Characteristic of Human Arm Frequency Radiation

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Abstract— Many studies have indicated that there are endogenous electromagnetic fields generated by the human body. All the living body, especially the human being is believed to have their own radiation which the field radiates into space around on the body. With the advancement of science and technology, this radiation field can be described as the vibration of electromagnetic (EM) field generated by the human body. The field penetrates the physical body and emits their characteristics radiations of frequency. This work discusses the analysis of frequency radiation on human arm and classifies the characteristic of human arm radiation based on gender. The human radiation frequency is experimentally studied from 33 healthy human subjects of 17 males and 16 females. The frequency radiation is obtained from 6 points of human arm on left-side and right-side of human body. The statistical technique is used to examine the characteristic of radiation frequency. The multivariate analysis of variance (MANOVA) is employed to compare the characteristic of radiation frequency differences between genders. Prior to MANOVA analysis, several preliminary assumptions testing were performed, which it is confirmed that no serious violations noted in the tests and met the MANOVA assumptions. The results of MANOVA indicate there is statistically significant difference among gender of males and females on a linear combination of human arm frequencies radiation. It is confirmed that the population means on a set of human arm frequencies varies across gender. Then, k-nearest neighbor (k-NN) technique is employed for classification. The default neighborhood setting of Euclidean Distance is used to find nearest neighbors. The results show that the k-NN produced 89% of correctly classified, which suggested that the k-NN classifier is able to classify human arm radiation frequency.

1. INTRODUCTION

Nowadays, with emerging application of physical field in biological objects has encourages the scientific studies of radiation wave in living body. All living bodies, particularly human is show have their own radiations that radiate into space on their surrounding body [1]. The radiation field emitted by human body can be identified as endogenous electromagnetic field, since it generated and contained within the biological system of body [2].

The electromagnetic radiation of human body is produced due to the electrical design of human body [3]. The electrical system is operated in the nervous system which responsible for sensing stimuli and transmitting signals to and from different parts of the body. As a biological system, the radiation is emitted around the physical body at various intensities, according to activity and health of the body. In essence, the human radiation is vibrates at their own frequencies which known as frequency radiation of the human body.

The unique characteristics of frequency radiation of human body are detected at a distance using special tuned antenna, as non-invasive technique using a body radiation wave detector. The frequency of human radiation is captured on 6 points of arm segment. In anatomical measurement, the arm is basically refers as the entire upper limb from shoulder to hand including upper arm, forearm, wrist and hand. A number of studies have been focused on human hand, which the information of human hand is extract based on its physical dimensions and shape [4, 5]. In [6], the dimension of hand length has been used to predict stature, and significant result is found in left hand length in both genders. Nonetheless, this research also shows that a characteristic of gender difference in anthropometric measures, which males having higher means values than females. Some other studies also have agreed that males and females differ significantly, which the results indicates that gender differences is relative to lengths of index and ring fingers [7]. Moreover, in gait analysis studies also show that all body segments including arm have their contribution for gender classification [8].

Based on the evidence described above, motivates to experimental studying a new technique that can distinguish between males and females subject using the frequency radiation of the human body. Initial analysis of extracting information from frequency radiation has shown that the human body has a different body radiation relationship between males and females [9]. Based from this study, a thorough analysis is performed to confirm the characteristic difference of human body radiation. This study focuses to examine frequency radiation characteristic in arm segment.

2. METHODOLOGY

2.1. Data Acquisition

The frequency radiation of human arm is obtained from 33 healthy participants of 17 males and 16 females between the ages of 19–26 years. The frequency is captured through body radiation wave detector that equipped with telescoping whip antenna used to detect a broad range of electromagnetic waves of human radiation fields. The frequency radiation is taken from 6 points of human arm on upper arm, forearm and palm, consisting 3 points on the left-side (L4, L5, L6) and 3 points on the right-side (R4, R5, R6).

The frequency for each subject was collected under controlled environment in anechoic chamber to ensure consistency and accuracy of frequency reading. During measurement, the chamber temperature is controlled to maintain at $23 \pm 2^{\circ}$C, and the ambient conditions are measured immediately before and after experiment [10]. Throughout measurement, the antenna is set on the 6th segment length and placed on horizontal position to the human body. The frequencies are obtained remotely at a distances of 1 to 5 cm from body to antenna [11]. The procedure of the experiment involves capturing frequencies of all 6 points on human arm is shown in Figure 1.

2.2. Comparison of Characteristic Differences

The characteristic difference of frequency radiation on human arm is explored using multivariate analysis of variance (MANOVA), which has been previously shown to be capable to compare group for differences [12]. It is used to establish significant genders differences among linear combination of variables. The Pillai's trace is selected due to the robustness of the tests with small samples and unequal sample sizes [13]. Subsequently, the individual characteristic of frequency radiation is determined by the tests of between-subjects effect of univariate analysis (ANOVA). A Bonferroni adjustment is employed to compute adjusted probability in multiple-comparison procedures. The new alpha level is calculated by taking into account the number of comparison performed. The effect size is estimated with partial eta squared value, which interpreted within Cohen's criteria [14].

