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ENHANCED EDUCATIONAL ROBOTICS FEATURE MODEL WITH PEDAGOGICAL ELEMENTS IN SOFTWARE PRODUCT LINE

SITI NORANI BINTI MOHAMAD EKSSAN

A dissertation submitted in partial fulfillment of
the requirements for the award of the degree of
Master of Computer Science

Faculty of Computing
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MAC 2017

I declare that this dissertation entitled "*Enhanced Educational Robotics Feature Model With Pedagogical Elements in Software Product Line*" is the result of my own research except as cited in the references. The dissertation has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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This dissertation is dedicated especially to my beloved mother and father (Hjh. Arbaiah binti Hj. Arriffin and Hj. Mohamad Ekssan bin Hj. Suib), my husband and baby inside my belly, and also not forgetting my beloved brothers and sisters for their endless supports and encouragements.

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ABSTRACT

Educational robotics (ER) has been increasingly used as a pedagogical tool to attract students in Science, Technology, Engineering and Mathematic subjects for engaging students with technology as technology will give a high impact in future. Software Product Line (SPL) Engineering is a methodology which allows systematic reuse of learning material in ER family products. Examples of SPL Engineering method are integrated CVAnalysis, FODA, FeatureRSEB, PLUSS and SMarty. However, most of the current approach is not fully integrated in domain analysis where the components reusability prediction is not done which may lead to the failure of systematic reuse. The current approach also must able to represent variability in clear and simplified way to promote understandability of reuser. Generative Learning Object (GLO) is a method that present learning variability (LV) of ER in a feature model (FM). The main disadvantages of GLO are LV FM still used FODA and LV was presented in few diagrams. This thesis applied integrated CVAnalysis to deal with components reusability prediction in domain analysis and to create ER FM. Then, SMarty was used to present FM in graphical representation with profiling mechanism. Finally, pedagogy element was infused into the FM to create ER FM with pedagogical elements. The validation of proposed ER FM and its guideline was evaluated using comparative study and questionnaire participated by six respondents. This thesis has contributed an integrated process for managing variabilities in SPL Engineering field and development of ER FM with pedagogy element.

ABSTRAK

Robotik Pendidikan (ER) telah diterima baik dan semakin banyak digunakan sebagai alat pedagogi untuk menarik minat pelajar dalam bidang Sains, Teknologi, Kejuruteraan dan Matematik disebabkan teknologi akan memberi kesan yang tinggi pada masa depan. Barisan Produk (SPL) Kejuruteraan ialah kaedah yang membolehkan penggunaan semula bahan pelajaran secara sistematik dalam barisan ER. Contoh kaedah-kaedah SPL Kejuruteraan adalah CVAnalysis, FODA, FeatureRSEB, PLUSS dan SMarty. Walaubagaimanapun, kebanyakan kaedah yang wujud tidak menganalisis secara mendalam di analysis domain dimana jangkaan penggunaan semula komponen tidak dilakukan akan berkemungkinan menyebabkan kegagalan penggunaan semula secara sistematik. Kaedah yang sedia ada juga perlu berkebolehan dalam membentangkan komponen ER dengan jelas dan mudah untuk meningkatkan kefahaman pengguna. Objek Pembelajaran Generatif (GLO) adalah satu kaedah yang menyampaikan kepelbagaian komponen pembelajaran (LV) di dalam model ciri-ciri (FM). Kelemahan utama GLO adalah LV FM masih menggunakan FODA dan LV dibentangkan dalam beberapa gambarajah. Tesis ini menggunakan CVAnalysis untuk menangani jangkaan penggunaan semula dan untuk membina ER FM. Kemudian, SMarty digunakan untuk membentangkan FM dalam perwakilan grafik dengan mekanisme profil. Akhir sekali, unsur pedagogi diterapkan ke dalam FM untuk membina ER FM dengan unsur pedagogi. Kegunaan ER FM yang dibina telah dinilai menggunakan kajian perbandingan dan soal selidik yang disertai oleh enam responden. Tesis ini menggabungkan process yang wujud untuk menguruskan kepelbagaian dalam SPL Kejuruteraan dan pembinaan FM ER dengan unsur pedagogi.

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