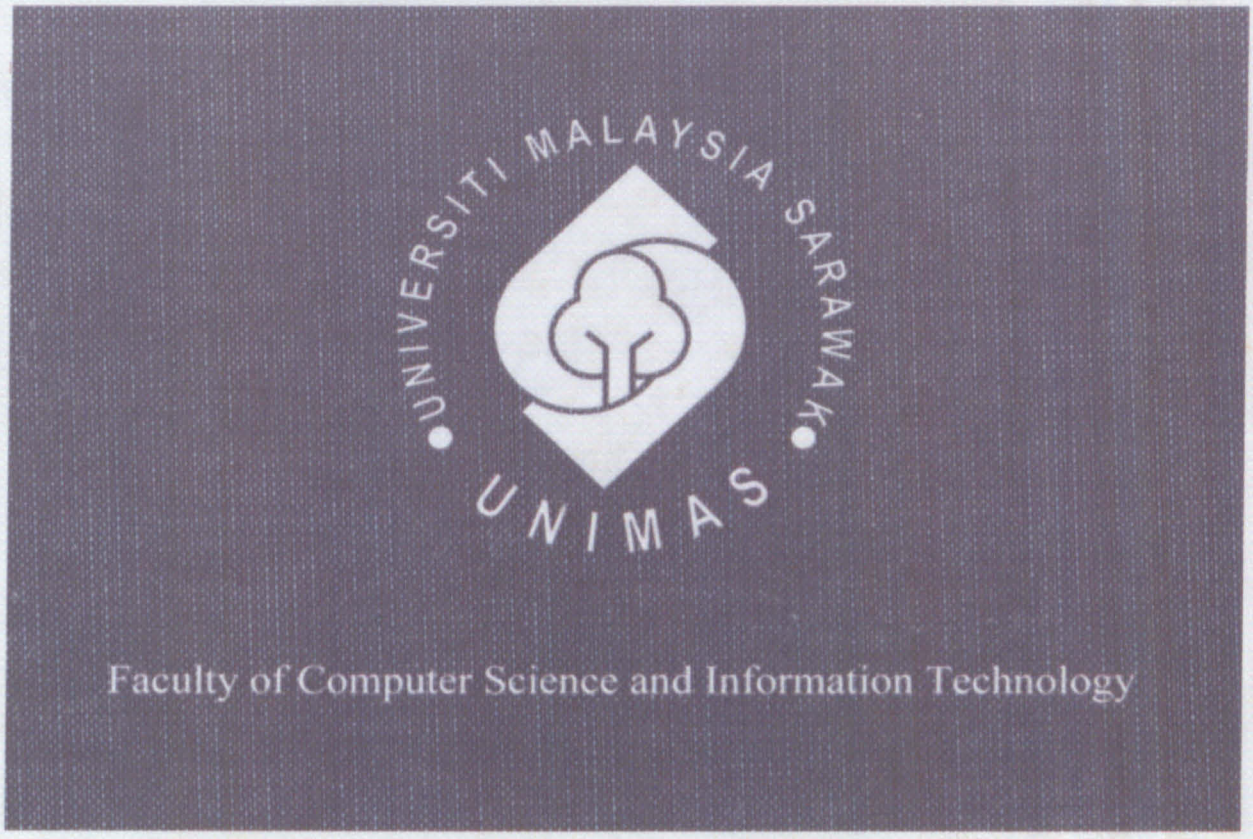

MANUFACTURING PROCESS OF LOCAL WINE (TUAK)

Teresa Susila anak James

Bachelor of Computer Science with Honours
(Software Engineering)
2014

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TERESA SUSILA ANAK JAMES

This project is submitted in partial fulfillment of the requirement
for the degree of
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Faculty Computer Science and Information Technology

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PROSES PEMBUATAN WAIN TEMPATAN (TUAK)

TERESA SUSILA ANAK JAMES

Project ini merupakan salah satu keperluan untuk
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ABSTRACT

