentiation operators, only give integer orders of differentiation

This paper organized as follows. In Sec(2), we introduce the two versions - causal and symmetric of fractional B-splines. In Sec(3), we concentrate at their important properties: There are ,fractional differentiation rules, Riesz bounds, two-scale relation, and fractional orders of approximation complete. in Sec(4), Then We use these results to produce continuous order parameter. These include Battle-Lemarie wavelets which are orthogonal and the B-spline wavelets which are of interest because of their near optimal time-frequency localization properties.

III. Notations and definitions

(A) Generalized Bionomials Euler's gamma function which generalizes the factorial, is defind as Well-known bionomial theorem

$$(u+1) = \int_0^x x^u e^{-x} dx$$

(B) Fractional Derivatives:

Differentiation operators are extended to non-integer exponents in the fourier domain:

$$f(x) = \sum_{k=0}^{+} ((-1)^k + \int_k^\alpha$$

This equation is equivalent to liouvillie's definition for derivative of fractional operator[9].

(C) Fractional finite difference :

This is a convolution operators in the fourier domain which has a more SFI.

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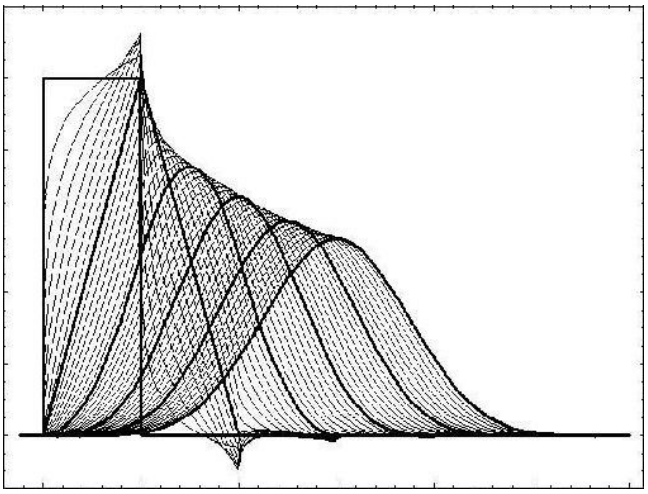
$$\beta^{\alpha} + 1 * \beta^{\alpha} + 2 = \alpha + 1^{\alpha} + 2^{+1}$$



MAX232x Dual EIA-232 Drivers/Receivers:

APPLICATIONS:

- TIA/EIA-232-F
- Battery-Powered Systems
- Terminals
- Modems
- Computers

IV.FEATURES

8085 CORE

- (PIC16F877AMICROCONTROLLER):
- High performance of the RISC CPU.
- Only 35 instructions to learn.
- Selectable oscillator options.
- Interrupt capability (up to 11 sources).
- Operating speed: DC – 20 MHz clock input.
- Deep hardware stack (Eight level)
- Direct and Indirect relative addressing modes.
- Programmable code protection.
- Flash memory 2K x 14 words .
- 128 x 8 bytes of RAM Data memory.

