Applying Methods of Feature Extraction in Detection of Arthritis Disease

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الملخص :

ان التهاب المفاصل هو مرض مزمن وهو اضطراب في العظام والمفاصل قد يسبب عدم حركة المفاصل. يحدث التهاب المفاصل بسبب الشيخوخة ، والتقدم الوراثي ، والموائل الناتجة عن الأمراض والعوامل البيئية الخارجية أو بسبب التلف العرضي للعظام والمفاصل. يصعب تشخيص المرض في المراحل الأولية حيث يصعب تحليل الصور المفاصل. وحيث ان صور الأشعة السينية التي يتم الحصول عليها من المريض بوضوح تقدم المرض لا توضح المراحل.

لذا فان تم تقديم مقترح لادماج كل من الألياف العصبية والكولاجين والعظام والأنسجة تشارك في عمليات تصوير التهاب المفاصل بالرنين المغناطيسي النووي والتصوير بالأشعة السينية مع صورة رقمية ، بحيث يتم تغذيتها بنظام ذكي لتحديد نمط النهايات العصبية للتقدم المحتمل للمرض هو أفضل طريق للكشف. وتم التعرف والحصول على نوع التهاب المفاصل من خلال تحليل المرض وتشخيصه أخيراً من خلال اتباع أنماط الألياف العصبية وكولاجين العظام وبنية الأنسجة ، وذلك باستخدم التعرف على الأنماط تقنيات مختلفة مثل استخراج الميزات ، والذكاء الاصطناعي ، والشبكات العصبية ، والمجموعات الضبابية ، والأنظمة الخبيرة ، وأشجار البحث الثنائية.

Abstracts

Arthritis is a deadly disease which is in simple terms a bone and joint disorder causing immobility of the joints. Arthritis is occurring on ageing, genetic acquatanice, disease due habitats and external environmental factors or due to accidental damage of bones and joints. Diagnosis of the disease is difficult in the initial stages as the joints are difficult to analyse. The X-ray images obtained from the patient does not clearly demarcate the disease progress. As the nerve fibres, collagen and bone and tissue is involved in arthritis NMR imaging and X-ray imaging with a digitized image fed to an intelligent system for determine the pattern of the nerve endings for possible disease progress is the best route for detection. The pattern recognition for arthritis is found by The disease is finally analysed and diagnosed by the following of patterns of the nerve fibres and the bone collagen and tissue structure. pattern recognition uses various techniques like feature extraction, artificial intelligence, neural networks, fuzzy sets, expert systems, and binary and multiple search trees.

Keys: Bit Allocation Analysis, Progressive Transmission , Motion Sequences , Low Bit Rates, Quantizes Formation, Inter-Quantizes Prioritization.

Introduction

Application of the criterion of efficiency thus servers only to eliminate a set of clearly wasteful modes of quantized-based allocation. terms of the novel bit-allocation analysis terminology: (i) It deals with a set of allocation processes which cannot be generated from a finite number of basic allocations processes, rather a continuum of vectors is required to characterize the set of allocation processes in rate-distortion (ii) the existence of a ``managerial choice'' is presupposed so that the combination of allocation-consumption processes always takes place to achieve some distortion constraint at the minimum bit rate which is nothing but the set of efficient allocations defined by the rate distortion function; and (iii) the set of efficient allocations in rate-distortion constitutes a differentiable function. the bit allocation analysis is confined to a study of processes when the number of basic allocation processes is finite. In other words, the set of allocation processes is to be confined to a ``trees truncated'' convex polyhedral cone. It is in the set-theoretic approach which is more fundamental and powerful than the smooth (differentiable) function approach.

Bit Allocation Analysis

`Bit allocation analysis'' is concerned with the study of efficient combinations of quantizer-based allocations and bit consumption by a model capable of numerical application. The modus operandi of bit-allocation analysis are to be through the use of set theory and the fundamental theorems of mathematical optimization. The most important concept in this analysis is ``efficient allocation process'' which represents a combination of quantizer-based allocations and bit consumption such that no bit allocation can be increased without decreasing other quantizer's allocation or increasing consumption. The main result of this paper allows to characterize the concept of efficient allocation process by profit maximization with respect to any combination of allocation-consumption among competing quantizes. In bit allocation analysis, the system makes a choice from the set of efficient allocations at any given time by using the appropriate strategy for computing the profit vector. It may allow to attend to different parameters of interest at different bit rates within the same spatial locations. It is a typical linear programming problem, of which the computational method is well known and widely used in practice. The comparative performance of the 3D-SPIHT with motion compensated temporal filtering and the proposed coder (without motion filtering) using bit-allocation analysis, is here tested on a set of sequences of moving targets.

