

The development of an experimental set and Finding efficiency the application using microcontroller boards of the controller robots in microprocessor and interfacing Subjects for 4rd undergraduate Students Computer Engineering Faculty of Engineering Kasembundit University

Kittisak Ungkanawin ¹

ABSTRACT

The purpose of this research is to develop and find the efficiency of the experimental set of microcontroller application in controlling the robot, microcontroller and interface, as well as to improve and develop media for modern teaching and learning. Consistent with current technology as well as able to stimulate the learning process of students by using tools used in Including teen Microcontroller experiment kit and performance-based tools consisting of a suitability assessment form for 5 experts and satisfaction questionnaires for the sample group were students who enrolled in the microprocessor and the interface of the Bachelor of Engineering Program in Computer Engineering. Kasembundit University, total of 30 people

The results of the study showed that the use of the developed experimental set was evaluated from 5 experts at a very good level. The satisfaction evaluation was evaluated by students at a very good level and the efficiency of the experiment set was 82.78 / 92.36, which was found to be higher than the standard criteria set at 80/80. Overall, it was considered that the experimental set developed suitable for the development of teaching and learning in microprocessor subjects and interface effectively.

Keywords: Experiment set, Microcontroller and Robot control

¹ Lecturer in Department of Industrial Education, Faculty of Industrial Education and Technology King Mongkut's Institute of Technology Ladkrabang Bangkok 10520, Thailand, E-mail:kittisak.un@kmitl.ac.th,Tel.094-961-5665

Rationale

At present, educational technology has progressed and has developed rapidly. Teaching and learning that uses educational technology has played a very important role in the education society both in the education system and in the educational system. Every country has developing their own educational materials to be diverse and always up-to-date. The progress of computer technology has resulted in teachers having to Tweeted media teaching efficiency can be applied to various types of media to be shared on a computer system. Examples of these media are audio, video, graphics, still images and animations. These media are used together to give students the best possible knowledge and understanding of the subject matter of the instructor. To achieve goals effectively, depending on many elements, such as content instructors, learners, which have interesting teaching materials Significant attract the attention of the students in their quest for additional knowledge and help the students to understand the subject better academic progress as possible on the conditions of teaching and learning. Teaching materials that can help learners to learn about content without being boring. And enjoy learning should offer a wide variety of content, such as presenting text, still images, animation, audio, video and more.

Teaching in science and engineering subjects Teachers and learners must interact with each other so that the instructors will be able to know how much the students understand the content, especially the subjects in the field of computer engineering in the field of microcontroller and interface. Can be seen from the application and more development every day,

whether it is industrial work, business work in appliances Toys. For this reason, the introduction of microcontrollers and interfaces the instructor should therefore have a set of teaching materials such as a microcontroller and interface training kit. And basic robot applications Consistency of Aniwat Pholrak and Somsak Aktimagul, a series of microprocessor instruction classes of Atthep Eggpetch to create and find the efficiency of the operating system, filter circuit, electron frequency, and the corresponding IC of Yutpichai Klaipan, the development of a microprocessor connection kit, digital signal processing DSP of Komphir Hirunpanich, development Instructional series on Strait circuits in the waveguide of Direk Maniwan, Phinit Khiangpirom and Somsak Aktimakul, color television set experiment, screen display LCD of Watcharin Mungsawang, Wisut Soonthornkanokpong and Peerawut Suwannachan and AVR microcontroller experiment kit ATMEGA32 Master of Industrial Education Program, King Mongkut's Institute of Technology Ladkrabang of Premchai Kongtan, Wisut Soonthornkanokpong and Peerawut Suwannachan, which can motivate learners to learn and be able to show the circuit in explaining principles. Can perform various tasks and see the results of the experiment with ease; speed and ability Summarize the lesson together with the learner.

Microcontroller subjects, CT.650 course code, are subjects that are taught at the undergraduate level level 4, Computer Engineering, Computer Engineering Department, Faculty of Engineering, Kasem Bundit University. The problem is that there is a broad explanation that "for students to learn about the application of microcontrollers Teller used to control electronic work As well as students have the ability to

use computer technology in both hardware and software. " Is the development of circuit design and software development, which does not tell other details (Academic Promotion and Registration Office, 2017), so it is the duty of the teacher to choose the content that is used to transfer knowledge to the students is consistent with Suwit Atkulchai by studying in various courses. Students need to have imagination in understanding the content, including how Learning to control hardware programming, which requires a lot of knowledge and skills in learning, but due to the problems found in the student's microcontroller study, the driver skills are not as good as That should In addition, the learning materials are not covered in some parts, therefore, the researcher should have the idea to solve such problems in order to develop students to learn more efficiently.

