The 3rd International Conference on Sciences and Social Sciences 2013: Research and Development for Sustainable Life Quality (ICSSS 2013)

Program and Full Papers

July 18-19, 2013

Rajabhat Maha Sarakham University, Maha Sarakham (Thailand)

In Cooperation with
Indiana State University (USA)
University of Applied Sciences, Neubrandenburg (Germany)
Nippon Veterinary and Life Science University (Japan)
College of Education, Massey University (New Zealand)
National University of Laos (Laos PDR)
Institute for Research and Development of New Technologies (Vietnam)
Vinh University (Vietnam)
University of the Philippines Los Baños (Philippines)
University of New England (Australia)

Contents

	Page
Conference Information	III
Organizers	IV
Committees	V
Reviewers	VI
Welcome Speech and Opening Address	VIII
Keynote Speakers	XI
Conference Program	XXXIII
Presentation Program	XXXVII
Oral Presentation Full Papers	1
Poster Presentation Full Papers	644
Proceeding Assemble Staff	789

Conference Information

Rajabhat Maha Sarakham University organized its first International conference on Sciences and Social Sciences in the year 2011, or ICSSS 2011, serving as an international platform for academics and scholars from Thailand and abroad to present and share their researches and experiences in various fields under sciences and social sciences. Our first ICSSS successfully attracted participants from all over the country and abroad. The second International conference on Sciences and Social Sciences was organized in 2012 under the theme “Innovation for Regional Development" in response to the urgent needs, policies and development strategies of the ASEAN countries to officially become one ASEAN Economic Community in the year 2015. With kind cooperation from our partner universities in the US, Europe and Asia, the ICSSS 2012 could attract more professionals, academics, scholars, researchers and graduate students from all over the country and abroad, especially our colleagues from other ASEAN countries,

This year's ICSSS 2013 under the theme "Research and Development for Sustainable Life Quality" is no less remarkable in attracting academics, scholars, and researchers from home and abroad to present and share their works and establish networks of academic cooperation in a variety of disciplines of Sciences and Social Sciences. It is expected that this year's event will lead to further cooperation among colleagues from ASEAN institutions as well as closer ties with our partners and fellow academics and researchers from other regions of the world to improve our works and share our research findings and experiences in sciences and social sciences. The ultimate goal is to motivate one another as we join hands to work in various disciplines of sciences and social sciences to improve life quality and to ensure sustainable high quality of living.

Organizers

Rajabhat Maha Sarakham University, Maha Sarakham (Thailand)

In Cooperation with

- ✍ *Indiana State University (USA)*
- ✍ *University of Applied Sciences, Neubrandenburg (Germany)*
- ✍ *Nippon Veterinary and Life Science University (Japan)*
- ✍ *College of Education, Massey University (New Zealand)*
- ✍ *National University of Laos (Laos PDR)*
- ✍ *Institute for Research and Development of New Technologies (Vietnam)*
- ✍ *Vinh University (Vietnam)*
- ✍ *University of the Philippines Los Baños (Philippines)*
- ✍ *University of New England (Australia)*

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- President of Indiana State University
- President of University of Applied Sciences, Neubrandenburg
- President of Nippon Veterinary and Life Science University
- President of College of Education, Massey University
- President of National University of Laos
- President of Institute for Research and Development of New Technologies
- President of Vinh University
- President of University of the Philippines Los Baños
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- Vice President for International Relations, Art and Cultures
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✍ Dr.Ubonsin Poprom	Sakon Nakhon Rajabhat University
✍ Dr.U-rasa Promta	Rajabhat Maha Sarakham University

Conference Program

Conference Program
International Conference on Sciences and Social Sciences 2013:
Research and Development for Sustainable Life Quality
Theater Hall (Building 34) Rajabhat Maha Sarakham University
July 18-19, 2013