Attention-Based Quantize Formation

In the first stage of the coding, a three level spatio-temporal wavelet transform is applied to the motion sequences. On the 3D subband structure, a spatio-temporal orientation tree naturally defines the spatio-temporal relationship on the 3D pyramid that results from the wavelet transformation. (Brunelli, 2009)gives the only one reasonable parent-offspring linkage.

Once a three level spatio-temporal wavelet transform is applied to the sequences of images, although most of the energy is concentrated in the temporal low frequency, spatial residual redundancy in the high temporal frequency band does exist due to the motion. That is, there exists not only spatial similarity inside each frame across scales, but also temporal similarity between two frames. However, quantized formation allows the exploitation of self-similarity across an

spatio-temporal orientation tree using zerotree coding. The grouping and segregation of wavelet coefficients to form quantizes is achieved now by attention-based quantized formation. In this formation process, wavelet coefficients of a 3D wavelet transform are partitioned into different quantizes by attention thresholding. It compacts points of maximum attention to a small number of high-attention quantizes.

Points of maximum attention can be calculated by searching for peaks in a local attention function. Local attention functions should be defined depending on the particular application of interest. We are here interested primarily in the transmission of sequences of moving targets Since (Biswas, 1993) demonstrates that velocity only accounted for forty-eight percent variation in the probability of target detection, the local attention function is here computed to measure the velocity at any given point.

Points of maximum attention are then signalled by peaks in the attention function and thus, to detect points of maximum attention, the values can be thresholder using a global threshold:

where the value of is selected using a performance rule on a sample of sequences. The performance rule is a top-down rule where the threshold is adjusted based upon improving target detection performance. The model is then applied using the same threshold without need of adjustment.

The grouping and segregation of wavelet coefficients into a small number of quantised.is achieved through quantizer formation using detected points of maximum attention as follows:

Quantizer Formation Algorithm

Detect points of maximum attention, .

For each 3D-region of the sequence of frames:

Form a new quantizer corresponding to the wavelet coefficients for the points in of maximum attention. The remaining coefficients are set to zero.

Form a last quantizer corresponding to the wavelet coefficients which were set to zero at quantizers for every 3D-region . The remaining coefficients are set to zero.

Stop.

Inter-Quantizer Prioritization by Bit Allocation Analysis

Once the attention-based quantizer formation is completed, a prioritization protocol should be used to choose the allocation of bits among competing quantizers up to availability limit , at any given time of the transmission, where: (i) Intra-quantizer prioritization simply follows embedded zerotree coding (Gastro, 2020); and (ii) bit allocation among competing quantizer follows bit allocation analysis by finding the efficient combination of allocations up to the bit consumption limitation.

Intra-quantizer prioritization by zerotree coding provides substantial coding gains over the first-order entropy for significance maps. Zerotree coding predicts insignificance across scales and spatio-temporal orientations using a model that is easy for most sequences to satisfy. The zerotree approach can isolate interesting non-zero details by immediately eliminating large insignificant 3D regions from consideration. At very low bit rates, where the probability of an insignificant coefficient must be high and thus, the significant threshold must also be large, expecting the occurrence of zerotrees and encoding significance maps using zerotree coding is reasonable for every competing quantizer: If it is observed that a parent is insignificant with respect to the threshold, a zerotree is expected regardless of the correlation between squares of parents (coefficients) and squares of children. Hence we have that differences in quantization costs for competing quantizers are not relevant, at extremely low bit rates, in determining the technological where the bit consumption is when using at its basic activity level.

In the maximization of with respect to over the set of allocation processes at any given time , we have that is a profit vector and represents the profit from at time ; where denotes the gross profit per bit for quantizer at ; and denotes the price per bit for available consumption at . Following Theorem 1, we make use of the imputed profit vector at any time in order to make a choice from the set of efficient points at this particular truncation time of the progressive transmission.

Within a rational approach for progressive transmission, the gross profit per bit for any quantizer at any time can have the form of its expected increase in utility per coding but as given by Proposition 3 in (Ortiz-Posadas, 3/20222), with denoting the maximum availability of bit resources for quantizer at time and being the number of bits in . For example, may be a fixed number of sorting and refinement bit streams from the intra-quantizer prioritization which follows the embedded zerotree coding scheme. (Ortiz-Posadas, 3/20222) demonstrates that this definition avoids certain forms of behavioural inconsistency within a rational approach which first states some general principles that the solution of this problem must obey and then derives the solution that satisfies exactly the principles.

