The Dominant of Bloggers in Malaysian Politics Through Social Networks

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ABSTRACT

Every country in this world has own political issues. In Malaysia for example, political issues played an important role that can influence other factors such as social and economy. As we all know, political factor can give positive and negative effect to a situation in Malaysia. The frequent usage of computer nowadays by Malaysian people helps in spreading information and news about political situation in Malaysia through cyberspace. In this paper, we use web mining system with Artificial Immune System (AIS) to regain a small group of relevant websites and webpages on political issues in Malaysia. To analyze the relationship between website and webpages, the concept of social networks will be used. Result from the web mining system with AIS will be used to understand the impact of social network to the political situation in Malaysia.

Keyword: Artificial Immune System, Web Mining, Political Social Network

Research Field: Information Technology

INTRODUCTION

The features of Web 2.0 technology in the World Wide Web will make Internet users much easier to communicate, sharing information, cooperate with other users and also increase creativity (Tim O'Reilly, 2005). The concept of Web 2.0 has led to the development and evolution of web community’s culture such as social networking sites, video sharing sites, wikis, blogs and folksonomy. These features will generate a social network concept. Social network concept exists when people are connected by the computer network. Social network can be defined as a set of people or organizations associated by a set of social relationships (B. Wellman, 1996). There are many social networking sites which uses a concept of social network such as Friendster, Facebook and YouTube. All of these applications provide many features that can help in building relationship between individuals in the communities. Nowadays, the social network applications has become most powerful tool that can give positive and negative effects to some organizations and global especially in the economy, social and politic factors.

Blog is one of the web applications which use the social network concept. Blog can be defined as journal based websites commonly use content management tools to allow the authors to post contents on the websites (Gordon, 2006). One of the popular examples of blog application is Wordpress.com. The statistic from wordpress.com shows that the numbers of blog publishers’ increased year by year. In 2008 there are 4.5 millions publishers uses WordPress.com as the blog publishing application and more than 200 million readers of wordpress.com blogs. This is due to the growth of Internet users in every country and it increases year by year.

In Malaysia, blog is one of the powerful weapons via cyberspace that have been used by certain people to influence readers by spreading news and information. The power of blogs gives a big impact to the political situation in the developing country like Malaysia. For example when the parliaments was presenting Malaysia’s budget 2009, bloggers played an important role to publish their opinions, rumours and information about Malaysia’s budget 2009 in their own blogs through cyberspace. It will influence the readers and directly give positive and negative effects to the political situation in Malaysia. This has been avowed by the former Minister of Information Malaysia, Datuk Seri Zainuddin Maidin which said blogs that spurred by politics can give influence to the readers and political situation in Malaysia. He believed that the power of blog can make political situation in Malaysia become worst if politicians or authors manipulate rumours and information for their own political issues or agenda (Utusan Online, 2007).
In this paper, we want to find relevant information from blog and website about political issues in Malaysia using our web mining system with AIS technique. Results from the web mining will be used to analyze the social network of weblogs and web pages and how it can make an impact to the political situation in Malaysia.

**PROBLEM BACKGROUND**

In Malaysia, weblog or blog has become a famous channel of web applications for everybody wants to express their feelings, publish opinions, story experiences and spread information. People can choose many types of blogs that have been provided by the open source blog such as WordPress.com and Blogger.com. Using this open source blog, Internet users can create their own free account to set up a weblog in a few minutes. With just one blog, individual that have their own blog can use a social network concept to build a community between the Internet users.

Blog sometimes can be a powerful tool for someone to cheat, provoke and give negative influence to a community. When it comes to the negative effect to the public, the blogger or owner of the blog can be directly involved to the cyber crime scene especially when it involves on political and social issues. Cyber crime in Malaysia is a very serious issues and it should be retained on because indirectly can make an impact to other factors in Malaysia such as political, economy and social. There are many cyber crime cases that make a big impact to the political issues in Malaysia. For example, cyber crime case on Raja Petra detention about political issues in Malaysia. Raja Petra who is one of the popular political blogger in Malaysia always writes articles commenting about arising issues in Malaysia especially in political issues (MalaysiaToday, 1998). He has been accused for publishing articles in his blog that allegedly ridiculed Islam and intentionally could threatening to Malaysian’s safety (Malaysiakini, 2008).

On the date of 8th March 2008, opposition party in Malaysia that have been represented by Parti Keadilan Rakyat (PKR), Parti Islam Se-Malaysia (PAS) and Democratic Action Party (DAP) has won many chairs in the parliaments and conquer five states in Malaysia’s 12th general election (The Star Online, 2008). Datuk Seri Lim Keng Yaik who is former Minister of Energy, Water and Communication said the victory of opposition party in Malaysia’s 12th general election was because of the usage of blogs to reach the voters (News Straits Times, 2008). Opposition party also used blog to build community in cyberspace, interact with public and raise funds for the party.

In Figure 1, it shows us how social network in political blog communities in Malaysia can influence Malaysian readers and directly affect the political situation in Malaysia. Politicians can use blog as a tool in reaching the voters and communicate to the public. They also need to write more blog posts about political issues in getting high ranking to be reviewed by readers (The Star Online, 2008). Politician also need to contribute into the political activity such as speech, attend public meeting and serving for local organization so that their blog can get more attention and influence online political citizen (Malaysiakini, 2008, The Star Online, 2008). From these facts, we believed that if the politician leaders are active in political activities and also active in posting articles in blog about political issues in Malaysia, it can make the blog relevant to be a political blog. Indirectly the blog can make influence to the political situation in Malaysia.

Based on this case study, we used web mining system with AIS technique to find weblogs and web pages that have relevant information about political issues in Malaysia. From the result we want to analyze how the social network between weblogs and web pages can influence the readers and effect the political situation in Malaysia.