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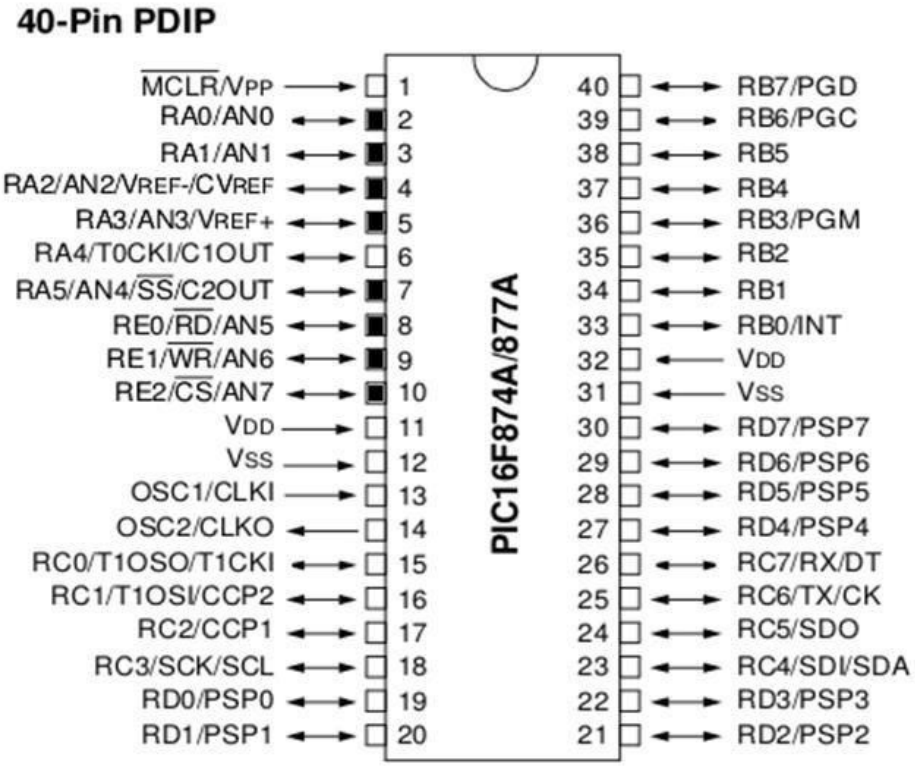
- 64 x 8 bytes of Data Memory(EEPROM)
- Fully static design.
- Power saving SLEEP mode.

PERIPHERAL FEATURES

Timer0: timer-counter with prescaler(8 bit)
Timer1: incremented during sleep 16 bit timer-counter with prescaler.
Timer2: timer/counter with period register(8bit), postscaler ,prescaler.multi channel Analog to Converter is 10bit.USART with 9 bit address detection



PIN OF PIC16F877a:

PIN DETAILS OF PIC16F877a:

The PIC16F877Ais a 28 pin DIP C. The Port A has 6 pins and the analog signal is given to this. The Port B and Port C have 8 pins each. It has 3 types of instructions set such as Bit type, Byte type package. The architecture of PIC is HARVARD architecture. It consists of 3 ports such as Port A, Port B and Port and Literal type instructions. In this the Accumulator is referred as Working Register or 1 and the registers are referred as Files or 0.

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The PIC has three memory blocks.

- The Program memory.
- Data memory.
- Flash memory.

The data memory is partitioned into multiple banks which contain General Purpose Register and the Special Function Registers. There are two banks such as Bank0 and Bank1. The PIC has two Timers such as Timer0 and Timer1.

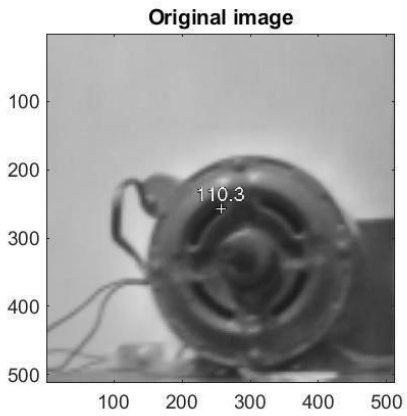
ADVANTAGES

- Very low power consumption.
- Flash memory (rewrite up to 100,000 times).
- Easily writable.
- Easily changeable.
- Easly debuggable.
- Low cost.
- Good availability of parts.

4.2 INTERFACING IC MAX 232

The MAX232 is a dual RS232 receiver/transmitter that meets all EIA RS232 specification while using only a 5V power supply. It has two charge pump voltage converters which generate +10V and -10V power supplies from a single 5V power supply. It has four level of translation, two of which are RS232 transmitters that convert TTL/CMOS input levels into +9V RS232 outputs .The other level of translation are RS232 receivers that convert RS232 inputs to 5V.