In any case, the theory of bit allocation analysis allows to achieve efficient allocations which may be descriptive of reality at any given time of the progressive transmission, since the profit vector can change its value over time to give a good predictor of target saliency for humans performing visual search and detection tasks at any given bit rate. An example is presented in the following section of experimental results. One possible use of our results would be for a video codec to possess several alternative definitions of a profit vector in such a way that a user of the system may choose the appropriate strategy for computing vector at different bit rates to the application of interest.

For example, at extremely low bit rates (e.g., up to 10 kbps) a profit vector consists of few points(data members)Thus, in bit allocation analysis, the system makes a choice from the set of efficient allocations at any given time by using the appropriate strategy for computing the profit vector. It may allow to attend to different parameters of interest at different bit rates within the same spatial locations.

Inter-Quantizer Prioritization by Bit Allocation Analysis

Once the attention-based quantizer formation is completed, a prioritization protocol should be used to choose the allocation of bits among competing quantizers up to availability limit , at any given time of the transmission, where: (i) Intra-quantizer prioritization simply follows embedded zerotree coding (Yalabık, 2010); and (ii) bit allocation among competing quantizer follows bit allocation analysis by finding the efficient combination of allocations up to the bit consumption limitation.

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Coder Evaluation

The 3D spatio-temporal orientation trees coupled with powerful SPIHT sorting and refinement, (Savvas a. Chatzichristofis, 2010) renders 3D-SPIHT video coder, [7], so efficient that it provides performance superior to that of MPEG-2 and comparable to that of H.263 (which are generally used nowadays) with minimal system complexity. That is, 3D-SPIHT is one wavelet-based coder that exhibits state-of-the-art compression performance. The comparative performance of the 3D-SPIHT with motion compensated temporal filtering (MC 3D-SPIHT) and the proposed coder (REVIC) without motion filtering, is tested on the data set of sequences of moving targets. In our problem the transmission of parameters is critical at extremely low bit rates. If motion compensated temporal filtering would be applied we will need to code motion vectors. Thus a key feature of the proposed video coder was to avoid the use of motion compensated temporal filtering, and consequently, motion vector components do not need to be transmitted. The bit rate necessary to achieve target detection was computed and registered for each sequence of moving targets. The winner should be the coder producing the lower average bit rate for achieving target detection. The experiment was performed on a dataset composed of 12 standard motion sequences of military targets on a natural background. Both camera motion and target motion are present in the sequences. Table (1) shows the compression ratio and kbps, 10fps, pixels/frame, in order to achieve target detection on each motion sequence. From this table we learn that the average bit rate to achieve target detection is 23.72 kbps using MC 3D-SPIHT and 12.60 kbps using REVIC.

Table (1) Compression speed and Image compression ratio

	Compr. ratio	kbps;10fps	Compr. ratio	kbps;10fps
1	144:00:00	10.24	18:01	13.04
2	492:01:00	10.66	132:01:00	39.72

3	512:01:00	10.24	252:01:00	20.8
4	252:01:00	20.8	202:01:00	25.95
5	412:01:00	12.73	412:01:00	12.73
6	512:01:00	10.24	302:01:00	17.36
7	492:01:00	10.66	152:01:00	34.49
8	10.24	202:01:00	25.95	54
a v g	**12.6**		**23.72**	72.3

Figure (1) show a visual comparison in performance of the MC 3D-SPIHT coder against the REVIC technique on motion sequences of military targets on a natural background. They illustrate frames from decoded motion sequences at the bit rate that is necessary to achieve target detection using the REVIC coder. They also display the respective frames using the MC 3D-SPIHT coder at the same bitrates. These figures demonstrate that the moving vehicles in each frame are easily visible using REVIC reconstructions at very low bit rates, whereas the moving targets are often invisible using MC 3D-SPIHT at the same bitrate. Recall that, in the REVIC codec, the embedded coding was performed without motion compensated filtering.