**Related Works**

The widely usage of Internet nowadays has made people realized how important Internet can help to solve problems in their day life. But now, Internet also is a channel for people to enjoy themselves and
to make connection with other people. In the Internet, there are many types of web applications which use the social network concept such as social networking sites, weblog, forums and so on.

Social network is a concept of network that is made up of nodes and links where nodes are connected by links and each node have relationship between each other (Wasserman & Faust, 1994). There are many researches that study about social network in cyberspace. Nowadays there are also researches in social network about the impacts of social network to the global situation such as politic, economy and social (The Star Online, 2008, J. Graph, 2006, C. Yao-Jen, et al., 2007). Research about social network in cyberspace helps in finding and discovering the technology of web. For example, the discovery of technology of web in social network applications such as blogs, social networking sites and wikis. All of these applications will help users to build communities in cyberspace and sharing ideas, opportunities and knowledge. In this paper, we used social network concept to analyze the connection of web pages with the domain weblog and how the connection will impact to the political situation in Malaysia.

Figure 1 shows the examples of social network structure that have been created by the nodes and links.

Figure 2: Examples of social network structure

Sometimes, search tools are vital to find information on the web. Most of the search tools used the information from web search engine such as Google and Yahoo in finding the relevant web pages. Nevertheless, the amounts of information on the web always change and grows day by day because of that we need a technology to continuously being pushed to the limit. Web mining is one of the technologies in finding information on the web. Web mining is an application of data mining to discover pattern on the web. There are many researches uses web mining as tools to discover information (S.N.A Ibrahim, et al., 2008) and recognize pattern on the web (A. Secker et al., 2008).

In this paper, we used Artificial Immune system (AIS) technique to be implemented into the web mining system. AIS technique will help the web mining system to become more relevant in discovering the information of the user’s search. AIS can be defined as a computational system based upon metaphors of the natural immune system (Timmis, 2000). The usage of AIS technique in this web mining system is because of AIS features itself such as pattern recognition, autonomy, dynamically changing coverage, distributivity, noise tolerance, robustness and etc. In AIS, mathematical theoretical immunology models is been applied to other tasks such as information discovery (A. Secker et al., 2008), recommender for websites (T. Morrison, et al., 2002), optimization (F. Freschi & M. Repetto, 2006), and etc.

Web Mining Using Artificial Immune System

In this section, we explained more about our web mining system by using Artificial Immune System (AIS) and how it works to find relevant information to the user’s search. The motivation of doing research in this web mining is because we want to give a small amount of relevant web pages to user about political issues in Malaysia.

In AIS technique, we chose clonal selection model as a model to find the relevant information about political issues in Malaysia. We believed that by using clonal selection model; immune cells will be capable on recognizing and selecting cells to proliferate and differentiate into active cells so it can find relevant information on the web based on relevant web pages. According to the immune system theory, immune cell named B cell recognizes an antigen with a certain affinity. If the antigen selected to be active cells, it will proliferate and produces antibodies in high volumes (A. Secker et al., 2008). Figure 3 shows the framework of web mining system using AIS.

Figure 3: Framework of web mining using AIS

In the web mining system using AIS, the process follows the clonal selection algorithm. First, the web mining must need seed URLs and some keywords that are related about political issues in Malaysia from user. After that, AIS technique will play its role to create initial population and place cells at the starting web page based on the seed
URL. Then AIS take user’s keywords as active cells and recognizes all hyperlinks in starting web pages as antigen. From the starting page, the affinity of a cell with a web page is calculated using the keywords by user. The calculation of the affinity is calculated by using formula at Eq. (1), where the numbers of words based on user keywords (UK) that appear at starting page are counted and divided by the length of UK.

\[
\text{affinity} = \frac{\sum_{i=1}^{\text{UK}} \delta_i}{|\text{UK}|}
\]

where \( \delta_i = \begin{cases} 1 & \text{if } \text{UK}_i \in W \\ 0 & \text{otherwise} \end{cases} \)

![Figure 4: The flowchart of AIS process](image)

AIS will choose one of the antigens and access the affinity between antigen and antibody. This process will show how the affinity between starting web page and other web pages is being accessed and calculated. If the result of the affinity is greater or equal than the starting page then AIS will select that web pages and put it in the best population. Then crawl all the hyperlinks in the web page by clone and mutate cells and move the cells to find the hyperlinks. For web pages that have low affinity, first AIS will clone and mutate cells and move all cells to every hyperlink at the web page. After that, AIS mark the web page as bad antigen before removing it from the population. All the URL of selected web pages will be saved in the database. The AIS will loop the process starting from choosing the second URL until it reaches the specific amount of relevant web pages that will be needed by the user. Lastly, the web mining system will list all of the relevant URLs to user about political issues in Malaysia. Figure 4 shows the flowchart of AIS process in web mining system.

By using AIS theory, it shows that AIS is suitable in classifying how the AIS copes with the process in the web mining to find relevant information about political issues in Malaysian. Results from web mining will be used to analysis the social network between weblog and web pages. From that analysis, we want to make a conclusion on how political weblog can make an impact to political situation in Malaysia.

**Result and Discussion**

For this paper, the goal of this experiment is to demonstrate the practicability and accuracy rate of the result of web mining using AIS. We build this application by using PHP programming and run it through online. This web mining using AIS technique helps to search relevant weblogs and web pages about political issues in Malaysia by using seed URLs from two party leader’s weblog. We used weblog URLs from opposition party leader’s Dato’ Seri Anwar Ibrahim and Datuk Seri Mohd Ali Rustam from the government party. For keyword to system we use keyword such as “politik”, “Malaysia”, “UMNO”, “MCA”, “MIC”, “PAS”, “PKR” and “DAP”. From these two URLs and keywords, the results will show us who is actually the top leader that can influence the readers to the political situation in Malaysia by using their own blog. This is based on the assumptions that have been mentioned from the problem background section.