Thursday, July 18, 2013

Time	**Place :** 1st Fl. Bld. 34
08.00-09.00	**Registration**

Time	**Place :** Theater Hall (1st Fl. Bld. 34)
	Opening Session
09.00-09.30	**Welcome performance**: ASEAN Relations
09.30-09.45	**Welcome speech:** Assoc. Prof. Somchai Wongkasem (RMU President)
09.45-11.00	**Opening Address by** Prof. Dr. Chira Hongladarom *"Research and Development for Sustainable Life Quality"*
11.00-12.00	**Keynote Speaker:** *"Generations, Resiliency, Adaptation and Culture in Sustainable Agriculture"* by Prof.Dr.Thomas L. Steiger; Indiana State University
12.00-13.00	**LUNCH** (Ground Fl. Building 15)
13.00-14.00	**Invited Speaker:** *"Transboundary Environmental and Social Impact assessment of Hydro-power Development: The Case of Lao PDR"* by Assoc.Prof.Dr. Sengdeuane Wayakone; Director,International Relation, National University of Laos
14.00-15.00	**Invited Speaker:** *"Contemporary Agricultural Cooperativim in the Philippines: Insights on Enterprise Sustainability"* By Asst. Prof. Nanette C. Abelilla-Aquino, University of the Philippines Los Baños (UPLB)

Time	**Place :** Winyoo Khuwanant Meeting Room (5th Fl. Bld. 15)
13.00-14.00	**Work Shop :** *"Faculty and Personnel Development toward International Standard and Quality"* by Prof. Dr. Chira Hongladarom

Time	**Place :** Conference Room 1 (1st Bld. 34)
13.00-14.00	**Invited Speaker:** *"Microbial Elicitors to Induce Immunity for Plant Disease Control in Chilli and Tomato"* by Assoc. Prof. Dr. Kasem Soytong Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL)

Time	**Place :** Conference Room 2 (1st Fl. Bld. 34)
13.00-14.00	**Invited Speaker:** *" Development of International Partnership and Cooperative Projects between Libraries"* by Prof. Dr. Ralph Gabbard, Arizona State University

Friday, July 19, 2013

Time	**Place :** Theater Hall (1st Bld. 34)
09.00-10.00	**Invited Speaker:** *"Sustainability and Aging: A Tale of Two Countries"* by Asst.Prof.Dr.Tina Kruger Newsham; Indiana State University
10.00-11.00	**Invited Speaker:** *"Sustaining Quality Teacher Education"* by Prof.Dr.Sally Hansen; Director, Massey University
11.00-12.00	**Invited Speaker:** "*Cultural Tourism and Sustainability: Exploring the Literature*" by Prof. Dr. Ralph Gabbard; Arizona State University

Time	**Place :** Conference Room 1 (1st Bld. 34)
09.00-10.00	**Invited Speaker:** *"Cat and Dog Feed"* by Prof. Dr. Anton Beynen; Vobra Special Petfoods, Veghel, The Netherlands

Time	**Place :** Conference Room 2 (1st Fl. Bld. 34)
09.00-12.00	**Work Shop:** *"Introduction and brief history of University Music Study in the United States. The International study of non-western instruments as a means of the continued development of percussion study in college and university settings."* by Prof.Dr. Jimmy Finnie and Prof. Dr.Brian T. Kilp, Indiana State University

Time	**Place :** Wiboon U-pin Laohapongchana (5th Fl. Bld. 15)
10.30-11.30	**MOU Signing between Technology University of the Philippines and Rajabhat MahaSarakham University**

Thursday, July 18, 2013

Time	Place : 150701 (7th Fl. Bld.15)
13.00-15.20	**Education Presentations**

Time	Place : 150702 (7th Fl. Bld.15)
13.00-15.00	**Education Presentations**

Time	Place : 150703 (7th Fl. Bld.15)
13.00-15.00	**Sciences and Applied Sciences Presentations**

Time	Place : 150704 (7th Fl. Bld.15)
13.00-15.20	**Humanities and Social Sciences**

Time	Place : 150705 (7th Fl. Bld.15)
13.00-15.40	**Information & Technology Presentations**

Time	Place : 150707 (7th Fl. Bld.15)
13.00-15.00	**Research Articles Presentations**

Time	Place : Conference Room 1 (1st Fl. Bld.34)
13.00-15.40	**Agricultural Sciences Presentations**

Time	Place : (1st Fl. Bld. 34)
13.00-16.00	**Poster Presentations**

Friday, July 19, 2013

Time	Place : 150701 (7th Fl. Bld.15)
09.00-10.40	**Education Presentations**

Time	Place : 150702 (7th Fl. Bld.15)
09.00-11.00	**Sciences and Applied Sciences Presentations**

Time	Place : 150703 (7th Fl. Bld.15)
09.00-10.20	**Sciences and Applied Sciences Presentations**

Time	Place : 150704 (7th Fl. Bld.15)
09.00-10.40	**Humanities and Social Sciences**

