UNIVERSITI TEKNOLOGI MARA

FORMATION SYNTHESIS FOR ENSEMBLING COLLECTIVE ADAPTIVE SYSTEM

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ABSTRACT

Collective Adaptive System (CAS) is an autonomous distributed system where its formation can reform itself collectively in adapting towards changes in a dynamic environment. However, the changes in CAS environment are unpredictable and can affect CAS formation performance. These uncertain changes come from various sources and can be identified during both design time and runtime. In a CAS formation, the complex design of the components working together can cause difficulty for the formation to adapt to the changes. The purpose of this study is to model and synthesize the modelling of CAS formation model with the consideration of uncertain changes. The model used for modelling CAS formation is concurrent stochastic games, which is suitable for modelling the formation closer to a real-world situation. The source of uncertain changes considered for modelling the formation is the changes of parameters in the formation components. Then, the CAS formation model is verified and synthesized which producing a strategy to ensure the reachability of the model. Lastly, the CAS formation model with the synthesized strategy went through the experimentation process to analyze the model reachability with the consideration of uncertain change. The results from the experimentation process show that the CAS formation model can reach the intended goals even when there are identical uncertain changes occur and when the probability of uncertain changes increases. The highest result for parking allocation is 0.64 probability to finish and the lowest result is at 1 probability.

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