In this paper, we evaluated the result from web mining system based on the web mining system (automatic) classification. The results are calculated based on the precision, recall and F1 (S.N.A Ibrahim, et al., 2008, N. H. Zainuddin, 2006). Precision (P) in this web mining is defined as the percent of retrieved relevant web pages by system. Recall (R) is defined as the percent of a fraction of all relevant web pages retrieved. F1 is defined as a measure of a test’s accuracy.
Table 1: Results from web mining system

* URL 1 = http://www.mohdalirustam2.blogspot.com
URL 2 = http://www.anwaribrahimblog.com

\[
P = \frac{\text{Number of relevance web pages}}{\text{Total of web pages}}
\]

\[
R = \frac{\text{Number of relevance web pages}}{\text{Total of relevant web pages}}
\]

\[
F1 = \frac{2 \times P \times R}{P + R}
\]

Table 1 shows the result from web mining using AIS and average result of calculation using precision, recall and F1 method. From the results, after 10 iterations the numbers of relevant web page from URL 1 is less than URL 2. This is because, the results of the experiment after 10 iterations shows the numbers of relevant web pages from URL 1 (6289) that have been which is less than URL 2 (3565). Based on the assumptions, results shows that the weblog that been owned by Dato’ Seri Anwar Ibrahim is more relevant to be a political weblog and can make an impact to the political situation in Malaysia rather than weblog that have owned by Datuk Seri Mohd Ali Rustam. Figure 5 and 6 show the visualization of social network from seed URL 1 and seed URL 2. These figures show several web pages that have connection with seed URL 1 and seed URL 2 based on the affinity.
Based on the precision graph and recall graph, precision performance is better than the recall performance. For precision, it shows that average results of URL 1 (35.65%) and URL 2 (62.89%) is better than recall average result for URL 1 (9.99%) and URL 2 (10.00%). In precision results, it shows that every retrieval web pages consists of relevant user’s information about political issues in Malaysia. In recall graph, it shows that not every relevant web page was successfully retrieved and displayed to the user. For F1, the graph shows us that the accuracy of web mining in finding relevant web pages about political issues in Malaysia which is still low and need to be improved for further experiment. My assumptions is that web mining that using AIS technique maybe need a lot of relevant keywords from user to find more relevant political issues in Malaysia based on the accuracy rate.

CONCLUSION

After completing the experiment in finding the relevant web pages about political issues in Malaysia using web mining with AIS, we found that our web mining has low accuracy rate and this web mining must be improved for further experiment to get a better results for finding relevant information on the web. For future, we will use web mining with AIS to analyze the social network in cyberspace about political issues in Malaysia and how it can create an impact to the political situation in Malaysia.

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INFORMATION SECURITY AND ETHICS IN EDUCATIONAL CONTEXT: THE DEVELOPMENT OF CONCEPTUAL FRAMEWORK TO EXAMINE THEIR IMPACT

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ABSTRACT

Information security and ethics are viewed as major areas of interest by many academic researchers and industrial experts. Information security and ethics is defined as an all-encompassing term that refers to all activities needed to secure information and systems that supports it in order to facilitate its ethical use. In this research, the important part of current studies introduced and the fundamental concepts of a security framework are explained. To achieve the goals of information security and ethics, suggested framework discussed from educational level to training stage in order to evaluate computer ethics and its social impacts. Using survey research, insight is provided regarding the extent to which and how university student have dealt with issues of computer ethics and to address the result of designed computer ethics framework on their future career and behavioural experience.

1. INTRODUCTION

The current development in information and communication technologies have impacted all sectors in our daily life where does not matter whether it is technical or routine. To ensure effective working of information security, various controls and measures had been implemented as the current policies and guidelines between computer developers (Hamid, 2007). However, lack of proper computer ethics within information security is affecting educational society day by day.

Undoubtedly, the most important of these controls is to define an understandable framework or model for students who roles future computer engineer or scientist. Hence, this project examines awareness and information of students in computer ethics from educational aspect. Also from Malaysian perspective, review of related research (Maslin & Zuraini, 2008) indicates the existence of conflicting views concerning the ethical perceptions of students. In today’s global economy, computer security and computer ethics awareness is an important component of any management information system (North, et al. 2006).

It would an undeniable element of security in Malaysian computer technology as Malaysia is ranked 8 out of 10 top infected countries in the Asia Pacific region as a target for cyber attackers (Sani, 2006). Indeed, points out that there is a need to understand the basic cultural, social, legal and ethical issues inherent in the discipline of computing. For these reasons, it is essential that as a future computer professionals are taught the meaning of responsible conduct (Langford, 2000).

As the computer ethics was one of the major topics which have been throughout the past decades, in order to prevent the people from the social impact, therefore in this part of introduction, we have a short milestone on computer ethics and related history of designed. During the late 1970s, Joseph Weizenbaum, a computer scientist at Massachusetts Institute of Technology in Boston, created a computer program that he called ELIZA. In his first experiment with ELIZA, he scripted it to provide a crude imitation of a psychotherapist engaged in an initial interview with a patient. In the mid 1970s, Walter Maner began to use the term “computer ethics” to refer to that field of inquiry dealing with ethical problems aggravated, transformed or created by computer technology.

Maner offered an experimental course on the subject at University. During the late 1970s, Maner generated much interest in university-level computer ethics courses. He offered a variety of workshops and lectures at computer science conferences and philosophy conferences across America.