Time	Place : 150705 (7th Fl. Bld.15)
09.00-11.40	**Information & Technology Presentations**

Time	Place : 150707 (7th Fl. Bld.15)
09.00-11.00	**Research Articles Presentations**

Time	Place : Conference Room 1 (1st Fl. Bld.34)
09.00-12.00	**Agricultural Sciences Presentations**

Time	Place : 1st Fl. Bld. 34
09.00-11.00	**Poster Presentations**

Time	Place : 150701 (7th Fl. Bld.15)
13.00-14.40	**Education Presentations**

Time	Place : 150702 (7th Fl. Bld.15)
13.00-14.40	**Sciences and Applied Sciences Presentations**

Time	Place : 150703 (7th Fl. Bld.15)
13.00-15.00	**Humanities and Social Sciences**

Time	Place : 150704 (7th Fl. Bld.15)
13.00-15.00	**Humanities and Social Sciences**

Presentation Program

Oral Presentation

July 18, 2013 ***13.00-15.20***

Session:	Education	Assoc.Prof.Dr. Somsong Suwapanich	Chairperson
Date:	July 18, 2013	Assoc.Prof.Dr.Siri Tee-Asana	Committee
Time:	13.00-15.20	Dr. Poosit Boontongtherng	Committee
Room:	150701 7th Fl. (Bld.15)		

No	Code	Topic	Time	Page
1	Ed1	Power Perception of Developing Countries in Their Sustainable Growth and Innovation Strategies ***Faik Çelik***	13.00-13.20	2-10
2	Ed2	Trends Reflection through Vocational Education in Thailand by "Theory of Change" Lens ***Soontornpathai Chantara***	13.20-13.40	11-16
3	Ed3	Applying Case-Based Reasoning to Teach Analysis of Non-Holonomic Mechanical Systems ***Weerayute Sudsomboon***	13.40-14.00	17-25
4	Ed4	The Study of Cognitive Styles of Primary Students in Watsaweattachat School Bangkok ***Wandee Srikongchan***	14.00-14.20	26-30
5	Ed5	Motivative Children to learn English with Chants ***Hoang Tang Duc***	14.20-14.40	31-39
6	Ed6	Workstation for Processing Seismic Data ***Nguyen Doan Quoc Khanh***	14.40-15.00	40-45
7	Ed7	The Application of QR Code in Public Transportation ***Pham Chi Cuong***	15.00-15.20	46-54

Oral Presentation Full Papers

APPLYING CASE-BASED REASONING TO TEACH ANALYSIS OF NON-HOLONOMIC MECHANICAL SYSTEMS

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ABSTRACT

This paper presents an application of a Case-based Reasoning (CBR) to teach analysis of Non-holonomic Mechanical (NHM) systems. NHM systems represent an important class of general nonlinear systems that applies elements of mechanics, mobile robotics and mobile manipulators. The key challenge of teaching a class of *dynamic systems* arises from the fact which considers the problem. It is absolutely accepted that metacognitive development increase both achievement and experience during coursework. NHM idea provides both challenging and relevant consider the control system for a wide range of achieving a dynamic level. Both 5592103 Machine Design I and 5594111 Machine Elements courses at Mechanical Technology Program, Nakhon Si Thammarat Rajabhat University applies CBR into the motion of a plane NHM, consisting of two point masses, which move in such a way. CBR describes as a constructivist teaching consists of systematic process: retrieve, reuse, revise and retain is investigated. The inclusions of NHM idea benefits students, who are able to solve the equations of the constraints of such a system, are derived. The learning outcomes provided to the students, metacognitive knowledge, and the main challenges of administering such a course.

KEYWORDS: Case-based Reasoning, Dynamic Systems, Metacognive Knowledge, Non-holonomic Mechanical Systems

INTRODUCTION

Non-holonomic Mechanical (NHM) systems represent an important class of general nonlinear systems that applies elements of mechanics, mobile robotics and mobile manipulators. Given its cross mechanical engineering design area, it is typically reserved for promoting metacognitive development undergraduate mechanical technology students. Studying on the motion of a plane NHM may be challenging to improve students' metacognitive knowledge increase both achievement and experience during coursework. However,
it is difficulty conducted that beginning undergraduate mechanical technology students are usually too previous experience to analysis of the motion of NHM.