FINAL OUTPUT:



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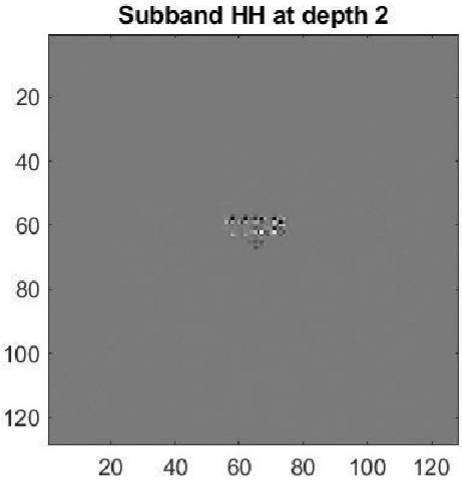
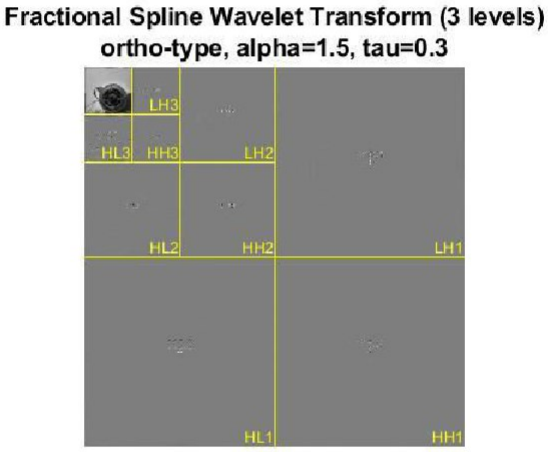
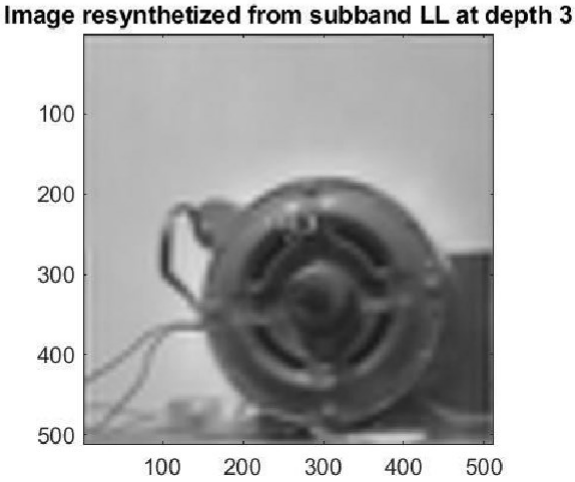
SUBBAND







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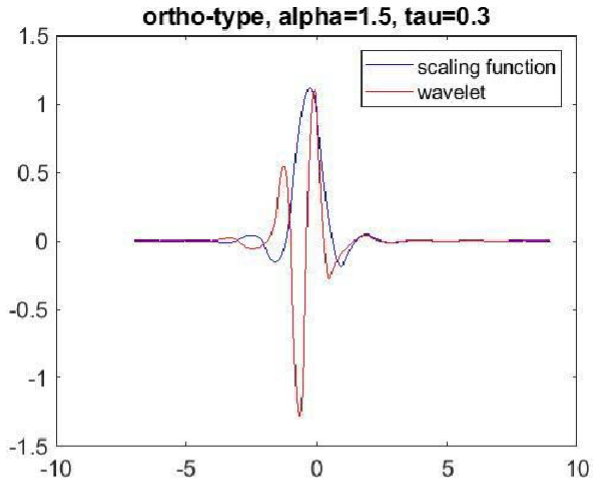

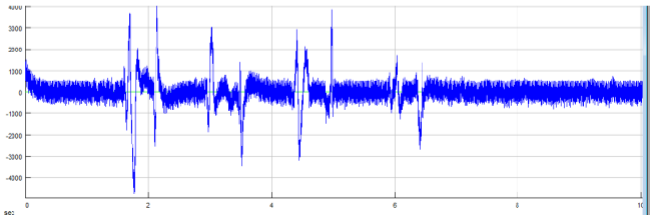

ABNORMAL CONDITION & NORMAL CONDITION

V. CONCLUSION

In the following model,we have estimated the real time junction temperature of a motor in various stages such as normal run ,slow speed and in transient mode .We are able to identify the heat level with the help of thermal camera .With the help of fractional spline transfer technique ,we are able to control the load according to the heat produced .The more advantageous thing is that more accurate than any other method .Though the cost of the camera is high,it's life span is more .In our paper we have not only estimated the temperature of the motor but also we are controlling it. Thereby we can analyse the life time of the motor and prevent the motor from damage.

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