South East Asian J. of Math. & Math. Sci. **ISSN : 0972-7752 (Print)**
Vol. 14, No. 3 (2018), pp. 133-142

GRAPH-TOKEN PETRI NETS

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(Received: May 8, 2018)

Abstract: Graph-token Petri net ($GTPN$), an extension of Tree-token Petri net ($TTPN$), is introduced by labelling the tokens with graphs. A study is done on the languages generated by $GTPN$. Some subclasses of graphs are generated by this Petri net model.

Keywords and Phrases: Petri net language, cycle, complete graph, bi-partite graph.

2010 Mathematics Subject Classification: 68Q45.

1. Introduction

Petri net is a particular kind of directed bi-partite graph consisting of two types of nodes called places and transitions connected by directed arcs [4]. Tree-token Petri net ($TTPN$) was introduced with tokens as trees and evolution rules at transitions [5]. Tree- token Petri net languages were studied and it was proved that the sets of derivation trees of regular, linear and context free grammars of Chomsky hierarchy are accepted by $TTPNs$ [2], [6]. Subclasses of trees, namely caterpillars and lobsters are generated by these Petri nets [7].

Motivated by the generating capacity of Petri net models, Graph-token Petri net ($GTPN$), an extension of $TTPN$ is defined. New evolution rules at transitions are introduced to perform the extended operations on graph tokens. In a $GTPN$, an enabled transition removes the tokens labelled by graphs from the input places and deposits it in the output places performing the evolution rule indicated at the transition. For the study of languages generated by $GTPN$, the net is reduced to a standard form. It is proved that the $GTPN$ languages are closed under finite union. Some subclasses of graphs namely, cycles, complete graphs and complete bi-partite graphs are generated by these Petri nets.