Both 5592103 Machine Design I and 5594111 Machine Elements courses in semester 1/2013 as a class of *dynamic systems* at Mechanical Technology Program, Nakhon Si Thammarat Rajabhat University applies a Case-based Reasoning (CBR) into the motion of a plane NHM, consisting of two point masses, which move in such a way. Students can be taught traditional mechanical engineering design, such as lecture notes, power point presentation, and discuss functional decomposition. Applying the constructivist teaching necessary to include a large-dimension of metacognitive into solve the equations of the constraints of such a system, are derived. The mechanical engineering design courses offer a required has 60 students per semester is a large expense. To offset this, CBR is crucial.

Deriving, in the CBR paradigm, mean adapting previous solutions to meet current demands; using previous cases to solve current situations; using previous cases to critique current solutions; and or development derived reasoning from create an equitable solution to a new problem. Interpreting an experience means creating an explanation that connects one's goals and actions with resulting outcomes [1-3] [4] [5]. Such deriving depends high extensively upon students ability to create such explaining, suggesting that the ability and need to explain are key to promoting the achievement and experience in this paper.

This paper presents an application of a CBR to teach analysis of NHM systems. In the following sections, the course goals are introduced and the analysis of the constraint equations that are provided base on CBR for the students are described. The implication have determined to conduct trajectories of points of the system, is included the learning activities and the special case is highlighted. Finally, the main challenges of the course and solutions to solve the problems are discussed.

COURSE GOALS

The course goals of 5592103 Machine Design I and 5594111 Machine Elements are:

1. Teach mechanical engineering design.
2. Teach the motion of a plane non-holonomic mechanical system based on CBR.
3. Introduction to analysis of the constraint equations.
4. Develop mechanical engineering design activities on the trajectories of points of the system with metacognitive and CBR.
5. Allow students to produce the special case.

CONSTRUCTIVIST TEACHING WITH CASE-BASED REASONING

CBR is an artificial intelligence as problem-solving approach that relies on past similar cases to find solutions to problems [5], and prepare professionals to deal with ill-defined and ill-structured problems by exposing them to stories generated in the real world situation. CBR views analogical reasoning as the mental model of our ability to define the powerful learning strategies. Actually, previous experience and knowledge to bear in the art of mechanical technology requires knowledge, skills and expertise and central to effective practice is ability to problem solving [6]. The CBR approach is based upon a model of cognition that:

1. Treats concrete experience (concrete, specific knowledge as opposed to abstract, general knowledge) as primary to learning to solve problems;
2. Exposes students' to new experiences; and
3. Integrates the factors of dynamic memory, reasoning, and practicing.

Additionally, a query describing a target problem is natural, analogical reasoning cycle, stories of concrete problem-solving experience retrieved from dynamic memory (analogs) are adapted to interpreting and solving a new problem [1-3] [4] [7] [8]. CBR can be seen as a 4 RE's systematic process: ***Retrieve Reuse, Revise*** and ***Retain***. This system is cited in Figure 1 can be represented as follows:

1. ***Retrieve*****:** the system searches and retrieves the case(s) most similar to the problem case, according to a predefined similarity measure.
2. ***Reuse*****:** the user evaluates it in order to decide if the solution retrieved is applicable to the problem.

3. ***Revise*****:** if it cannot be reused, the solution is revised (adapted) manually (by the user) or automatically (by the CBR system).
4. ***Retain*****:** the confirmed solution is retained with the problem, for future reuse, as a new case in the database.

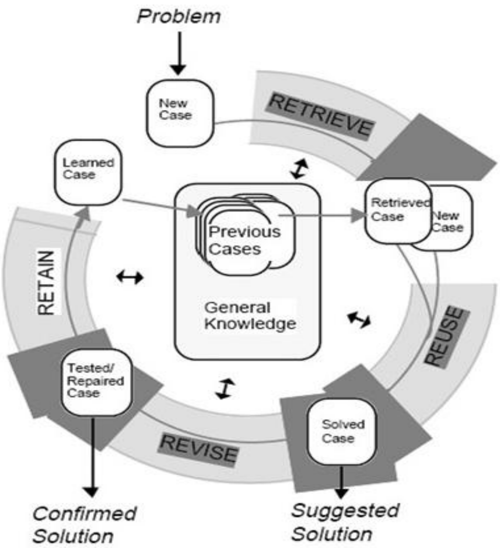

Figure 1 The CBR system [7]

CBR usually concerns the following issues so that different components can work co-operatively, contributing to efficient and effective system in education. A vast amount of work has been carried out concerning a wide range of issues and different techniques in CBR [8]. Although the CBR cycle is a ***retrieve-evaluate-adapt-learn*** process, CBR as a constructivist teaching may very well implement only the *retrieve* step, as this is the expression of the concept of reuse of experience. The difference between a database search and CBR *retrieval* is that the latter employs searching mechanisms that are based on classification and decision tree algorithms, or on assessment of the similarity of cases using predefined similarity measures.

