

Analysis and Assessment of Entire Body Posture for Computer Operators with Alert in Android

Gagana M S

MTech student, Computer Science & Engineering, GSSSIETW, Mysuru.

Abstract - The common occupational problem of the workers is musculoskeletal disorders in India. Currently the work is being carried out manually in most of the small scale industries therefore the issues of work related musculoskeletal disorders and injury in different body sites are of top priority. Postural analysis tool using Rapid entire body assessment (REBA) were applied for assessment which indicates that the workers are working above the secure limit. These techniques helped in process refinement by identifying actions causing high fatigue. The results of the analysis were used to improve the process of work, design of workstation and also improving the work posture to enhance the comfort level of operators. This study is crucial among the mining industry that is a lack of the information and research about the ergonomics issues in the industry. The overall finding indicated that the whole process of selected work task will contribute to musculoskeletal disorder either for a short or long time exposure.

Key words: Ergonomic Assessment, REBA, Musculoskeletal Disorders

I. INTRODUCTION

Small scale industry plays a vital role in development in countries like India; they play an important role in employing the majority of the industrial workers. The majority of workers are suffering from musculoskeletal disorders which is a most common work-related problem in India. In small scale industries most of the work is still carried out standing and manually hence issues of work related musculoskeletal disorders and injuries in different parts of the body are of great concern.

Postural analysis can be a powerful technique for assessing work activities. The risk of musculoskeletal injury associated with the recorded postures in the context of a full ergonomic workplace assessment can be a major factor for implementing change so the availability of the task-sensitive field techniques is of great assistance for ergonomics practitioner. A need was perceived within the spectrum of postural analysis tools,

specifically with sensitivity to the type of unpredictable work postures found in various industries.

The development of this project can be used in various circumstances and therefore it can be applied in multiple workplaces. The evaluation of the physical load is analysed by the body postural movement. The objective of this research work is to assess the postures of an individual by using REBA device who works continuously for hours.

The development of REBA is essential for evaluating the job activities in the analysis of body postures. The risk of this muscle and skeletal injury is interconnected with the readings or the values which are being recorded due to the changes in the position of the body. REBA provides a fast and convenient way to evaluate different working postures of the body.

II. SYSTEM MODEL

Rapid Method Entire Body Assessment (“REBA”) analysis identifies musculoskeletal risks through a sensitive postural analysis in a variety of tasks. The tool divides the body into segments that are analyzed individually in relation to the planes of movement. The result of this method is a score for muscular activities caused by dynamic postures, static postures, rapidly postural changes and unstable postures.

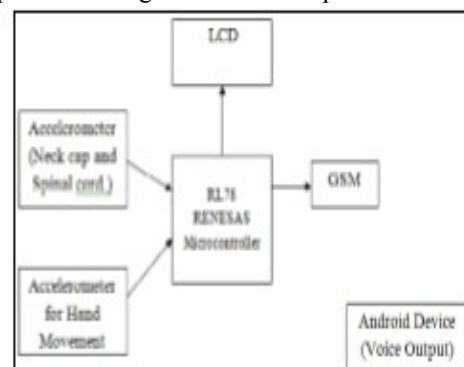


Fig 2.1:Block Diagram Of REBA

REBA is being proposed as a platform to analyse the body posture of an individual. This device is categorized into three different parts of the body i. e Knee, eye and leg movement .If a person working since a long time tries to deviate from the normal position to another position, a message alert is displayed on the LCD screen of the device, and that message is sent to a registered mobile number on an android phone application through which the voice alert is also provided. The message is sent through a GSM where a sim is inserted in it. The data of all the commands or instructions including the login details are stored in the MySQL Front.

III. PREVIOUS WORK

Chiasson M and D. Imbeau [1] provided postural analysis assessment tool Rapid Entire Body Assessment (REBA) in terms of its development, applications, validity and limitations. Research showed REBA's convenience for postural assessment of jobs in numerous professional settings, including industrial and health care jobs, construction, sawmill tasks, supermarket industry.

Coyle, A.[2] compared the use of two different assessment tools (Rapid Entire Body Assessment versus New Zealand Manual Handling Hazard Control Record) to assess, plan and implement changes in manual handling practices in the supermarket industry.

David, G[3] provided an overview of the range of methods that have been developed for the assessment of exposure to risk factors for work-related musculoskeletal disorders.

P.N.Kale and R. T. Vyavahare presented the review on the studies carried out so far to analyse the various tools used for ergonomic analysis. Review shows that the many of the researchers are focussed on study of a single tool and its use in particular industry for analysing the problem.