From the history and importance of such problems, from the problems mentioned above, the equipment that is related to the microcontroller instruction set is found in the Department of Computer Engineering, Faculty of Engineering, Kasembundit University still lacks a set of experiments, including work sheets and various teaching materials that are necessary and to encourage students to apply the knowledge from theory to practice. Therefore, in this research, the researcher therefore conducted Developing an experimental set and finding the efficiency of the application of microcontroller boards in robot control, subject to microcontroller and interface CT.650 for professors Education Undergraduate 4th year, Department of Computer Engineering and Vocational. This research is to provide learning and teaching to improve and develop the media to be consistent with the current technol-

ogy and can summarize lessons simultaneously with the learner and help to make learning more and more effective. The next highest image.

Research objectives

1. To develop an experimental set of microcontroller application in robot control, microcontroller and interface for 4th year undergraduate students in Computer Engineering.

Faculty of Engineering, Kasembundit University with quality.

2. To study the efficiency of the application of microcontroller boards in robot control, microcontroller and interface for 4th year undergraduate students in Computer Engineering, Faculty of Engineering, Kasembundit University developed.

Study method

This research was to find the efficiency of the application of microcontroller boards in robot control, subject to microcontroller and interface for 4th year undergraduate students in Computer Engineering, Faculty of Engineering, and Kasembundit University. Work suitability assessment form for experts and satisfaction questionnaires Mind for the sample group by doing the following

1. Research plan

1.1 Study the information and prepare work sheets by studying relevant information, which includes details such as relevant research or research-related documents, and then compile the knowledge that has been prepared by the technique in The preparation of the worksheet must be clear, clear, easy to understand to the user or the study person

1.2 Evaluate the work by experts

by using the suitability assessment form, finding the efficiency of the experiment set of microcontroller application in robot control, microcontroller and interface for the 4th year undergraduate students. Department of Computer Engineering, Faculty of Engineering, Kasembundit University, prepared by 5 experts from the results if the appraisal does a staph or an error was made, the revision and the results have been revised to provide a complete and accurate based on the recommendation of experts.

1.3 Apply to 30 sample groups
 1.4 Finding efficiency and evaluating satisfaction from 30 sample groups
 1.5 Applying results obtained from finding efficiency and results from the satisfaction assessment form to interpret and summarize results and when compiling the data obtained from the application for data analysis (Chan Trak, 2529: 40-42) The researcher therefore set the conceptual framework with the following steps as shown in Figure 1