2.3. Classification of Frequency Radiation

The frequency radiation of human arm is classified into gender using K-nearest neighbor (kNN) algorithm. The kNN is one of the most fundamental, simple and robust classification methods. Applications of kNN have been successful in many areas including gene expression classification [15]. Basically, the kNN classification is performed by classifying samples based on closest distance of the feature space, which samples are classified according to majority vote of its neighbor. The default neighborhood setting of Euclidean is used to find closest neighbors. The Euclidean distance between two samples of x and y is computed as Equation (1),

$$d(x, y) = \sum_{k=1}^{n} \sqrt{(x_k - y_k)^2} \tag{1}$$

The distance between two samples is estimate using some distance function $d(x, y)$, where x, y are samples composed of n features, such that $x = \{x_1, \ldots, x_n\}$, $y = \{y_1, \ldots, y_n\}$. The value of k determines the desired number of nearest neighbor, and typically $k = 1$ is considered as nearest neighbor. The frequency data is divided into training and test sets. For each training set, different values of k are used to train to determine the optimal value of k that gives the best classification result. One of the techniques is performed algorithm with different values of k and chooses who has the best performance. In this study, the value of k varies from 1 to 10 is used to find a class match

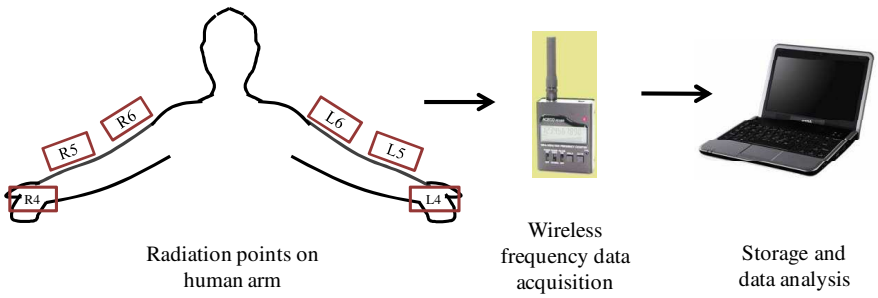

Figure 1: Frequency data acquisition procedure.

between training data and test data. In addition to the accuracy, the performance of classification could also determine by calculating of sensitivity and specificity.

3. RESULTS AND DISCUSSION

The frequency radiation of human arm has been studied from 33 healthy human subjects. All frequencies were taken in the anechoic chamber in order to obtain reliable data, and also seek to eliminate the influence of interference in the environment. In addition, ambient frequency is also taken before and after measurements. It is observed that the frequency of the ambient is constant, confirming the stability of the measurement system.

The characteristic of frequency radiation on human arm has been examined using statistical analysis of multivariate analysis of variance (MANOVA). Prior to MANOVA analysis, preliminary tests were conducted to examine several assumptions included normality, linearity, univariate and multivariate outliers, multicollinearity, and homogeneity of variance-covariance matrices, with no serious violations noted in the tests and met the MANOVA assumptions. The multivariate test of MANOVA indicates there is statistically significant differences among gender of males and females on linear combination of frequency radiation on human arm which the Pillai's trace obtained the significant value of $\rho < 0.05$ (Pillai's trace = 0.643, F(6,26) = 7.795). The results also show the power to detect the effect is 0.999 and therefore confirming the population means of human arm frequencies on left-side and right-side varies between genders. Further examination for gender differences on individual characteristic of six frequency radiation on left-side and right-side arm was studied from ANOVA. New level of alpha value using Bonferroni adjusted was computed ($\rho = 0.05/6$) to determine statistical significant difference among gender. The results indicate that all frequencies obtained the significant value after Bonferroni adjusted new alpha level ($\rho < 0.008$), which suggests the difference is significant. The effect sizes of these differences were in the range of large effect (Table 1).

For the purpose of classification, the classifier is train for the best value of k-nearest neighbor. Different values of k are used to compare the result which ranging from 1 to 10. The accuracy of each value of k is computed. Finally, the value of k is selected based on best classification performance [16]. The classification results are given in Figure 2. Note that each point in the graph represents a value of k ranging from 1 to 10. As shown in the graph, it is observed that the kNN classification achieves its best performance when $k = 3$, which yields an accuracy of about 89 percent. Therefore, the results suggested the kNN classifier is suitable to classify gender and capable to achieve a sensitivity and specificity of about 100 percent and 80 percent, respectively (Table 2).

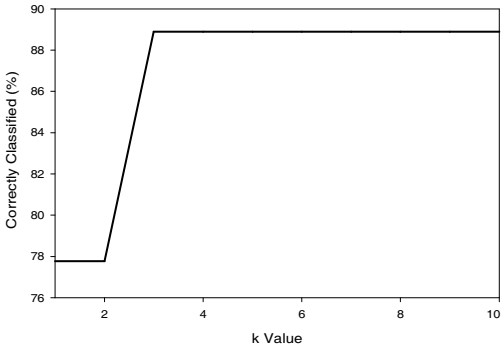

Figure 2: Accuracy plot using kNN classifier to train and test algorithm.

Table 1: Between-subjects effects.

Source	**GENDER**					
Dependent Variable	**L4**	**L5**	**L6**	**R4**	**R5**	**R6**
F	19.768	36.776	21.565	9.451	28.547	23.179
Significance (ρ)	0.000	0.000	0.000	0.004	0.000	0.000
Effect size (η_p^2)	0.389	0.543	0.410	0.234	0.479	0.428

Table 2: Performance characteristics of kNN classification.

k	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Sensitivity (%)	80	80	100	100	100	100	100	100	100	100
Specificity (%)	75	75	80	80	80	80	80	80	80	80

4. CONCLUSION

The characteristic of frequency radiation of the human arm was experimentally studied from 33 healthy human subjects on 6 points of left-side and right-side. The results of the experiments have shown the characteristics different of frequency radiation among gender, which both analysis of MANOVA and ANOVA produced a significant results. Further analysis on gender classification suggested the kNN classifier correctly classify gender for about 89 percent and achieve the sensitivity and specificity of 100 percent and 80 percent, respectively. These results confirm that human has different characteristic of frequency radiation between gender and it is possible to classify the human gender based on frequency radiation analysis of human body, particularly in arm segment.

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