TEACHING STARTEGIES

The student's ability to solve a class of *dynamic systems* have sophisticated engineering problems as one of the key challenges in industrial technology education. The research area in teaching of NHM systems problem solving focused on the association between analytical and complex problem solving, but rarely took into account the structure of problem-solving processes and metacognition aspects. Therefore, author believe that individuals who produce systematic thinking with metacognitive knowledge structures, have already acquired the knowledge required to focus on dynamic systems related to the given problem as shown in Figure 2.

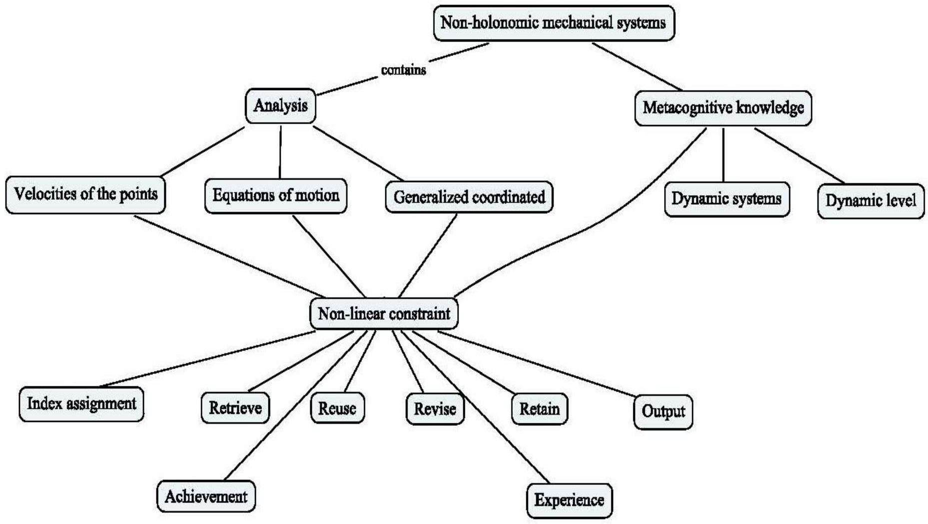

Figure 2 A concept map with metacognitive knowledge representation process

In Figure 2, a concept map refers to generate idea in which both cognitive representation of prior experience and the components of NHM systems problem situation are reorganized to achieve a designated courses [3]. According to Sudsomboon & Maungmungkun [9] proposed integration of CBR with concept maps as learning and teaching strategies, which contributes the contemplative learning task model in industrial technology research course can be implementing as shown in Figure 3. The contemplative learning task model via CBR and integration model provided a relatively easy means of transferring a solution from a previous experience corresponding research problem to a new research problem. Since CBR searches for solutions in a certain domain, the proposed approach introduces students' to devise research problem-solving skills and solution strategies that are applicable across mechanical technology areas.

ANALYSIS OF THE CONSTRAINT EQUATIONS

Recently, mobile manipulators have received increasing attention over the last 15 years, because of their industrial relevance and academic interest [10]. The dynamic systems obtained the explicit equations of motion for mechanical systems that are subjected to non-holonomic constraints. However, the motion planning and control of mobile manipulators cannot be addressed by traditional methods due to the non-holonomic nature of the systems are imposed. Thus, the control design for dynamic systems is a challenging problem, and has attracted much attention in the robotics and control in both 5592103 Machine Design I and 5594111 Machine Elements courses.