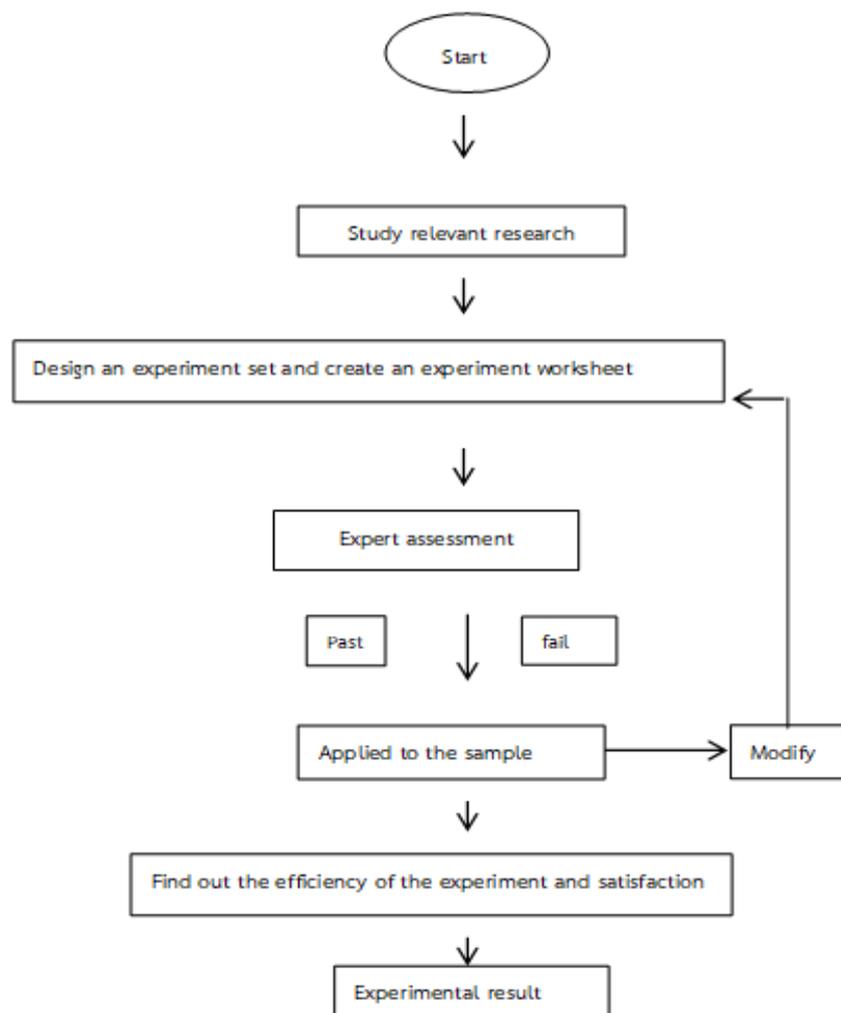


Figure 1 Plan for creating and finding quality test kits

Scope of population and sample group

1. Population and sample group

1.1 Population in research is the fourth year undergraduate students in Computer Engineering, Department of Computer Engineering, Faculty of Engineering, Kasembundit University studying microcontroller subjects Course code CT.650 1st semester, academic year 2018, 60 students enrolled in microcontroller courses Course code CT.650.

1.2 Sample group for research at the 4th year undergraduate students in Computer Engineering, Department of Computer Engineering, Faculty of Engineering Kasembundit University studying microcontroller subjects, CT.650 code 1st semester, academic year 2018, 30 students enrolled in microcontroller subjects, CT.650 code, which were obtained by group sampling. (Cluster or Area Sampling) by using the classroom as a random unit in which the classroom is organized by the ability of students.

2. Study variables

2.1 Quality and efficiency of the application of microcontrollers in robot control, microcontroller subjects and interfaces.

Tools used to collect data in research

1. In this research, the researcher has designed a tool to collect data for the development of the experimental set and to find the efficiency of the application of microcontroller boards in robot control, microcontroller subjects, and interfaces for undergraduate year students. 4, Computer Engineering, Faculty of Engineering, Kasembundit University to be suitable for the sample group by machine Used in this study was composed.

1.1 Microcontroller experiment board in

the experiment set of application of microcontroller to control robot Microcontroller and interface subjects for 4th year undergraduate students in Computer Engineering, Faculty of Engineering, Kasembundit University using the board Arduino based on the board structure will consist of the AVR microcontroller family of ATMEL. This family of ICs has the advantage of being able to create a boot loader.

The loader has boot loader. Is the part that can be used to receive program files via the serial port, which can be compressed inside it? Which looks like an internal program tool Making users more convenient, not having to buy a program like microcontroller In other families, but there are times when the use may cause the boot loader to be corrupted, cannot be programmed (Than Phong, 2017). With the trial work, with instructions to allow students to write a written instruction according to the specified procedure. Then, when processing through without programming errors, it will bring Connect with various devices Related.

1.2 Teaching media PowerPoint of microcontroller application in robot control, microcontroller and interface.

1.3 Worksheet of experiment set of application of microcontroller board in robot control, Microcontroller, 5 work sheets, ie work sheet 1, write instruction, receive I / P value from sensor, work 2, write instruction, receive I value / P from joy play Worksheet 3: Writing commands to control DC motor. Worksheet 4 Writing control commands Worksheet 5 Writing commands, controlling walking robots, capturing lines and controls with joy play.

1.4 Tools used in data collection are student achievement tests which are multiple

choice options.

1.5 Quality evaluation form of the experimental set of the application of microcontroller in controlling the microcontroller robot.