Practical and Computational Significance

We can now use the imputed profit vector at any time in order to make a choice from the set of efficient points. For example, given competing quantizer let be a set of allocation processes holding Axiom 1 through Axiom 4. From Axiom 1 and Axiom 3 we have that is a convex set of allocation processes. Hence, by Theorem 1, the concept of ``efficient allocation process" is now characterized by profit maximization. That is, maximization of with respect to over the set of allocation processes at any given time . Given that is a compact set (by Axiom 1 and Axiom 3), the existence of solution for this maximization problem is guaranteed by the Weierstrass Theorem since the inner product is a continuous function. with being the cost of quantization (bits per pixel) for at the given time. The fraction is a normalized measure of bit consumption when using a technique has been developed for estimation 3D motion of knee prosthesis from its 2D perspective projections. Our estimation algorithm includes some innovations such as a two-step estimation algorithm, incorporative use of a geometric articulation model and a new method to solve two silhouettes 'overlapping problem. Computer model simulations and experiments results demonstrated that our algorithms give sufficient accuracy. Next, with the cooperation of medical surgeons, we assessed the algorithm's clinical performance by applying it to moving fluoroscopy images of patients who had just undergone TKA recently. Our experiments were done in four steps; first we've taken the moving X-ray pictures called fluoroscopy images of the knee prosthesis at different knee motions; second, introduced the absolute positions/orientations for both components, third, introduced the relative positions/orientations between the femoral and the tibial components and finally, introduced the contact points trajectories between the femur and the tibial insert.

We drew the estimation results graphically and made the CAD model pictures of the prosthesis, thereby helping us to assess how the relative motions between the femoral and the tibial components were generated. Estimation results of the clinical applications demonstrated that our algorithm worked well as like as theoretical. Keywords: Knee prosthesis, Fluoroscopy images, Contact point trajectories, Kinematic estimation, Overlapping, Clinical applications.

The coordinate conventions for perspective imaging are shown in Figure. 1(a) and (b) for the first-step estimation and the second-step estimation. The first step estimation was done; in the same way as banks) on the assumption of orthogonal projection. In the second-step estimation, a computer-generated model was placed at the position/orientation introduced from the first-step estimation and its projection image was obtained. Then, rotations around x and y axes in small increments in both positive and negative directions were added to the model, thereby obtaining eight images surrounding the first image. A new image library was prepared; whose elements were the nine images as shown in Fig. 1(b). Then we repeated the same process in the second-step estimation as the first-step estimation, Kinematic Assessment of Knee Prosthesis from Fluoroscopy Images

(a) First-step estimation.

(b) Second-step estimation.

The unknown outnumbers the equations by four. However; with respect to the tibio-femoral relative motions, six variables can be introduced from our pattern matching algorithm, reducing the number of unknown variables fourteen to eight. This gives two surplus equations, and we may recalculate two more variables as if they were unknowns. Simulations and experiments using CCD pictures were performed to investigate the performance of our algorithm with respect to accuracy and computation time. We found that our algorithm produced position/orientation estimations that were more accurate than those of other methods, especially for depth translation at shorter computation time, and successively introduced

intact point trajectories between the articulating surfaces. countermeasure to the Overlapping between the Tibial and Femoral Silhouettes As the entire silhouette contour of each prosthetic component was required, our algorithm did not unction when the silhouettes of tibio and femoral components overlapped with each other. To overcome he problem we planned a new method; which was processed in two steps. First, interpolate the missing arts of tibial and femoral contours due to overlapping with free-formed curvature such as Bezier as showing. In figure (3), and the other is to use clipping windows in order for the missing parts to exclude from the estimation process. We can easily identify the intersection from the curvature values because the contour forms an edge and the curvature becomes close to $-\infty$ at the intersections. When two intersections are identified long the contour, we will be able to distinguish the tibial and femoral silhouettes respectively from the overlapping silhouette. We will restore the missing parts of silhouettes using Bezier curve interpolation s shown in Figure 3. Since the femoral condyle has a circular shape, the contour of its projection image suallyforms an elliptical shape; which can be easily approximated by the Bezier curve. The control points to both ends of Bezier curve are assigned at the intersections. Surface of tibial tray in contact with a polyethylene insert has an irregular shape with grooves however; its silhouette contour shape is usually simple. Thus we will apply Bezier curve to the missing part of the femoral silhouette as well. Since the original contour may not be reproduced exactly by means of Bezier interpolation, we will to achieve highly accurate position/orientation estimation as expected. For this reasons, we will apply the Bezier interpolation technique only to the first-step estimation process. n the next step as own in Figure (4) , clipping window was set in the projective coordinate so as to separate the overlapped silhouette drawn using the first-step estimates. After that the localized library whose templates were clipped in shape was prepared and the second-step estimation was performed. The matic Assessment of Knee Prosthesis from Fluoroscopy Images (13) was found from the Bnizr curve are shown in figure (4) Projection through a clipping window. Figure(3) Interpolation by Bezier curvature to resto missing parts of silhouette due to overlapping.