Students	**Learning Tasks**
Index assignment	1. Searches and retrieves research (cases)
Retrieve	2. Solving the problem: Research on causes and effects and research design process
Reuse	3. Finding the know-how method–and engineering design, and discussion
Revise	4. Proposing of knowledge acquisition

Figure 2 Integration of CBR and the contemplative learning task model

In the presented paper, students' yields the assumption of known dynamic systems, much research has been illustrated to control mobile manipulators including input–output feedback linearization nonlinear feedback control. Because of dynamic uncertainty, adaptive neural network controls have been proposed for motion control of mobile manipulators. However, for practical applications, not only the motion but also the force of the end-effector of the arm should be considered. The inclusions of NHM idea benefits students, who are able to solve the equations of the constraints of such a system, are derived.

Analysis of the constraint equations have been conducted the mobile manipulators practical realization of a system consisting of two point masses, which move in such a way that their velocities are mutually perpendicular as shown in Figure 3. This system is NHM systems. Consider x_1, y_1, x_2, and y_2 are generalized coordinated, which the velocities of the point masses to be orthogonal can be written in the equation (1) and the velocities of the points M_1 and M_2 and the planes to be shown in the equation (2)

$$\dot{x}_1\dot{x}_2+\dot{y}_1\dot{y}_2=0 \qquad (1)$$

$$\dot{x}_1\cos\varphi+\dot{y}_1\sin\varphi=0,\quad \dot{x}_1\cos\varphi-\dot{y}_1\sin\varphi=0, \qquad (2)$$

Constraints equations (1) and (2) are dependent. Hence, the reactions of the constraints R_1 and R_2 are perpendicular to the planes of motion is equal to zero. In case of the left-hand side of equation 1 is a homogeneous function of Φ of power two can be written in the equation (3)

$$\frac{\partial\Phi}{\partial\dot{q}^i}\dot{q}^i=0 \qquad (3)$$

where q^i are general coordinates, and the possible displacement constrained by non-linear constraint, can be defined, like Chetayev in the equation (4) and $\delta\dot{q}^i$ depend on the velocities

$$\frac{\partial\Phi}{\partial\dot{q}^i}\delta\dot{q}^i=0 \qquad (4)$$

Hence, the Henceforth summation is repeated indices, where

$$i, j, k = 1, \ldots, n; \quad \alpha, \beta, \gamma, = 1, \ldots, m; \ \nu, \rho = m + 1, \ldots, m + l = n$$

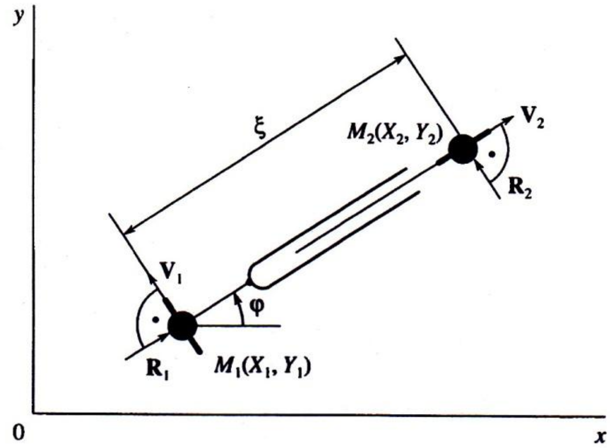

Figure 3 Non-holonomic mechanical systems [11]

IMPLICATION

The implication has determined the trajectories of points of the system. The equations of motion of the system associated as the generalized coordinates, and then applied a CBR in each of step:

1. *Index assignment*: students is searching the case as the generalized coordinates $\dot{x}_1$, $\dot{y}_1$, ξ and φ as shown in Figure 3,

$$\dot{x}_1 \cos\varphi + \dot{y}_1 \sin\varphi = 0,\ \dot{x}_1 \sin\varphi - \dot{y}_1 \cos\varphi - \xi\dot{\varphi} = \sqrt{\dot{x}_1^2 + \dot{y}_1^2} - \xi\dot{\varphi} = 0 \qquad (5)$$

2. *Retrieve*: Solving the problem by taking $\dot{\xi}$ and $\dot{\varphi}$ as independent velocities, students can be obtained the equation

$$\dot{x_1} = \dot{\xi}\,\dot{\varphi} \sin\varphi,\ \dot{y_1} = -\dot{\xi}\,\dot{\varphi} \cos\varphi \qquad (6)$$

3. *Reuse*: Derived the kinetic energy of the system, provided that the masses of the point M_1 and M_2 can be written in the equation

$$T = \frac{1}{2}\left(\dot{x}_1^2 + \dot{y}_1^2\right) + \left(\dot{x}_2^2 + \dot{y}_2^2\right) \qquad (7)$$