1.6 Learning achievement test.

Data collection methods

The procedure of using the experimental set with a sample of 30 people. The researcher planned and conducted the data collection as follows.

1. The researcher made a letter from the Faculty of Industrial and Technology Education, King Mongkut's Institute of Technology Ladkrabang to 5 experts to clarify various details and ask for cooperation in research and to confirm the acceptance of the quality assessment of the set. Trial of application of microcontroller board in robot control, microcontroller subject and interface.

2. Set teaching and learning goals, meaning the need is to allow the learner to be able to do it through the teaching process.

3. Determine the behavioral objectives by the behavioral objectives that are analyzed from the teaching goals and the content and the experimental set of the application of the microcontroller in the control of the robot microcontroller subjects and the interface in the teaching process.

4. Issue the tests used in microcontroller and interface instruction such as pre-test, exercises, test after lesson And the experimental

work that uses the experimental set of the application of the microcontroller board to control the robot, the microcontroller and the interface based on the behavioral objectives.

5. The experiment set of microcontroller application in robot control, microcontroller and work interface interface, experiment kit and achievement test, delivered to the qualified appraiser.

6. Find learning achievement by looking at the scores collected from the test before the study, the exercises, the test after the lesson from the experimental work using the experimental set of the application of the microcontroller in the robot control, the microcontroller and the accompanying interface Go with 5 work sheets, including the work sheet 1 Writing commands, accepting I / P values from the sensor, work 2, writing instructions, receiving I / P values from joy play, work 3, writing control commands, DC motor work 4, writing control commands stepping motor, work 5, writing instructions, controlling the robot, walking the line and controlling with joy play.

7. Find the efficiency of the application of microcontroller boards in robot control, microcontroller and interface for 4th year undergraduate students in Computer Engineering, Faculty of Engineering. Kasembundit University.

Data analysis and interpretation

The method of conducting research begins with testing.

Table 1 shows the One-Group Pretest-Posttest Design research plan.

Group	Test first	Study with a set of experiments	Test after study
Sample	T1	X	T2

Learning achievement measurement T1 = Sample group before studying with the experiment set, X = Let the learner from each experiment set ready to do the test of learning after, completing the experiment in that work sheet. After the students have completed all the tests, then take the achievement test after the experiment, T2 = using the combined test to measure the same set of results before the study. Without having to measure the achievement of the total work In this regard, the assessor namely, the researcher who is the instructor of the course, brought the results of the analysis to analyze according to the statistical method to find the efficiency of the experiment set created

Research result

The development of the experimental set and the efficiency of microcontroller application in robot control, microcontroller and interface for the 4th year undergraduate students in Computer Engineering, Faculty of Engineering,

Kasem Bundit University, has been evaluated by a number of experts. 5 people and evaluating satisfaction by 30 students Of the experiment set created Can present this

1. The results of the expert evaluation This research uses the evaluation form for the suitability of the experiment set on the development of the experimental set and the efficiency of the application of the microcontroller in controlling the robot, microcontroller and interface for undergraduate students. Year 4 Department of Computer Engineering, Faculty of Engineering, Kasem Bundit University, with 5 experts.

From Table 2, the evaluation results showed that the experimental set and the efficiency of the application of microcontroller boards in robot control, microcontroller and interface for the fourth year undergraduate students Department of Computer Engineering, Faculty of Engineering, Kasembundit University, has an average score of \bar{x} = 4.70, S.D = 0.75 is very appropriate.

Table 2 the results of the evaluation of the experts in the experiment and the efficiency of the application of microcontrollers in robot control, microcontroller and interface for 4th year undergraduate students in computer engineering, Faculty of Engineering, University Kasembundit

No.	Evaluation list	\bar{x}	S.D	Quality level
1	Suitable for learners	4.50	0.45	excellent
2	The results are accurate	4.70	0.45	excellent
3	Easy to use and convenient	4.50	0.55	excellent
4	Suitable for the content and teaching objectives	5.00	0.00	excellent
5	Can encourage learners to learn	4.70	0.45	excellent
Total average		4.70	0.45	excellent