By the 1980s, a number of social and ethical consequences of information technology were becoming public issues in the world, issues like computer-enabled crime, disasters caused by computer failures, invasions of privacy via computer databases, and major law suits
regarding software ownership. Because of the work of Parker and others, the foundation had been laid for computer ethics as an academic discipline. In the mid-80s, James Moor of Dartmouth College published his influential article "What is Computer Ethics? In Computers and Ethics, a special issue of the journal on that particular time.

During the 1990s, new university courses, research centers, conferences, journals, articles and textbooks appeared, and a wide diversity of additional scholars and topics became involved. The mid-1990s has heralded the beginning of a second generation of Computer Ethics which contain the new concept of security. The time has come to build upon and elaborate the conceptual foundation whilst, in parallel, developing the frameworks within which practical action can occur, thus reducing the probability of unforeseen effects of information technology application.

In 2000s, the computer revolution can be usefully divided into three stages, two of which have already occurred, the introduction stage and the permeation stage. The world entered the third and most important stage "the power stage" in which many of the most serious social, political, legal, and ethical questions involving information technology will present themselves on a large scale. The important mission in this era is to believe that future developments in information technology will make computer ethics more vibrant and more important than ever. Computer ethics is made to research about security and it’s beneficial aspects.

The remainder of this paper is organized as follows: section 2 describes the details of DAMA framework by further phases on section 3. In section 4 the related theories are discussed from ethical views.

2. FRAMEWORK

We have developed a framework for development of information security with computer ethics respect to educational conception. The further discussion follows the exact code of ethics which are including Privacy, Property, Accuracy and Accessibility. As Fig. 1 depicts, DAMA (Delimma, Attitude, Morality, Awareness) framework examines information security and computer ethics from two major dimensions: the educational and security training. In addition DAMA framework are also explored to suggested the educational core of computer ethics which is the effective ways to teach information security along with computer ethics from the basis of educational level rather than higher level.

The educational dimension is focusing on the core of information security which considers along with awareness, morality, attitude and dilemma. In fact, educational dimension is explored from various perspectives to have relevance for group rather than individuals where the main focus of this issue has been mentioned in training level. Examples of questions in order to guide the development of DAMA framework references include: have you ever heard about computer ethics? What are ethical dilemmas and its social impacts?

The other main phase of educational dimension is moral development that includes personal beliefs related to their background of computer ethics. In fact, it focus on morality and further effectiveness that how individual morality can change their attitude and therefore acquire appropriate awareness hence evaluate ethical dilemmas.

![Fig. 1 DAMA Framework.](image-url)

Moreover, security and training dimension is what students themselves manifest core of information security along with the help of formal and informal discussion. The security dimension includes informal discussion of common mistakes that happens among most of security consultant and officers which are relevant to information security ethics. It includes discussions of specific exploits of current weaknesses and may result as unethical behaviour. The goal of security dimension is to communicate students from technical perspective to theoretical training.

DAMA approaches present methods and creative ideas for teaching of computer ethics with respect of information security for diverse audiences. The framework’s dimensions cover the basic levels for computer ethics lectures and class room discussions related to ethical behaviour of future computer scientists. The main emphasis is to presents creative and beneficial methods for learning experiences in various kinds of information security ethics. The authors place particular focus that will require students to build and rebuilt their beliefs in different ways in order to know unethical behaviours and their social impact on their future career.

3. EDUCATIONAL DIMENSION

3.1 DAMA

Computer education now begins in elementary school and is no longer a restricted technical specialty learned
only by those who are going to design or program computers. Because of the widespread prevalence of computers in society a core of ethical precepts relating to computer technology should be communicated not only to computer professionals, but to the general public through all levels of education. The issue should be viewed from the perspective of society and perspective of computer professionals (Spinello, 2003).

In looking at the computer ethics there is a great emphasis upon incorporating ethical and social impact issues throughout the curriculum starting at the point when children first become computer users in school. In particular, there are a set of guidelines regarding what students in general need to know about computer ethics. The preparation of future computer professionals should be examined at both the high school and university computer science curriculum (Forcht, et al., 2004).

The researchers (Maslin & Zuraini, 2008) are in the process of developing new recommendations at both levels of curriculum. In the high school curriculum, there will be both general and specific approaches to ethics and social impact issues.

The general approach is to incorporate these concerns across the curriculum, not just in computer courses. This is in keeping with the philosophy that computers should be integrated across the curriculum as a tool for all disciplines. The specific approach is to develop social impact modules within the computer courses that will focus on these concerns (Foster, 2004).

At the university level the researchers faces a yet-to-be resolved dilemma of how to implement the proposed societal strand in the new curriculum recommendations. There is much discussion, but little action, regarding the necessity of preparing ethically and socially responsible computer scientists, especially in light of the highly publicized computer viruses that are an embarrassment to the profession. When combined with other computer science core material, the teaching of ethics is made complicated by the fact that it is not as concrete as the rest of the curriculum. In accepting the value-laden nature of technology, researchers should recognize the need to teach a methodology of explicit ethical analysis in all decision-making related technology. The moral development is at the heart of interest in the morality element. In this model (Dark, et al., 2006), researchers wanted to create educational opportunities that allow students to examine their existing beliefs regarding ethical and technical issues and in relation to existing technical, professional, legal, and cultural solutions. In an earlier section, it described how students examine these solutions with an external, objective point of view.

Now, the student is positioned at the centre of the intersecting circles. The is aim to create educational opportunities that allow and encourage students to explore “who am I now” in relation to technical, professional, cultural, and legal solutions to these ethical and security issues, and asks questions such as “what is the relationship between who am I, who I want to be, and these issues and solutions”?

The most important factor in effective computer security is people’s attitudes, actions, and their sense of right and wrong (Huff & Frey, 2005). Problems and issues raised in the computing environment, Topics to be discussed include misuse of computers, concepts of privacy, codes of conduct for computer professionals, disputed rights to products, defining ethical, moral, and legal parameters, and what security practitioners should do about ethics.