4. *Revise*: Finding the result of eliminating the dependent velocities in the expression for T^* using the constraints equations and formulate the equations of motion in Chaplygin form Fufagev & Neimark [11]

$$T = \frac{1}{2}(\xi\dot{\varphi}) + \frac{1}{2}(\dot{\xi})^2 \qquad (8)$$

$$\frac{d}{dt}\frac{\partial T^*}{\partial \dot{q}^\alpha} - \frac{\partial T^*}{\partial q^\alpha} + \frac{\partial T^*}{\partial \dot{q}^\nu}\gamma_\alpha^\nu = 0$$

$$\gamma_\alpha^\nu = \frac{\partial \Psi^\nu}{\partial q^\alpha} - \frac{d}{dt}\frac{\partial \Psi^\upsilon}{\partial \dot{q}^\alpha},\ \dot{q}^\nu = \psi^\nu(q^\alpha, \dot{q}^\alpha), \tag{9}$$

And then $\dot{q}^3 = \dot{x}_1 = \xi\dot{\varphi}\sin\varphi = \psi^3,\ \dot{q}^4 = \dot{y}_1 = -\xi\dot{\varphi}\cos\varphi = \psi^4$

Students obtain the following equations of motion: $\ddot{\xi} = 0$, $(\xi\dot{\varphi}) = 0$

These equations can be integrated in succession giving

$$\dot{\xi} = C_1 = \dot{\xi}_0,\ \xi\dot{\varphi} = C_2 = \xi_0\dot{\varphi}_0 \tag{10}$$

$$\xi = \dot{\xi}_0 t + \xi_0,\ \varphi = \frac{\xi_0\dot{\varphi}_0}{\dot{\xi}_0}\ln\left(\dot{\xi}_0 t + \xi_0\right) + C_3 \tag{11}$$

5. *Retain*: In the special case when $\dot{\xi}_0 = 0$, the point of M_2 can be at rest of radius ξ_0, while the point of M_1 will move uniformly over the circle. If the point M_1 is at rest, the point M_2 will move uniformly along the fixed straight line. The boundary condition is: $\xi_0 = 1$, $\dot{\xi}_0 = 1$, $\varphi_0 = 1$, $\dot{\varphi}_0 = 1$

6. *Output*: Students solve the equation (6) and (11) on the laws of motion of the points M_1 (s = 1, $\delta_{21} = 0$) and M_2 (s = 2, $\delta_{22} = 1$) Thus, the solution is:

$$x_s = \frac{e^{t+1}}{2}\{\sin[\ln(t+1)] - \cos[\ln(t+1)]\} + \delta_{2s}(t+1)\cos[\ln(t+1)],$$

$$y_s = -\frac{e^{t+1}}{2}\{\sin[\ln(t+1)] - \cos[\ln(t+1)]\} + \delta_{2s}(t+1)\cos[\ln(t+1)]$$

STUDENTS FEEDBACK

In the end of this course, an in-depth interview was conducted to obtain the students feedback. Here are excerpts from several students:

- My cognitive skills were improved, and I hope we can get more supplement learning sources from instructors.
- My background knowledge was poorly. Science, Technology, Engineering and Mathematics could be improved is that the project-based learning would be generate and establish.
- CBR could be described insight of *dynamic systems* arises from the fact which considers the problem.
- That is a good course, but our practical solving ability was insufficient. I need to be developed much more trough metacognitive, practice and experience.

- NHM is too much equation, which means the workload and difficulty of individual pace is also different.
- The resources in the lab are not adequate, some special tools are not appeared, and I think that instructors must help and support for improving our achievement in the dynamic systems for a wide range of achieving.

Although the results found that guidance to improve in the future: self-directed active learning, task decomposition and learning strategies would be employed.

CONCLUSIONS

The course provides many students with their first face engineering education and previous experiences, as well as providing experience in derive the explicit equations of motion for mechanical systems that are subjected to non-holonomic constraints. The motion planning and control of mobile manipulators cannot be addressed by traditional methods due to the non-holonomic nature of the systems are imposed. The inclusions of NHM idea benefits students, who are able to solve the equations of the constraints of such a system, are derived. The learning outcomes provided to the students, metacognitive development, and the main challenges of administering such a course. For the future research, the course project and contest provides students achievement with the highlight of their undergraduate educational experience.

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