Table 3 Average and standard deviation of the quality of the experimental work

No.	Evaluation list	\bar{x}	S.D	Quality level
1	Work sheet covering objectives	4.44	0.47	good
2	The work sheet is suitable for the purpose	4.65	0.47	excellent
3	The work sheet has the correct content	4.83	0.37	excellent
4	The worksheet is appropriate for the content and teaching objectives	4.57	0.47	excellent
5	The work sheet contains content that can encourage learners to learn	4.73	0.37	excellent
Total average		4.57	0.47	excellent

Table 4 Results of learning progress from the Long Set Worksheet (E1)

worksheet	Σx	\bar{x}	S.D	E1
Worksheet Title 1	129	8.06	1.12	80.25
Worksheet Title 2	130	8.25	1.14	81.25
Worksheet Title 3	132	8.26	1.45	82.55
Worksheet Title 4	133	8.35	1.08	83.34
ค่าเฉลี่ย				82.78

From Table 3, the evaluation results showed that the side of the work has the application of the microcontroller board to control the robot, microcontroller subjects and interfaces. For the 4th year undergraduate students in Computer Engineering, Faculty of Engineering, Kasem-bundit University has a score Average equal to $\bar{x}= 4.57$ and S.D = 0.47 is very appropriate.

2. The results of the analysis of the efficiency of the experimental set, finding the efficiency of the experiment set by applying the

designed work sheet with the experimental set to be applied to the sample group of 30 people. The efficiency of the experiment set by considering the achievement the study of the sample group. The results of the data analysis are shown in Table 3 and 4.

From Table 4, the results showed that all 30 students of the sample group made 4 work sheets. About 82.78 percent, this is 80 percent higher than the specified criteria.

Table 5 Learning Achievement from Experimental Worksheet (E1)

worksheet	Σx	\bar{x}	S.D	E2
Worksheet Title 5	135	9.34	0.98	92.36

Table 6 Results of student satisfaction assessments

No.	Evaluation list	\bar{x}	S.D	Quality level
1	Is suitable for learners	4.34	0.47	good
2	The results are accurate	4.55	0.50	excellent
3	Easy to use and convenient	4.50	0.47	excellent
4	Suitable for the content and teaching objectives	4.65	0.37	excellent
5	Can encourage learners to learn	5.00	0.00	excellent
Total average		4.67	0.65	excellent

From Table 5, the results showed that all 30 students of the sample group made work papers, subject 5 Scored 92.36 percent, which is 80 percent higher than the specified criteria from Table 3 and 4, summarizing the results of the development of the experimental set and finding the efficiency of the application of microcontroller in robot control, microcontroller subjects and interfaces For the 4th year undergraduate students Department of Computer Engineering, Faculty of Engineering, Kasembundit University, in controlling the operation of the robot control process by the process of designing a set of experiments, it appears that the generated model has efficiency 82.78 / 92.36 which is higher than the specified criteria.

3. Results of student satisfaction assessment

The researcher used the experiment set created for the 4th year undergraduate degree in Computer Engineering, Faculty of Engineering,

and Kasembundit University. Enrolled in the microprocessor course and the course code interface CT.650 enrolled in semester 1/2017 Graduate Engineering Program Computer engineering in the amount of 30 people. After studying with the experiment set, it was found that the students had more understanding and the satisfaction of the students towards the experiment set was at a very good level.

From Table 6, the results showed that students' satisfaction with the experimental set of microcontroller application in robot control, microcontroller and interface for 4th year undergraduate students Department of Computer Engineering, Faculty of Engineering, Kasembundit University, has an average score of $\bar{x} = 4.67$ and S.D = 0.65 is very good.

Research result

This research article presents the development of an experimental set and finding

the efficiency of using a microcontroller board to control a robot. Microcontroller and interface subjects for 4th year undergraduate students in Computer Engineering, Faculty of Engineering Kasembundit University

The result of the evaluation by the expert, this research article uses the evaluation form for the suitability of the experiment and the efficiency of the microcontroller application in controlling the robot, the microcontroller and the interface for the undergraduate year students. 4, Computer Engineering, Faculty of Engineering, Kasembundit University, has a score Average equal to $\bar{x} = 4.70$, S.D = 0.75 is very good.