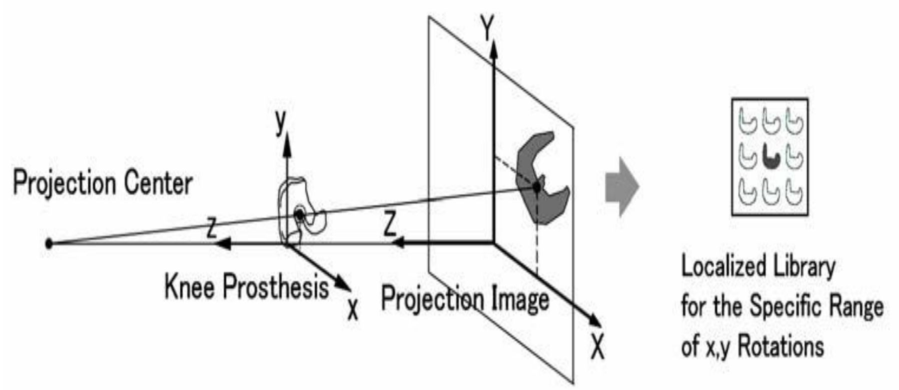
2.2 Simulations and results

Simulations were conducted to assess the accuracy of our two-step estimation algorithm. The rotation and translation conditions applied to the computer model to create the library needed for the first-step estimation and the second step-estimation. The rotation about z-axis and all other translations were set at zero. The angles were set over a range of -12o to 12o about the x-axis and 24o t 24o about the y-axis. The elements interval for the x-and y- rotation in the library was set at 2o for the firt-step estimation and was set at 2o, 1o and 0.5o for the second-step estimation at first-, second- and third. (a) femoral component (b) tibial component The values of vertical axes for each graph are the root mean square (RMS)of estimation errors. Rapid decreases in errors between the first-step estimation and second-step estimation are marked as shown in the figures. Thus it is mentionable that our method (second-step estimation) worked reasonably well as compared to the Banks and Hodges2) method (first-step estimation). We found that the accuracies were much improved after the second-step estimation was processed despite that the total number of library elements was decrease (a) femoral component (b) tibial component.

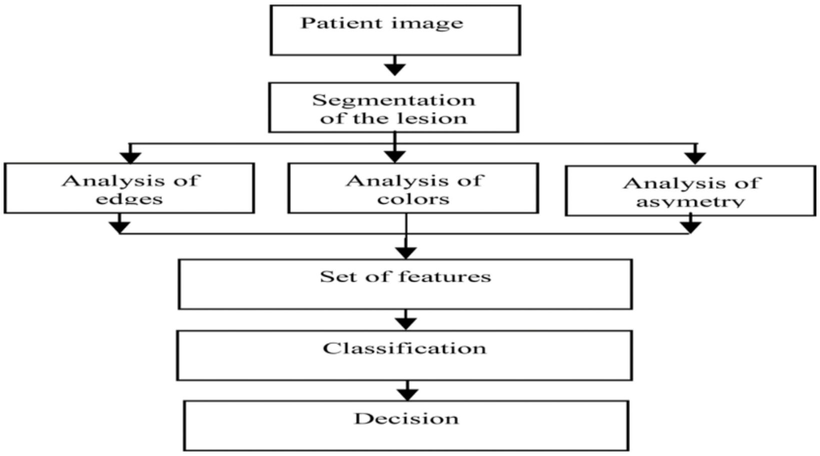
For the overlapping method, Fig. 6(a) and (b) show the simulation results for the femoral and tibial components respectively. The Computer model simulations demonstrated that corporative use of the Bezier interpolation and the clipping process in accordance with two-step estimations could achieve estimation accuracy as high as those of the images without overlapping.