The issue of computer security has fallen into the gray area that educators and industry alike have avoided for fear that too little knowledge could be hazardous and too much could be dangerous. Most organizations acknowledge the need for data security, but, at the same time, approach security as hardware. It may be more important, and far more successful to address the issue of data security as an attitude rather than a technology.

### 3.2 PAPA

According to (Mason, 1986) decision makers place such a high value on information that they will often invade someone's privacy to get it. Marketing researchers have been known to go through people's garbage to learn what products they buy, and government officials have stationed monitors in restrooms to gather traffic statistics to be used in justifying expansion of the facilities.

These are examples of snooping that do not use the computer. The general public is aware that the computer can be used for this purpose, but it is probably not aware of the ease with which personal data can be accessed. If you know how to go about the search process, you call obtain practically any types of personal and financial information about private citizens. Here four major aspect of Mason’s theory shall be studied:

#### 3.2.1 Privacy

Privacy may define as the claim of individuals to determine for themselves when, to whom, and to what extent individually identified data about them is communicated or used. Most invasions of privacy are not this dramatic or this visible. Rather, they creep up on us slowly as, for example, when a group of diverse files relating to a student and his or her activities are integrated into a single large database.

Collections of information reveal intimate details about a student and can thereby deprive the person of the opportunity to form certain professional and personal relationships. This is the ultimate cost of an invasion of privacy. So why integrate databases in the first place. It is because the bringing together of disparate data makes the development of new information relationships possible.

#### 3.2.2 Accuracy

Accuracy represents the legitimacy, precision and authenticity with which information is rendered. Because of the pervasiveness of information about individuals and organizations contained in information systems, special care must be taken to guard against errors and to correct
known mistakes. Difficult questions remain when inaccurate information is shared between computer systems. Any framework should describe the legal liability issues associated with information. Who is held accountable for the errors? This is an important question may come across every researcher’s mind or which party liable for inexact or incorrect information that leads to devastation of another.

3.2.3 Property
One of the more controversial areas of computer ethics concerns the intellectual property rights connected with software ownership. Some people, like Richard Stallman who started the Free Software Foundation, believe that software ownership should not be allowed at all. He claims that all information should be free, and all programs should be available for copying, studying and modifying by anyone who wishes to do so. Others argue that software companies or programmers would not invest weeks and months of work and significant funds in the development of software if they could not get the investment back in the form of license fees or sales (Mason, 1986).

Today’s software industry is a multibillion dollar part of the economy; and software companies claim to lose billions of dollars per year through illegal copying. Many people think that software should be own able, but “casual copying” of personally owned programs for one’s friends should also be permitted. The software industry claims that millions of dollars in sales are lost because of such copying.

3.2.4 Accessibility
Accessibility represents the legitimacy, precision and authenticity with which information is rendered. Regarding this important aspect of research this question may come across the people’s mind who is held accountable for errors? Who can you trust in order to outsource your project? In fact, in term computer ethics accessibility means, what kind of information would available for the legal users and students.

4. SECURITY AND TRAINING LEVEL
In terms of computer ethics, security would be an undeniable factor of it. Therefore, short review on information security which is influence in computer ethics will help the researcher to identify the further study. Many different terms have been used to describe security in the IT areas where information security has become a commonly used concept, and is a broader term than data security and IT Security. Information is dependent on data as a carrier and on IT as a tool to manage the information.

Information security is focused on information that data represent, and on related protection requirements. So the definition of information system security is “the protection of information systems against unauthorized access to or modification of information, whether in storage, processing or transit, and against the denial of service to authorized users or the provision of service to unauthorized users, including those measures necessary to detect, document, and counter such threats”. Four characteristics of information security are: availability, confidentiality, integrity and accountability, simplified as “the right information to the right people in the right time”. Availability: concerns the expected use of resources within the desired timeframe. Confidentiality: relates to data not being accessible or revealed to unauthorized people Integrity: concerns protection against undesired changes. Accountability: refers to the ability of distinctly deriving performed operations from an individual. Both technical and administrative security measures are required to achieve these four characteristics.

4.1 Technical level security
From a technical perspective, the preservation of confidentiality, integrity availability and accountability requires the adoption of IT security solutions such as encryption of data and communication, physical eavesdropping, access control systems, secure code programming, authorization and authentication mechanisms, database security mechanisms, intrusion detection systems, firewalls. At this level it is possible to introduce frameworks and methods for the selection of the appropriate technological solution depending on the needs for a particular application with respect to security in computer ethics.

4.2 Formal level security
The formal level of information security is related with the set of policies, rules, controls, standards, etc. aimed to define an interface between the technological subsystem (Technical level) and the behavioural (computer ethics) subsystem (Informal level).

According to many definitions of an information security, this is the level where much of the effort of the information security is concentrated. An interesting review of the security literature identifies a trend in information system research moving away from a narrow technical viewpoint towards a socio-organizational perspective.

4.3 Informal level security
In the domain of the informal level of information security, the unit of analysis is individual and the research is concerned about behavioural issues like values, attitude, beliefs, and norms that are dominant, and influencing an individual employee regarding security practices in an organization. The solutions suggested in this domain are more descriptive than prescriptive in nature and the findings at this level need to be effectively implemented through other levels (i.e. formal and technical). An interesting review of research papers in the behavioural or computer ethical domain is, looking at used theories, suggested solutions, current challenges, and future research (Bynum, 2006) .
5. THEORIES PERSPECTIVE

Ethics is an important facet of comprehensive security of information system’s security. Research in ethics and information systems has been also carried outside the information security community. Anyhow, researcher sees that the relationship of hackers and information security personnel has not yet been properly analyzed. Within this short review, a philosophical point of view shall be taken, and problems of establishing ethical protection measures against violations of information security shall be studied.

