

Analysis of body dynamic posture to detect body discomfort by using a webcam and python image histogram

N.S.A Ramdan^{1,2,*}, A.Y. Bani Hashim¹, Seri Rahayu Kamat¹, Siti Azirah Asmai¹

¹) Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.

*Corresponding e-mail: sufiah.akmala@gmail.com

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ABSTRACT – Nowadays, in factory, manual workers dynamic posture can be recorded by CCTV, but cannot be scientifically analyzed. In this paper, the authors have shown a method to do analysis of human dynamic posture. The purpose of the analysis is to know the sign of body discomfort of the workers after some period of time. The analysis is done by using image histogram and Python software.

1. INTRODUCTION

Dynamic posture is the movement of human that consist of all of the body parts. Body dynamic posture is defined as the movement of every part of the body to produce a dynamic movement. Dynamic posture is how your body is aligned during movement, such as running or walking, according to Lenny Parracino, co-founder of Kinetic Conditioning in Montrose, California. Proper posture ensures that the muscles are optimally aligned in proper length and tension relationships for optimal function. This allows your body to absorb and distribute forces throughout your body evenly [1].

In this paper, the experiment focuses on the dynamic movement of the worker in fitting workstation. In this workstation, one of the processes involved is a metal filing process. Metal filing process is a process where the workers need to file a block of metal, to get the desired shape. It is done by using a suitable file and strength of the worker by hand movements. An example of the posture is as Figure 1. The purpose of the analysis is to know the sign of body discomfort of the workers during working period.



Figure 1 Metal filing process

2. BACKGROUND

2.1 Body discomfort

Body discomfort is the condition where the body of a human experienced a discomfort feeling on their body part such as arms, legs, neck and back bones. There are many researchers that have done their research about body discomfort. Example as Liao MH and Drury CG (2000) did their study on body discomfort. The objective of their study was to demonstrate the interactions between workplace, work duration, discomfort, working posture, as well as performance in a 2-h typing task. While Van Dieen JH and Oude Vrielink HH (1998) did the study on evaluation of work-rest schedules with respect to the effects of postural workload in standing work [2]. Riihimaki H, Tola S, Videman T, Hanninen K. (Et al) (1989), states that Sciatic pain was more common among machine operators and carpenters than among office workers, and also more frequent among machine operators than among carpenters. [2].

2.2 Color histogram

Color histogram is a histogram that has digital image pixel tonality for 24 bit RGB (RED-GREEN-BLUE) color is expressed as a number between 0 and 255. 0 equals pure black and 255 equals pure white. At 127, about the midpoint, would be the equivalent of middle gray in density. Digital image histograms are presented as a bar chart with the horizontal axis being the tonal range of your image. The left side of the graph is 0 and the right side of the graph is 255. The vertical axis is the relative number of pixels in each of the 255 tonal values. The taller the hump of the graph, the more pixels in that particular tonal range [3].

3. METHODOLOGY

Six subjects were selected to do this pilot test. The pilot test was done by following the procedure that has been prepared. The venue takes place at the Fitting workstation, Manufacturing Engineering Faculty, Universiti Teknikal Malaysia Melaka. In this experiment, only one camera is used to record the movements of the subjects. The subject is asked to do the filing process for 15 minutes for non-stop. One of the subjects is assigned to do stand in the position of filing process but without any movement. This is to show the position of mannequin without any movement.

Table 1 Subject's Details

Subject	Age	Height (cm)	Gender
Subject A	24	149	F
Subject B	22	170	M
Subject C	23	165	M
Subject D	22	173	M
Subject E	24	158	F
Subject F	23	171	M

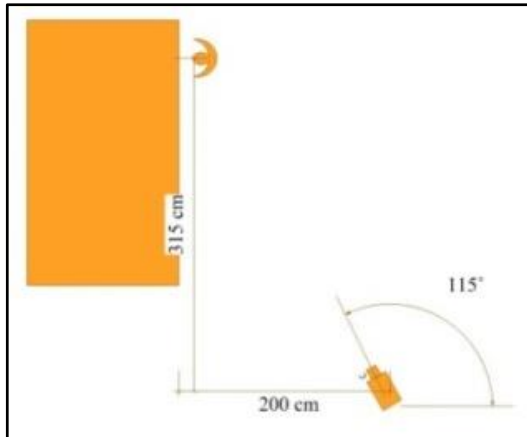


Figure 2 The experimental set up

Figure 2 shows the experimental set-up in the Manufacturing Engineering Faculty, UTeM.

4. RESULTS AND DISCUSSIONS

Table 2 shows that the image analysis for Subject A. In this analysis, three pictures of the frames will be chosen to be analyzed. The frame that has been chosen is (1,2), (1,5), (1,9). From these three pictures, we can see the differences between the position of the neck and head of the subject. This shows that movements are happening and the person has a body discomfort around his neck. This can be proven by the differences of the peaks between the graphs. Figure 3 shows the combination of ten image histograms of Subject C. We can see the differences between each line of the histogram. We can relate the image histogram and the image frames to know the body discomfort by seeing the changes in the picture frame by frame.

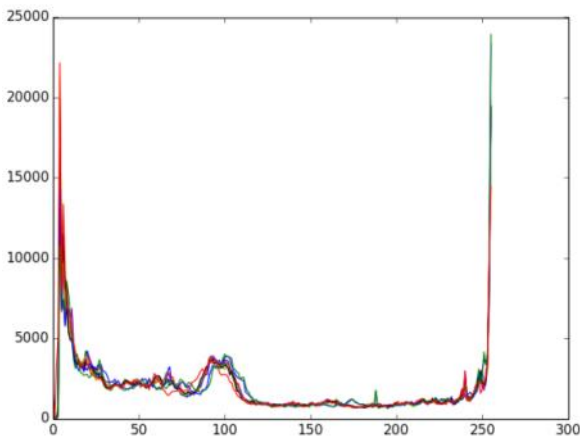


Figure 3 The combination of 10 image histograms of the picture frame

Table 2 Analysis of picture for Subject C

Time (minutes)	Frame picture	Graph
3.00		
7.30		
13.30		

5. CONCLUSIONS

By using the image histogram, we can see that the graph in the respective image is showing some differences in their peak. This shows that there are some differences in the movements of the body within the working period. By relating the picture frame and the graph, we can say that shows body discomfort has happened to the workers.

6. REFERENCES

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