FCT - 11

Development of low-cost automated robot arm; its limitations and the validity of results through modified potentiometric experiments

K. A. N. K. Perera[1], S. Rodrigo[1], I. Liyanage[1], I. Umayanga[1], B. Perera[1], D. Nawarathne[1], D. Perera[1], N. Jiffry[1], N. Sirimuthu[2], E. M. M. S. Ekanayake[1]*

[1]*Nawaloka College of Higher Studies, Sri Lanka*

[2]*University of Sri Jayewardenepura, Sri Lanka*

Robotics is used widely in design, construction and operation, further also in control, sensory, feedback and information processing. Robotics arm performs a crucial task in all the above. Automation in a chemical laboratory will be a major breakthrough in terms of productivity, quality and the reproducibility of the results, improved safety, reduce the time and cost of the whole running process. To catalyze this revolutionized system performances, as a combination of engineering and chemistry, we developed an automated robot arm and validated its results while overlooking the limitations via modified potentiometric experiments. The idea behind this concept is to use this robotics hand in places where it can be used to replicate the action of a human hand and thereby substituting its purpose in places where a human hand cannot be used. During this experiment robot arm involved in measuring cell voltage by using a standard calibrated potentiometer in a thermostat water bath at different temperatures; where it produced steady results compared to the manual procedure under same conditions while saving a considerable working time. The potentiometric reading equipment IEEE 488 fitted with an Interface Scanner 740 and a GPIB (General Purpose Interface Bus) program was used to obtain a continuous record of the potentials while test solutions were moving on a belt. For the validation, reading taken by using the automated arm and manual readings for the same sample were statistically analyzed (n=181) using t-test, linear regression and Spearman correlation coefficients which clearly indicate no significant difference between them. In summary, this work described an inexpensive and simple method for the automated potentiometric titration. The only limitation encountered during this process was the servo motors used, have only a maximum rotation of 180^0 for 1m radius semicircle within 75s. Therefore, the area of movement is restricted to a certain region of space, but the arm can move an object from one-point coordinate to another in the x, y and z axes which could be adapted to many applications other than in a chemical lab.

Keywords: Automated robot arm, Potentiometric validation

*Corresponding author. Nawaloka College of Higher Studies, Sri Lanka.
Email address: mekanayake@swin.edu.au