Further analysis leads to quite opposite results of the main stream arguments that support the need of common ethical theories for information security. This addition provides with a framework that is feasible within the current technology, supports natural social behaviour of human beings and is iterative enabling forming of larger communities from smaller units.

Recently, the trend appears to be that the ethics approved by the security community is having the law enforcement (Cruz & Frey, 2004). Several attempts around the world are made to enforce proper behaviour in the information society by theoretical methods. From information security point of view, hackers are seen as criminals, unaware of the results of their immoral activities making fun out of serious problems.

Hacker community, on the other hand, sees information security staff as militants that respecting the freedom of individual and information (Fowler, 2004). Further depth into the conflict can be found by introducing another dimension to the classification of ethical theories into two categories: Phenomenologist vs. Positivist and individualist vs. collectivist ethics.

**Phenomenologism vs. Positivism:** According to the phenomenological school, what is good is given in the situation, derived from the logic and language of the situation or from dialogue and debate about “goodness”. Positivism encourages s to observe the real world and derive ethical principles inductively.

**Individualism vs. Collectivism:** According to the individualistic school, the moral authority is located in the individual whereas collectivism says that a larger collectivity must care the moral authority. Major schools, based on these concepts, can be listed to be Collective Rule-Based Ethics, Individual Rule- Based Ethics. A detailed analysis of these schools is provided by (Leiwo & Heikkuri, 1998).

Also from distributed information systems perspective security of information systems requires both technical and non-technical measures, special effort must be paid on the assurance that all methods support each other and do not set contradictory or infeasible requirements for each other which contain two major theoretical elements:

**Ethics negotiation phase** is where organizations or individuals representing themselves negotiate the content of ethical communication agreement over specific communication channels.

**Ethics enforcement phase** is where each organization enforces changes in the ethical code of conduct by specifying administrative and managerial routines, operational guide lines, monitoring procedures, and sanctions for unacceptable behaviour. Organizations or university individuals involved in negotiation should code desired ethical norms in terms of acceptable behaviour within the information processing. Agreement should be searched and once reached, contract made and agreed norms enforced throughout the organization. In the optimal case, ethics has the law enforcement and juridical actions against violations can be prosecuted in court.

6. CONCLUSION

Educational centers within higher educational level have unique opportunity to help and educate computer users in order to face with ethical dilemmas. Therefore, this would be the main challenge of this study to focus on computer ethics with the help of suggested framework. As a result, computer ethics is becoming a field in need of research based upon a necessity to provide information for education which is related to security concepts. The legal structure appears to be limited in its ability to provide ethical behaviour effectively. While not wishing to be alarmists, research suggests the needs to be concerted effort on the part of all the computer professional societies to update their ethical codes and to incorporate a process of continual security.

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MAPPING MARMOT PROCESS MODEL INTO PECOS COMPONENT INFRASTRUCTURE FOR EMBEDDED REAL-TIME SYSTEM

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ABSTRACT
Embedded software development requires multidisciplinary knowledge including software, mechanical and electronic engineering fields. Engineers struggle hard to master the pitfalls of modern, complex embedded systems, but often they only approach the problems from their individual perspectives. What is really lacking is a vehicle to transport the recent advances in software engineering and component technologies into the embedded world in a way that engineers of the three disciplines can actually communicate and understand each other. Beside that, in software development of embedded real time (ERT) system, software functionality is not only focus but non-functionality such as timing, resource constraint etc is also an important focus. This will increase the complexity of the software development for ERT system. To meet these challenges, ERT software developer must be able to cope with complexity, communicate and understand each knowledge involves, to quickly adapt to the changes and capable to support extra-functionality. A solution approach receiving increased attention is components-based software for ERT systems. Therefore, methodological support is important to enable systematic development of component based software. This paper will propose integrate MARMOT model and PECOS component model as a methodological support, whereby MARMOT is used to solve multidisciplinary knowledge and PECOS to solve multi constrain (focus on timing).

Keywords—Component-based software and embedded real-time systems

1. INTRODUCTION

In software development of embedded real time (ERT) system, software functionality is not the only focus but extra-functionality such as timing, resource constraint etc is also an important focus. This will increase the complexity in software development for ERT system (Yen, et al, 2002) (Martin, et al, 2007). To meet these challenges, ERT software development must be able to cope with complexity, to adapt quickly to changes and capable to support extra-functionality. Existing industrial component model technologies such as OMG’s CORBA Component Model (CCM), Microsoft’s (D)COM/COM++, .NET, SUN Microsystems’ JavaBeans and enterprise JavaBeans, are not suitable to develop ERT systems because they do not address the non-functional properties in ERT systems. To meet the requirement of ERT systems, a number of component technologies such as PBO (Stewart, et al, 1997), Koala (Ommering, et al, 2000), PECOS (Nierstrasz, et al, 2002), KobrA (Colin Atkinson, et al, 2000) with extension of MARMOT method to support ERT system and ReFlex (Wall, et al, 2003) have emerged. All of these ERT component models have their own unique strengths to support their nature of ERT problem domain. PBO was developed for control of manipulator robotics, Koala for consumer products, KobrA is for software product line, PECOS for field devices systems and ReFlex for product-line real-time systems. Beside the focus on non-functional properties embedded software development requires multidisciplinary knowledge including software engineering, mechanical and electronic fields. Engineers struggle hard to master the pitfalls of modern, complex embedded systems, and often they only approach the problems from their individual perspectives (Bunse, et al, 2007). What is really lacking is a vehicle to transport the recent advances in software engineering and component technologies into the embedded world in a way that engineers of the three disciplines can actually communicate and understand each other (Bunse, et al, 2006). Therefore, Method for Component-Based Real-Time Object-Oriented Development and Testing (MARMOT) has emerged as a development method for mastering multi-disciplinary (involving mechanical, electronic and software engineering) embedded systems
development. MARMOT has more features that are particularly important in embedded real time development system such as hardware integration, real time specification, aspect orientation and scheduling (Atkinson, et. al, 2002). MARMOT is based upon fundamental principles, such as software or hardware integration, real time specification, aspect orientation and scheduling that are fully in line with the KobrA method. A weakness of the KobrA method is it does not have capability to support the non-functional requirements (Khan, et. al, 2006). Through MARMOT has the advantages of focusing on multi-disciplinary knowledge and can support non-functional requirement. From the previous evaluation MARMOT still has two disadvantages. The first one is it cannot support software component at details level. The second one it has no method interfaces for component communication.

