

GENERATION GRAPH WITH RANDOM GRAPH ERDOS ROYI METHOD BY MEDICAL IMAGE TO HELP DIAGNOSES OSTEOPOROSIS

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ABSTRACT

Graph may be useful to analysis density of trabecula. Properties of graph can be used to measure density of edge. We generate random graph with erdos royi methods by dentals x-ray. Each pixel of bone presented as isolate edge. We found feature space of degree and cluster coefficient most accurate better than histogram of degree and cluster coefficient

Key words: medical image, random graph, graph properties, graph analysis.

1. INTRODUCTION

Osteoporosis is skeletal disease with lose bone mass or decrease strength of bone with increase fragility and rate of fracture [1]. Osteoporotic fractures are most occur at people age 50 year, common at woman than man. Process fragility of bone continues for many long time and nothing visible marker [2]. So, many people be late to known than they are have osteoporosis.

Bone mineral mass or bone mineral density (BMD) is standart meansurement to know rate of bones density. Spine, hip, and wrist are commonly bone witch use to measurement. Right now have any method to measurement bone's density, they are SXA, DXA, QUS, QCT, radiography, and MRI. DXA is more accurate better than another methode [2].

Rates of osteoporosis are increasly year by year. Hips fracture in wordwide rise from 1 million in 1995 to 2 million in 2025 [2]. However, DXA measurement is expensive.

In another side, DXA have 90% accurations rate [2]. Because that reason, many researcher are interest to looking for new method or modifications method.

Images dental x-ray is once alternative to detection of osteoporosis. Reseach to find correlation mandibular bone with BMD [3]. [3] have measured MCI and BQI than obtain result BQI most related with BMD than MCI. Mental foramens width uses to detected osteoporosis [4]. Mental foramens width more significant better another parameter in [4]. Mandibular cortical width uses to relate to BMD [5][6].

Research using trabecula bone to detection of osteoporosis [7][8][9][10]. [7] analysis of trabecula pattern at wrist. [8] measure at six area in mandibula trabecular bone. Bone density are calculation of grayscale intensity. [9] analysis to trabecula pattern changes in mandibular bone and rate of pattern changes to hip fracture. [10] comparison mandibular cortical width, count of dental, mandibular index, and pattern of mandibular bone. [11] built Computer-aided system to measured mandibular cortical width.

This paper, is novel method use random graph to help diagnose osteoporosis. Random graph uses to measure density of trabecula in mandibular bone. Trabeculars image uses to generated random random graph. random graphs methods is erdos and royi [12]. Graph property use to analysis of bones density. That's property are degree and cluster coefficient.

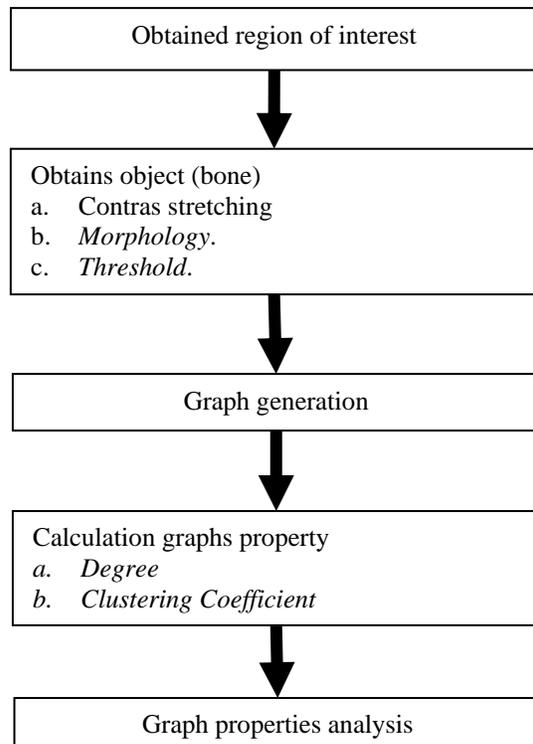


Fig. 1 Flow diagram for using random graphs to help diagnoses osteoporosis

2. MATERIAL AND METHODS

2.1 Materials

Material for research are 100 dental x-rays image from 100 postmenopausal women aged 50 year or older (mean 59.6; range 50-84 years). All images had been measured with DXA at lumbar spine and femoral neck. 54 of 100 women identified as normal, 21 as osteopenia, and 25 presented osteoporosis BMD. In this paper, we assumed osteopenia as normal. All x-ray images use in [11].

2.2 Methods

Our methods have five step, they are (a) Obtained region of interest, (b) obtains object, (c) graphs generation, and (d) graph properties analysis. That's properties are degree and cluster coefficient. Figure 1 is flow diagram of our proposed method.

2.3 Obtained region of interest

Regions obtain at part of mandibula right or left. That's area is rectangle from caninus to first molar with length 200 and width 100 pixels. Take region without roots teeth and mandibular cortical bone. Region in that location possible contain mental foramen. Mental foramen is small hole that can be use to reference of background color. Since mental foramen on both sides, two regions of interest can be obtained (Fig. 2)

2.4 Obtain object

Process after determined of region is take object (bone) from background. There are have any process, that are contrast stretching, images morphology, and Threshold. contrast stretched to appropriate color intensity of the region [13]. Morphological process use to put bone from background [13]. Transform bones image to binary image with otsu's method [13]. White pixels in binary image are part of trabecula bone. Fig 3a is region of interest from original image. Fig 3b is binary image obtained from process of fig 3a.

