氏 名	LYNN HTET AUNG
授与した学位	博士
専攻分野の名称	工学
学位授与番号	博甲第 7279 号
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学位授与の要件	自然科学研究科 産業創成工学専攻
	(学位規則第4条第1項該当)
学位論文の題目	Implementations of Web Application Systems for Docker Image Generation and Flutter Programming Exercise Answer (Docker イメージ生成および Flutter プログラミング演習問題解答のための Web アプリ ケーションシステムの実装)
論文審査委員	教授 舩曵 信生 教授 田野 哲 教授 野上 保之
学位論文内容の要旨	

This thesis presents the implementations of two web applications for university educations using various opensource software including Docker.

As the first contribution of the thesis, I implement the Docker image generation assisting tool (DIG-assist) for user-PC computing (UPC) system. This tool adopts Angular JavaScript for creating user interfaces, PHP Laravel for handling logic and data models using Rest API, MySQL database, and Shell Scripting for running the whole program. The Docker image generated by the tool is speedily uploaded to DockerHub. For evaluation, I selected 30 popular Docker projects from online or DockerHub generated their Docker images using the tool to validate our proposal.

As the second contribution of the thesis, I implement a web-based answer platform for the Flutter Programming Learning Assistant System (FPLAS) by integrating four Docker images using Docker Compose. This platform incorporates Node.js and Express frameworks for the user interface, the Flutter/Dart framework for the language environment, the Nginx web application server for automatic UI image capturing, and an image-based User Interface (UI) testing tool for image comparison. The primary contributions of this study are extension of answer platform for Flutter Programming, integration of existing Flutter environment, adoption of Nginx web Application server, Docker Compose integration for four images and installation setup and learning Speed. The proposed solution reduces the complexity of the installation procedure, ensures a quicker and more consistent setup across diverse operating systems, provides immediate feedback to students, and enhances their learning speeds by allowing them to complete assignments more efficiently compared to the existing VS-Code-based Flutter environment setup. For evaluation, I asked 10 graduate students at Okayama University, Japan, to install the implemented answer platform on their PCs and solve five exercise problems. All students successfully completed the tasks, confirming the validity and effectiveness of the proposed system.

The thesis is organized as follows: Chapter 2 presents adopted open-source software tools. Chapter 3 reviews user-PC computing (UPC) system. Chapter 4 presents the design and implementation of the Docker image generation assisting tool (DIG-assist) and the evaluations. Chapter 5 reviews Flutter Programming Learning Assistant System (FPLAS). Chapter 6 presents the implementation of FPLAS answer platform and its evaluations. Chapter 7 introduces relevant works in literature to this thesis. Finally, Chapter 8 concludes this thesis with future works.

## 論文審査結果の要旨

In this thesis, the applicant presented the implementations of two web application systems that will be useful in university educations using various open-source software including Docker.

As the first contribution of the thesis, he implemented the Docker image generation assisting tool for user-PC computing (UPC) system. This tool adopts Angular JavaScript for creating user interfaces, PHP Laravel for handling logic and data models using Rest API, MySQL database, and Shell Scripting for running the whole program. The Docker image generated by the tool is speedily uploaded to DockerHub. For evaluation, he selected 30 popular Docker projects from online or DockerHub generated their Docker images using the tool to validate our proposal.

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The applicant has published two journal papers, one international conference paper, and two national conference papers to present the contributions.

From the overall evaluation of this thesis, the applicant has satisfied the qualification condition for the doctor degree in Engineering from the Graduate School of Natural Science and Technology at Okayama University.