Accordingly to overcome weaknesses of MARMOT method, PECOS component technology will be used to support software component at details level and method interfaces. Jawawi, at, al. (2004) identified the strengths of PECOS component model for ERT systems among them are light-weight component model, industrial recognized component model, support of development of platform independent component based systems and support predictable real-time performance ERT system.

Component technologies especially from the major organisation such as Microsoft, Sun and OMG are becoming widespread and better known. Nowadays, component technologies allow us to specify a component using a common language, component middleware and component architecture. However, methodology hasn’t caught up on the move towards component software (Poels and Dedene, 2000). Technology alone is not enough to build the component software system, thus methodological support also equal importance. Therefore, this paper propose process model beginning from analysis phase, early design phase, detail design phase, integration, composition right to implementation phase.

Overview of MARMOT method will describe in Section 2. Section 3 will elaborate briefly of PECOS component model. Meanwhile, Section 4 describes the process model that proposed and the implementation of case study will describe in Section 5. Meanwhile, Section 6 will be discussing and concluding the process model to support component base software development for ERT system.

2. OVERVIEW OF MARMOT METHOD

MARMOT stands for Method for Component-Based Real-Time Object-Oriented Development and Testing (MARMOT). The growing complexity of the system requires well-structured approaches, which in turn increases the possibilities for reusability. Reuse can be seen as a major driving force in hardware and software development. The MARMOT method is introduced to facilitate component-based structuring and reused in embedded systems development. MARMOT is an extension to the KobrA method. MARMOT adds concepts addressing the specific requirements of developing embedded systems. Composition is a key activity in component-based development with MARMOT. A system is viewed as a hierarchy of components, in which the parents/child relationship represents composition. The component within an embedded system belongs to one out of three groups or types: 1. Software 2. Hardware (divided into electronics, mechanics and mechatronics components) 3. Software/hardware components (Bunse, et. al, 2006). Software and hardware components are treated in the same logical way. In principle, hardware components in an embedded system typically consist of the hardware itself and a device driver to communicate with the software. For CBD, additional interface definition is required which follows the same standard as that for software components. Therefore, a “hardware wrapper” must be devised to provide such an interface, and the one that triggers the events concerning hardware interruptions, and passes calls and parameter’s device driver. The wrapper and the device driver hide hardware-specific details and allow the component to participate in remote method calls (Bunse, et. al, 2006).

2.1 MARMOT Process Model

The core principle of MARMOT is separation of concerns, as it associates its main development effort with two basic dimensions that map four basic activities. The two dimensions can be show in Figure 1. The two dimensions are composition/decomposition dimension and abstraction/concretisation dimension.

PECOS component model was originally developed for field device systems. PECOS component consists of two main parts, i.e. the static structure model which
describes the entities included in the model, their features and properties; and the execution model which defines the behavior of the component execution. The following Subsection describe each parts in detail.

3.1 Static structure model

There are three main entities in the PECOS model: Components, ports and connector (Genssler et. al, 2002). Components are used to organize the computation and data into parts that have well-defined semantics and behavior. A port is a reference to data that can be read and written by a component and enables a component to be connected to another component through a connector. Data passed over the port is specified with name, type, range and direction (in, out or inout). Only compatible ports can be connected with connectors. Components can be any of three types: active, passive or event component. Active components have their own thread of control; passive components do not have their own thread of control; and an event component is a component that is triggered by event.

PECOS components can be hierarchically built from other subcomponents. A component which contains subcomponents or children is called a composite component or a parent component, and these subcomponents are not visible outside the composite component.

The components composition using PECOS static structural model is performed by connecting the compatible ports between components. Figure 2 shows two active components: MotorSpeedControl and PI marked with “$\mathcal{P}$” at the upper right corner, and two passive components: Encoder and Motor.

![PECOS structure model for a motor speed control application](image)

Fig. 2: PECOS structure model for a motor speed control application

3.2 Execution model

There are two different behaviors associated with active and event components: execution behavior and synchronization behavior. Execution behavior determines the action that is performed when the component is executed while the synchronization behavior is responsible for synchronizing the data space of the active or event component with that of the parent (Genssler et. al, 2002).

4. PROCESS MODEL PHASE

This process model proposed includes six phase for ERT system development as shown in Figure 3. The first phase is analysis phase where in this phase developer must model the requirements into use case diagram. At the same level, the use case will be described in detail with description table and interaction model shows use case.

The second phase is early design where in this phase developer must define possible class diagram and the operation specification. Class diagram can be component in this stage. After that, activity diagram must be defined to know more details about data input and output.

At the third phase, containment hierarchy will be produced where many class diagrams can be grouped in one package. In this level, each package must define the in port which shows data receive by the package or out port data that will be send respectively from that package.

The fourth phase is the integration phase where integration diagram will be produced based on previous phase. This integration tries to connect more than one package or component to develop new application.

The fifth phase, composition phase will produce composition diagram that includes the runtime behavior.

Last phase, implementation phase is the code template where user can modify the code to adapt it to the environment as needed.