2.5 Graph generation

One pixel in binary image presented as one isolated edge. Build vertex with random graph by methods erdos and royi. Probability of every pair edge obtained from Waxman model in [14]. Probability every pair edge threshold with same value. In this paper, we use 0.8 to threshold. Fig 3c is graph obtained from process of figure 3a.

2.6 Calculation graphs property

Calculate property of every edge in the graph. Each edge has cluster coefficient and degree. Degree every edge use to determined density of graph. Cluster coefficient use to

determined relation between each edge have been neighbor

2.7 Graph properties analysis

Analysis of graph can be obtained from overview at histogram of degree and cluster coefficient. Two's histogram use to build feature space. Confusion table be obtain from overview of histogram and feature space.



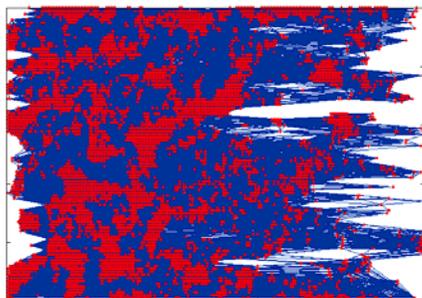
Fig. 2 two rectangles on left and right sides of mandible.



a



b



c

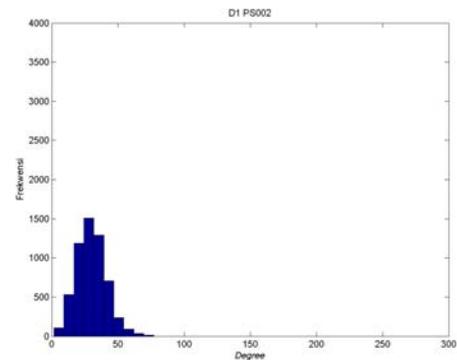
Fig 3 image from ROI to graph. (a) original image, (b) binary image of ROI, (c) graph from x-ray.

3. RESULT

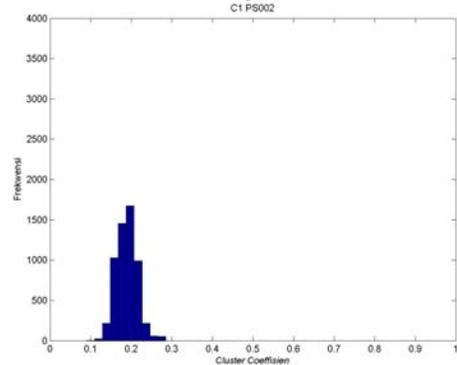
Observation of histograms degree can be obtained trend of osteoporosis are degree under 100 and frequency under 1500.

Histogram of cluster coefficient can be obtained that osteoporosis have cluster coefficient under 0,2 and frequency under 1500. Fig. 4 is graphic of osteoporosis sample. Fig. 5 is graphic of normal sample

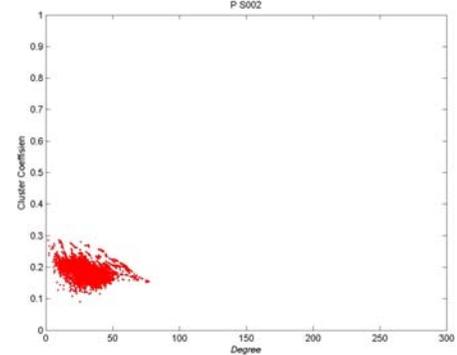
Result of overview at histogram of degree can be obtained accuracy are 38%. Accuracy on histogram of cluster coefficients are 62%. Overview on feature space are obtain accuracy 66%



a



b



c

Fig. 3 graphic from osteoporosis sample. (a) histogram of degree, (b) histogram of cluster coefficient, (c) feature space.

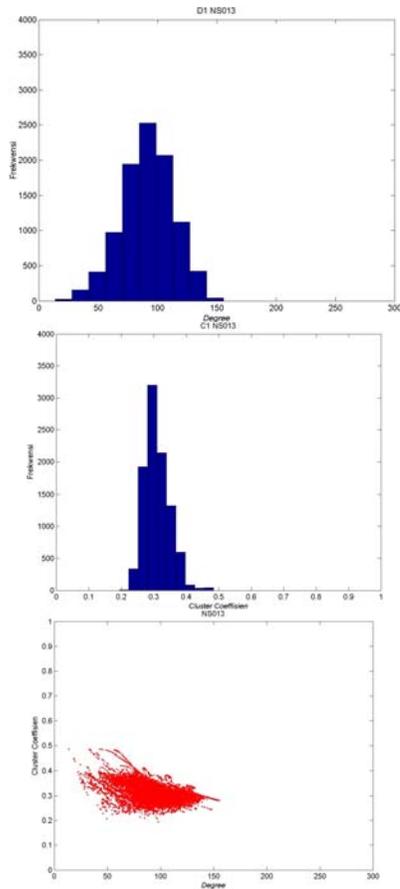


Fig. 4 graphic from normal sample. (a) histogram of degree, (b) histogram of cluster coefficient, (c) feature space.

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