

## ABSTRACT

Collaborative learning is widely applied in education system. One of the key aspects of collaborative learning is group formation. The obstacle in group formation is to determine appropriate attributes and attribute's types to get a good group results. A previous study proposed ant colony algorithm using personality traits and performance attributes for group formation. The method showed a good performance in scalability when grouping the large number of learners.

This thesis studies the use of an improved ant colony system (ACS), called Multi Objective Ant Colony System (MOACS) for group formation. Unlike ACS that transforms all attributes' values into a single value, thus making any attributes are not optimally worth, MOACS tries to gain optimal values of all attributes simultaneously. MOACS is designed for various combinations of attributes and can be used for homogeneous, heterogeneous, or mixed attributes. In this thesis, sensing/intuitive learning styles (LSSI) and interests in subjects (I) are used in homogeneous group formation, and active/reflective learning style (LSAR) and previous knowledge (KL) used for heterogeneous or mixed group formation.

Experiments were conducted for measuring the average goodness of attribute (avgGA) and standard deviation of goodness of attribute (stdGA). The objectives of MOACS for homogeneous attributes were minimum avgGA and stdGA, while those for heterogeneous attributes were maximum avgGA and minimum stdGA. They were compared with those resulted from random grouping and ACS algorithms. The experiments showed that MOACS gave minimum avgGA and stdGA in homogeneous group, which means the group have members with a similar degree of attributes. On the other hand, MOACS gave minimum avgGA and stdGA in heterogeneous group, which means, it forms groups with a similar degrees of attributes, but their heterogeneity was low. Furthermore, MOACS gave maximum avgGA in active/reflective learning style and minimum avgGA in sensing/intuitive learning style, which means the group have members with similar degree in sensing/intuitive learning style and diverse degree in active/reflective learning style. To conclude, MOACS was appropriate for group formation with homogeneous and mixed attributes.

**Keywords:** collaborative learning, group formation, ACS, MOACS, homogeneous group, heterogeneous group, mixed group.