Figure(1) root mean square (RMS)of estimation errors

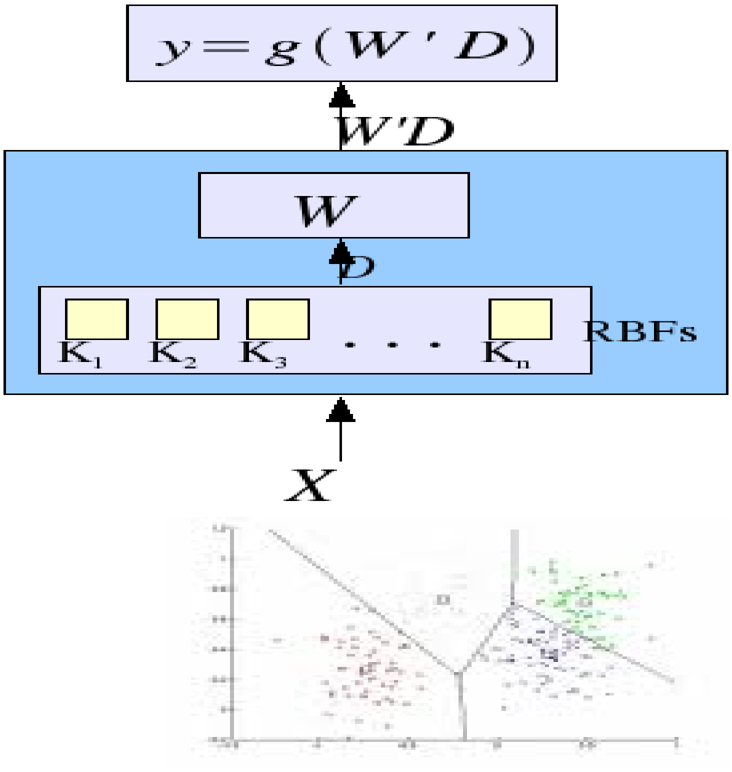
Figure(2) **dataset of Arthitis of fingers**



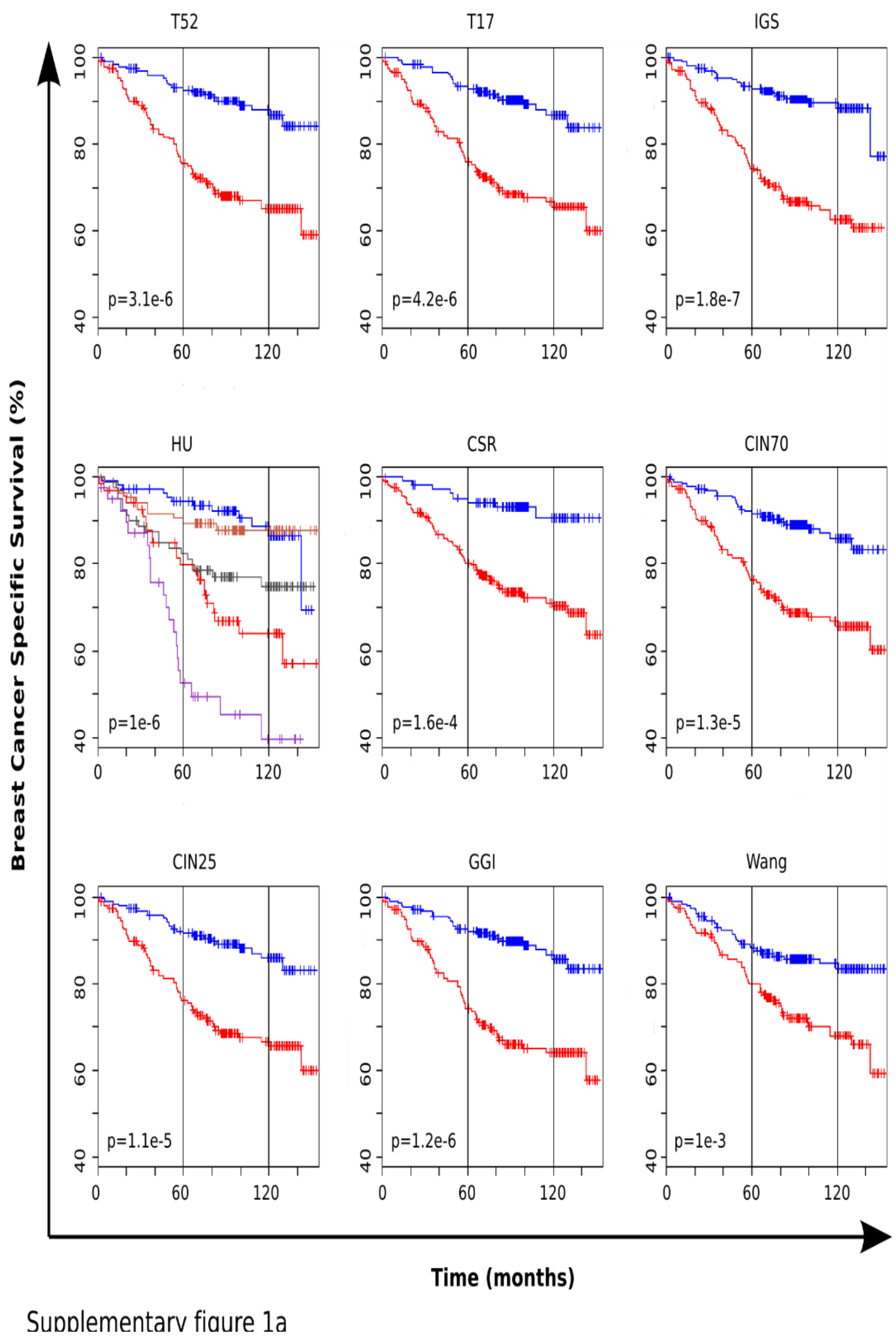
Figure(3) Image detection in and processing dtawarehouse for pattern generation and recognition images cement material