Andrzej M. Lasota assessed the workload and risk of musculoskeletal discomfort (MSD's) in the process of order fulfillment for the position of packer and to conduct an analysis of risk factors.

IV. PROPOSED METHODOLOGY

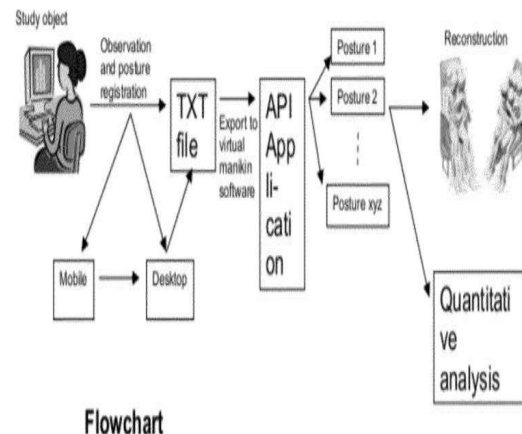


Fig 4.1: Flowchart of REBA

A system and method for analysis of steps of action of a person in activity in an environment with potential occlusion and without the need to use of invasive equipment. Non-limiting implementations use posture registration and postural analysis based on an observation protocol that allows reconstruction, in a digital human simulation environment, of the adopted postures observed in a real time situation or by video

Since we have implemented on three different parts of the body i.e Neck, eye and knee, for each movement a command is generated. One command for Neck (Spine) which alerts with a message “Keep your Neck straight”, the second command is for eye which is alerts with a message “blink your eyes “and then for the knee which alerts with a message “Take a Walk” or “Walk Alert“. All these commands are displayed on the LCD screen and then to the mobile phone application which is also installed with a voice output.

V. SIMULATION/EXPERIMENTAL RESULTS

Using the REBA , the evaluator will assign a score for each of the following body regions: neck, eyes and legs. After the data for each region is collected and scored, tables on the form are then used to compile the risk factor variables, generating a single score that represents the level of MSD risk:

TABLE 1.LEVEL OF MSD RISK

Score	Level of MSD Risk
1	negligible risk, no action required
2-3	low risk, change may be needed
4-7	medium risk, further investigation, change soon
8-10	high risk, investigate and implement change
11+	very high risk, implement change

REBA Level	0	1	2	3	4
REBA score	1	2-3	4-7	8-10	11-15
Risk Level	Negligible	Low	Medium	High	Very high
Reqd. Action	None necessary	May be necessary	Necessary	Necessary soon	Necessary now
Percentage of workers	--	13	33	53	--

TABLE 2: Categorization under REBA Level

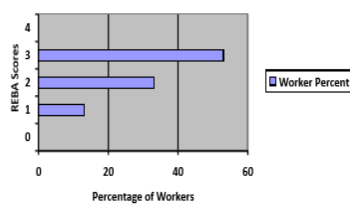


Fig 5.1 Percentage of worker under REBA Level

Around 53% of the workers were working at high risk levels. It was found that, if the workers continued to work in the same posture they suffer from the MSDs related to neck, trunk and wrist in the near future. It was recommended to take the corrective action as soon as possible. However, when these units were studied using the REBA tool, REBA showed that most of the workers in the drilling operation were working in acceptable posture and a necessary change may be required for them. Around 53% of the workers were working at high risk levels and their neck, trunk and wrist were under high physical strain and needed a necessary action soon. Around 33 % of the workers in the jobs were at medium risk levels and needed a necessary change. Some of the workers in the turning jobs were bending their trunk to unacceptable limit and most of them had upper arm under high strain. The workers were suggested to keep their trunk straight while working. Also, in some jobs the workers were bending their trunk to a higher degree which was not acceptable and they needed an necessary change. However, in rest of the activities the workers were working in fine posture and they may require a necessary action.

VI. CONCLUSION

The evaluation of body posture has been carried out for this particular manufacturing unit by REBA tool, it can be concluded that; significant proportion of the workers are working in uncomfortable and painful postures as found by analysis. we have developed a device which helps people to overcome their health related issues.

VII. FUTURE SCOPES

As a future enhancement, we are making use of the same project being implemented for the wireless sensors replacing wired sensors. This device is likely to boost the country's economy in the future days. These type of wireless sensors enable a larger group of people to work comfortably without any health hazards even in complex environment continuously. This device could also be a boon in reducing the risk factors leading to musculoskeletal disorders resulting in a healthier workplace.

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