The results of evaluating the satisfaction of the learners towards the experimental set were satisfied with the experiment set and finding the efficiency of the application of the microcontroller in robot control, microcontroller and interface for undergraduate students. Year 4, Computer Engineering, Faculty of Engineering Kasembundit University has an average score of $\bar{x} = 4.67$ and S.D = 0.65 is very appropriate

The results of the analysis of the efficiency of the experimental set, finding the efficiency

of the experimental set by applying to the sample group of 30 people, based on the learning achievement of the sample. /92.36 which is higher than the threshold Overall, the developed experimental set is at a very good level, suitable for use in the development of teaching and learning in microprocessors and interfaces.

Suggestion

1. There must be an explanation of the work and the use of the trial set before allowing students to follow the worksheet and provide knowledge, precautions and safety of using the microcontroller experiment kit.

2. In the trial operation according to the work order for good results, one experiment should be used per experiment set.

Suggestions from research in development

1. There should be research to create and find the effectiveness of the microcontroller training program and the interface for the 4th year undergraduate students. Computer Engineering, Faculty of Engineering, Kasembundit University with the AVR family of Microcontrollers are popular now.

Reference

- [1] Phairot Triaranathanakun. 1998. Practical Teaching Methods. Bangkok: King Mongkut's University of Technology Thonburi Printing School.
- [2] Wanlop Chantrakul. 2530. Guidelines for designing teaching aids for demonstration equipment: Vocational journals
- [3] Wanlop Chantrakul. 2255. Design, build and evaluate teaching set performance: How to be logical. Techniques for educational journals for the masses. July - September: King Mongkut's University of Technology North Bangkok.
- [4] Pool Sap Nak Nakha. 2009. Teaching materials. Academic Research in Education. Faculty of Education: Suan Dusit Rajabhat University.

- [5] Thanin Sinjaru. 2012. "Research and Statistical Analysis by SPSS and AMOS", Type 13, SR Printing Mass Products. Bangkok.
- [6] Puangrat Thaveerat. 2010. Behavioral and social science research methods . Educational and Psychological Testing Bureau: Srinakharinwirot University
- [7] Chaiyot Tumsuwan. 2533. Educational theory and technology Theory and research. Bangkok: Odean Store Publishing
- [8] Aniwat Phonrak, and Somsak Aktimakul. 2013. Creating and finding effective training packages on microcontrollers and basic robot applications Faculty of Industrial Education King Mongkut's University of Technology North Bangkok
- [9] Adithep Khaipetch. 2003. Creation of a microprocessor instruction set for the Faculty of Industrial Education Rajamangala Institute of Technology
- [10] Yuthapichai Klaikan. 2003. Creating and finding efficiency of operating sets, filter circuits, electron amplifiers and ICs Diploma course 2003. Master of Industrial Education thesis Electrical Communication Engineering College King Mongkut's Institute of Technology Ladkrabang.
- [11] Komphachiranapanich. 2005. Development of connection test kit Microprocessor digital signal processor DSP. Master of Industrial Education thesis Electrical Communication Engineering College Institute of Technology King Mongkut's Institute of Technology Ladkrabang.
- [12] Direk Maniwan, Phinij Khenpirom and Somsak Aktimakul. 2015. Development of teaching sets on strait circuits in lead tubes Wave of Faculty of Industrial Education. King Mongkut's University of Technology North Bangkok.
- [13] Wacharin Rungsawang, Wisut Soonthornkanokpong and Peerawut Suwannachan. 2013. Color television set experiment, LCD display CD. Faculty of Industrial Education. Electrical Communication Engineering College King Mongkut's Institute of Technology Ladkrabang.
- [14] Prem Chai Kongtan, Wisut Soonthorn Kanokpong and Peerawut Suwannachan. 2012. AVR Microcontroller Experiment Kit ATMEGA 32. Journal of Industrial Education. 11 (2), Nor. 113 - 137.
- [15] Rajamangala University of Technology Suvarnabhumi. 2012. Education Curriculum. Graduate Industry Electronics and Telecommunication Engineering (Curriculum Update 2008).
- [16] Donson Pong Pha B.E. 2007. PIC Microcontrollers and Applications. Bangkok: Thai-Japanese Technology Promotion Association.
- [17] Supawit Muangcharoen. 2016. Development and creation of a test kit for the application of microcontroller boards with object sorting tasks. Electronics and telecommunications engineering Faculty of Industrial Education Rajamangala University of Technology Suvarnabhumi.