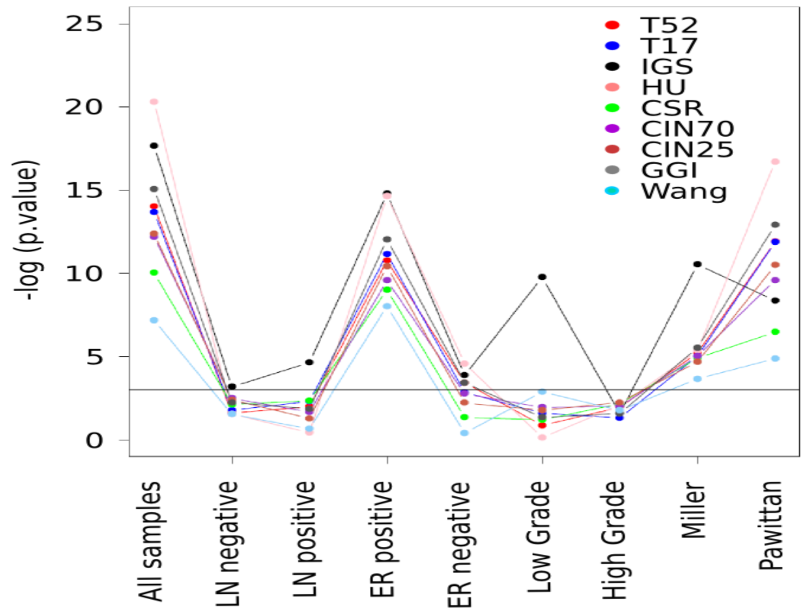
Figure(4) Image recognition processing and pattern generation from an Image data warehouse

