

Department of Management
and Information Sciences

Key words

Programming education, Scratch, Actual robot control, Embedded system, GUI, CUI, Continuous learning, Obtaining particular solutions of P/T Petri nets, Automatic program generation



Doctor of Engineering / Professor

Masahiro Osogami

Education

Department of Electrical Engineering, Faculty of Engineering, Fukui University
Department of Electrical Engineering, Graduate School of Engineering, Fukui University of Technology (Master's Program)

Professional Background

Technical support staff at IBM of Japan Corporation; Research Associate, Associate Professor, and Professor at Fukui University of Technology

Consultations, Lectures, and Collaborative Research Themes

Programming workshops and the history of computers

e-mail address

osogami@fukui-ut.ac.jp

Main research themes and their characteristics

[Development of teaching materials and verification method for the continuous learning from GUI-based to CUI-based in programming education]

With the remarkable progress of today's information society, ICT (Information and Communication Technology) has been essential to our life. However, according to the annual economic and fiscal report issued from the Cabinet Office of Japan in July 2013, there is a chronic workforce shortage of ICT engineers[Cabinet Office Government of Japan "2013 Annual Economic and Fiscal Report" (June 2014 revised)]. Therefore, cultivating ICT engineers has become an urgent task for our country. In the new educational guidelines of Japan, the ICT curriculum in elementary, middle, and high school has been extended["The new educational guideline of Japan", April 2017]. For this reason, the development of effective teaching materials for learning programming is being researched. Additionally, we have researched the effects of robot control through GUI-based programming (Scratch) as an introductory education to programming[1-3](Refer to Fig.1 and Tab.1-3). Much research involving the introductory education of programming uses a GUI-based environment. On the other hand, continuous programming learning, which is the next stage of introductory education, is also required [Ministry of Internal Affairs and Communications, "Research report on the way of programming human resource development", Jun. 2019]. For such continuous learning, a learning method that can smoothly transition from GUI-based to CUI-based is needed.

In this research, the aim was to focus on the development of methods used for transition education from GUI-based programming to CUI-based programming. Specifically, would it be possible to learn algorithms, which are an important aspect of learning programming, effectively through the easier to understand visualization of a GUI-based programming environment. Additionally, another aim was to establish a general-purpose questionnaire method that could be used for evaluating the effect of the course contents. A questionnaire was devised that avoids asking provocative questions and that could be analyzed based on a psychological scale.

In future studies, the effect of the timing of pre GUI-based learning (for example every half-year, every other week, the first half or second half of class, etc.) on the comprehension level of students will be researched.

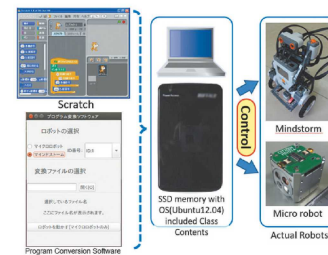


Fig.1 Developed materials

Tab.1 Contents and results of the questionnaire before and after classes^[1]

The questionnaire before class	Results			
Before (Q) What classes do you like?	1. Japanese 19(21%)	2. Mathematics 22(25%)	3. Science 19(24%)	4. Society 14(20%)
Before A) I like computer operation.	5. English 7(7%)	6. P.E. 30(34%)	7. Art 11(20%)	8. Other 18(23%)
Before B) I understood information classes at high school.	4: 7(13%)	3: 33(59%)	2: 10(18%)	1: 0(0%)
The questionnaire after class	Results			
After A) I understood today's lecture.	4: 25(45%)	3: 30(54%)	2: 1(2%)	1: 0(0%)
After B) I had fun today's class.	4: 45(80%)	3: 11(20%)	2: 0(0%)	1: 0(0%)

Tab.2 Distribution of evaluation value differences before and after classes^[1]

Questionnaire (before and after classes are same)	Distribution of evaluation value differences before and after classes						
	3	2	1	0	-1	-2	-3
Before/After B) I acknowledge the importance of absorbing knowledge about computers.	0	0	0	45	5	0	0
Before/After C) I have the desire to pursue an ICT related vocation.	0	2	10	40	4	0	0
Before/After D) I am interested in application software.	0	1	13	40	2	0	0
Before/After E) I am interested in computer hardware.	0	1	13	42	0	0	0
Before/After F) I prefer practical work to lecture in classes information sciences.	1	0	11	41	3	0	0
Before/After G) I lack knowledge the importance of computer knowledge in daily life.	0	0	4	48	3	1	0
Before/After H) I regard computer knowledge to be useful for the future.	0	0	5	48	3	0	0

Tab.3 standard deviation, average of evaluation value differences and significant difference of before and after classes^[1]

Questionnaire	B	C	D	E	F	G	H
Average of evaluation value differences before and after classes	0.018	0.179	0.232	0.268	0.196	-0.018	0.036
Standard Deviation	0.443	0.601	0.534	0.481	0.610	0.443	0.376
Significant difference for average of before and after classes(t-value)	0.299	*2.204	**3.223	**4.126	*2.388	-0.299	0.704

*: $P < 0.05$ - -: $P < 0.01$

Major academic publications

[1] Masahiro Osogami, Kazumasa Ohkuma and Kazutomi Sugihara, "The Practice of Programming Education by Controlling Actual Robots Using Scratch", Journal of Information Processing Society of Japan, Transactions on Computers and Education, Vol.2, No.2, pp.76-84, Oct. 2016.

[2] Masahiro Osogami and Kazumasa Ohkuma, "Effects of GUI-based Programming Learning before CUI-based Programming Learning: Toward Continuous Learning in Computer Programming", Proc. of The 18th International Conference on Information Technology Based Higher Education & Training (IHTET 2019), in Magdeburg, Germany, September 26-27, 2019, ID-114, 978-1-7281-2464-3, 2019 IEEE, 2019.12, 2019.

[3] Masahiro Osogami, Kazumasa Ohkuma and Kazutomi Sugihara, "The Effects for Programming Learning using Actual Robots Control with Scratch", Proc. of the 7th International Conference on Knowledge and Education Technology (ICKET2018), in Edinburgh, Scotland, UK, August 22-24, 2018, IC2-003, The International Journal of Mechanical Engineering and Robotics Research, Vol.8, No. 5, pp.764-770, 2019.