![Process Model Phase for ERT system](image)

Fig. 3: Process Model Phase for ERT system

5. THE IMR 71848 CASE STUDY

Intelligent Mobile Robot (IMR71848) will be use as a case study in this paper. This robot software project is being prepared as part of a working group in UTM71848RG. The parent project is funded under UTM grant, vot number 71848.

The first phase on the process model proposed earlier, starts with model of the requirement for IMR 71848 using
Use Case Diagram as shown in Figure 4 followed by Use Case Description in Table 1 to elaborate the details of use case. For details about the interaction between user and the system can be seen in Figure 5. Unified Modeling Language (UML) 2.0 is used to design the use case diagram and interaction model.

Fig. 4: IMR 71848 Use Case Diagram: Analysis Phase

Table 1 IMR 71848 Use Case Description: Analysis Phase

<table>
<thead>
<tr>
<th>Name</th>
<th>Avoid Obstacle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actor</td>
<td>User</td>
</tr>
<tr>
<td>Goal</td>
<td>The IMR 71848 cruises around the environment to find the passage</td>
</tr>
<tr>
<td>Description</td>
<td>The robot needs to avoid obstacles that exist within its environment</td>
</tr>
<tr>
<td>Exception</td>
<td>N/A</td>
</tr>
<tr>
<td>Rules</td>
<td>N/A</td>
</tr>
<tr>
<td>Quality Requirement</td>
<td>N/A</td>
</tr>
<tr>
<td>I/O</td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>IR Proximity</td>
</tr>
<tr>
<td>Output</td>
<td>Motor Speed</td>
</tr>
<tr>
<td></td>
<td>Display robot status at LCD</td>
</tr>
</tbody>
</table>

Table 2 IMR 71848 Operation Specification: Early Design Phase

<table>
<thead>
<tr>
<th>Name</th>
<th>Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Uses two types of sensor: IR Proximity Sensor to detect the presence of obstacles during the movement of the robot and IR Distance Sensor to estimate the distance of obstacles and walls from the robot’s current location. Switches: operator switch on, operator switch off, operator switch go and operator switch stop. In addition, encodes change of the tuning pulses that read the speed value of the motor.</td>
</tr>
<tr>
<td>Constrain</td>
<td>Encodes 50 millisecond – 100 millisecond</td>
</tr>
<tr>
<td></td>
<td>Switches 1 sec – 2 sec</td>
</tr>
<tr>
<td></td>
<td>IR Proximity Sensor 0.5 sec – 1 sec</td>
</tr>
<tr>
<td></td>
<td>IR Distance Sensor 1 sec – 2 sec</td>
</tr>
<tr>
<td>Return</td>
<td>Controls speed and avoids obstacles while displaying information of the status for monitoring purpose</td>
</tr>
<tr>
<td>Sends</td>
<td>IR Proximity Sensor</td>
</tr>
<tr>
<td></td>
<td>IR Distance Sensor</td>
</tr>
<tr>
<td></td>
<td>Digital camera</td>
</tr>
<tr>
<td></td>
<td>Motor</td>
</tr>
<tr>
<td></td>
<td>Encoder</td>
</tr>
<tr>
<td></td>
<td>Switches</td>
</tr>
<tr>
<td></td>
<td>LCD</td>
</tr>
<tr>
<td></td>
<td>RF transceiver</td>
</tr>
</tbody>
</table>

At the detail design phase, knowledge from PECOS component model is used to design the component and MARMOT method is used to identify the relationship between components as shown in Figure 7.

Fig. 5: IMR 71848 Interaction Model: Analysis Phase

At the early design, class diagram as shown in Figure 6 is produced where application IMR 71848 connects with other components such as controller, driver, and movement component. In addition, Table 2 describes the operation specification that includes description of the operation sensor, constrain, data return and send.

Fig. 6: IMR 71848 Class Diagram: Early Design Phase
For the integration phase each component that matches will be connected. The connection did not only consider the in / out port only but it is also based on several other rules such as maximum and minimum value, types of data return or send etc.

The MobileRobot component composition of Figure 8 is mapped to a task which executes sequentially two passive components IRSensor and Distancesensor; and six synchronization parts of its child components, i.e. Avoid, Cruise, Subsumption, motorctrl-right, motorctrl-left and manrobotintf.

Figure 9 shows the example of template code for the motorControl component.

```c
#include "pecos.cfg.h"
#include "pecos.h"

void MobileRobot (void* data) {
    // EXECUTION PART
    // Execute all passive components
    EXEC<IRSensor>();
    EXEC<Distancesensor>();

    EXEC<Avoid>();
    EXEC<Cruise>();
    EXEC<Subsumption>();
    EXEC<motorctrl-right>();
    EXEC<left>();

    // EXECUTION PART
    EXEC<Sync<manrobotintf>>();

    // Call RT to create periodic execution
    SYSTimeDelay(MOBILEROBOT_PERIOD);
}
```

6. DISCUSSION AND CONCLUSION

The main objective of using hybrid component technologies in our work is to support process model flow from analysis to code template for ERT system development. Two component technologies is used in this paper are KobrA and PECOS component technology.
Due to the inability of KobrA to support ERT system, its extension component technology, MARMOT is used in this research. Base on our previous work MARMOT model is good in component modelling and graphical component but it cannot support software component at detail design level and no method interfaces for component communication available. PECOS component technology cannot support component modelling but it good support software component at details design and clearly present interfaces for component communication. PECOS component technology is used to support detail design, integration and composition phase. As known object oriented analysis and design method become matures but for component oriented analysis and design in beginning stage. This paper showed the flow of process model by integrating the two component technologies which are KobrA and PECOS component technologies. Therefore, this process model proposed earlier hopefully can support component oriented methodological and can support component oriented analysis and design to enable systematic development for ERT system

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