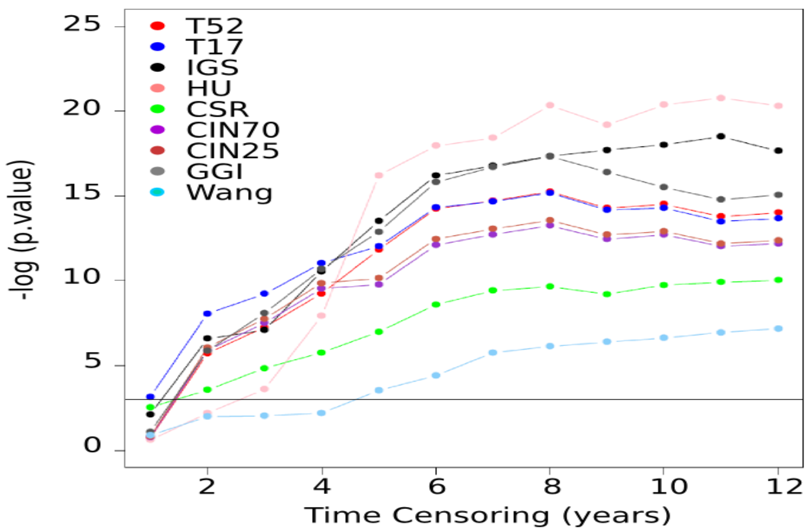


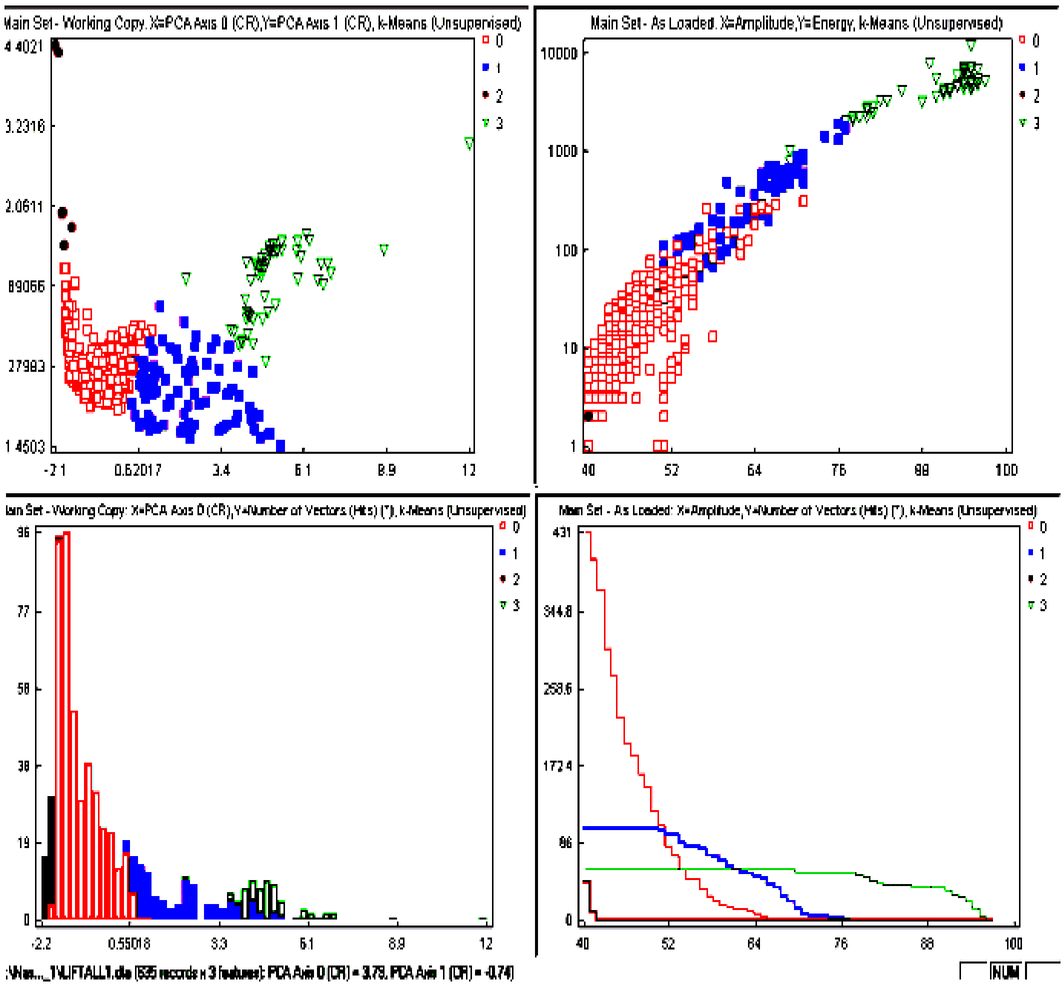
Figure(6) Applying an neural



Figure(7) plots of data fitting curves for the images


T52
T17
IGS
HU
CSR
CIN70
CIN25
GGI
Wang
-log (p.value)
All samples
LN negative
LN positive
ER positive
ER negative
Low Grade
High Grade
Miller
Pawittan


T52
T17
IGS
HU
CSR
CIN70
CIN25
GGI
Wang
-log (p.value)
Time Censoring (years)



Conclusions

Various methods of statistical correlation and image matching were studied and their suitability was tested and ranked for finding a suitable pattern in

arthritis cases. For a given input vector
(t*12,14,72) the Result image, pattern mark(matching pixels) found at (84, 213) .The purpose of this program is to provide resources to experienced researchers as well as new comers in the fields of pattern recognition, artificial intelligence, machine learning and other overlapping research fields. The focus of this project was to fully describe the relationships between data characteristics and classifier behaviour, and to develop algorithms that automatically select classifiers and parameters appropriate for a given set or subset of data.in This paper we describe, proposes and evaluates methods for automated analysis and quantification of medical images. A common theme is the usage of generative methods, which draw inference from unknown images by synthesising new images having shape, pose and appearance similar to the analysed images. The theoretical framework for fulfilling these goals is based on the class of Active Appearance Models, which has been explored and extended in case studies involving cardiac and brain magnetic resonance images (MRI), and chest radiographs.

Recommendations

The medical applications include automated estimation of: left ventricular ejection fraction from 4D cardiac cine MRI, myocardial perfusion in bolus passage cardiac perfusion MRI, corpus callosum shape and area in mid-sagittal brain MRI, and finally, lung, heart, clavicle location and cardiothoracic ratio in anterior-posterior chest radiographs can be area to be studied and researched.

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