Tuak is a welcoming drink that is usually served by the Dayak community in Sarawak during Gawai – a celebration which is for religious purpose and for social event which is celebrated on the 1st of June; every single year. Tuak also served during the other occasions such as wedding; as a sign of respect to the guest. There are numbers of Tuak in Sarawak; but the most famous Tuak is Tuak Beras. Traditionally, Tuak is made by using a traditional process, and the amount for every ingredient used is not fixed. The Manufacturing Process of Local Wine (Tuak) is a process where the Tuak is simulate according to its ingredient. Three types of Tuak is simulated in the process namely Tuak Beras, Tuak Tampui, and Tuak Tebu. The type of Tuak produced then are divided into four types of Tuak namely Strong-Taste Tuak, Regular-Taste Tuak , Mild-Taste Tuak, and Not Tuak. One of the ingredients used for making Tuak Beras is also simulated since the ingredient needs 11 different ingredients to produce it. The ingredient mentioned is Yeast. For yeast, the ingredient of yeast is imulated accordingly and if the amount entered is in the range, it will then results in good yeast. Meanwhile if the amount entered is beyond the range, the yeast will results in bad yeast. The system also provides steps on Tuak-Making process as well as questionnaires to determine on which type of Tuak that the user actually belongs to. Each type of Tuak is determined by the invariant formula that simulates the amount of ingredient to classify in accordingly. Besides that, the questionnaire results is also divided into four types of results namely Strong-Taste Tuak, Regular-Taste Tuak , Mild-Taste Tuak, and Bad Tuak. The questionnaire results are determined using the same method as to determine the result of Tuak produced. The system eventually had achieved all of the objectives that was mention on chapter 1.

ABSTRAK

Tuak merupakan minuman alu-aluan yang kebiasaannya disajikan oleh masyarakat Dayak semasa hari Gawai. Selain disajikan pada Hari Gawai, Tuak juga turut disajikan sebagai tanda penghormatan kepada tetamu pada majlis-majlis keramaian contohnya semasa majlis perkahwinan. Antara jenis tuak adalah Tuak Beras. Tuak yang dihasilkan secara tradisional tidak menggunakan sukatan yang tetap bagi setiap pembuatan Tuak. Proses Pembuatan Wain Tempatan (Tuak) merupakan proses simulasi Tuak yang menggunakan bahan bahan nya sebagai pemboleh ubah bagi keputusan simulasi kelak. Tiga jenis Tuak telah dipilih dalam proses simulasi tersebut. Antara Tuak yang terpilih adalah Tuak Beras, Tuak Tampui dan juga Tuak Tebu. Jenis Tuak yang terhasil kemudiannya dibahagikan kepada 4 jenis tuak termasuklah Rasa Tuak yang Kuat, Rasa Tuak Yang Biasa, Rasa Tuak Yang Lembut dan juga Bukan Tuak. Salah satu daripada bahan untuk membuat Tuak Beras juga turut disimulasikan. Bahan tersebut merupaka Yis. Bagi Yis, bahan-bahan yang digunakan untuk tujuan simulasi Yis dimasukkan dalam lingkungan had yang ditentukan dan ini akan menghasilkan keputusan sama ada Yis yang dihasilkan tersebut adalah Yis yang bagus ataupun tidak. Sistem ini juga turut menyediakan langkah demi langkah proses pembuatan Tuak. Selain daripada itu, keputusan bagi soalan yang disediakan dalam system akan menentukan jenis Tuak yang dipilih oleh pengguna, berdasarkan jawapan yang telah dipilh oleh mereka. Keputusan bagi jenis Tuak turut dibahagikan kepada 4 jenis Tuak termasuklah Rasa Tuak yang Kuat, Rasa Tuak Yang Biasa, Rasa Tuak Yang Lembut dan juga Bukan Tuak. Keputusan bagi soalan ini ditentukan melalui kaedah yang sama untuk mencari keputusan bagi Tuak. Sistem ini telah berjaya mencapai kesemua matlamatnya sepertimana yang telah tertulis dalam Bab 1.

CHAPTER 1

INTRODUCTION

1.1 Problem Statement

The traditional Tuak-making may not provide a cost-effective process. Therefore a study needs to be done to capture the complete Tuak-making process and to determine the cost-effective procedures by maintaining the same good taste of the Tuak. Furthermore, the generation of the day is not aware of the correct steps and processes to produce Tuak. Thus, the steps and processes involved need to be recorded for future references. A simulation system will be developed to be utilized for the proper preparation of the Tuak.

1.2 Objectives

1. To simulate the local or traditional process of Tuak-making process.
2. To preserve the tuak making process and its environment.
3. To develop a prototype to provide a platform to record the taste of different process and environment.
4. To generate a report about the popularity of different tuak based on it process and environment.

1.3 Methodology

The methodology that has been chosen for this project is Unified Process (UP). The Unified Process (UP) was chosen because it is an iterative methodology with well described roles and activities, using modeling techniques in object oriented analysis and design. This methodology was chosen to make the scope clear during the development of the project itself. Unified process is an incremental design driven by constructing views of system architecture. The Unified Process consists of four phases that includes inception, elaboration, construction and transition.

- Inception phase: decide the project scope in manufacturing process of Local Wine (chapter 1 & 2).
- Elaboration phase: collect more details by distributing the preliminary questionnaire and start on analysis and design, chapter 3.
- Construction phase: key phase for iteration which can be any phase which falls on the development phase on chapter 4.
- Transition phase: beta testing and documentation at chapter 5 (implementation & testing phase.)

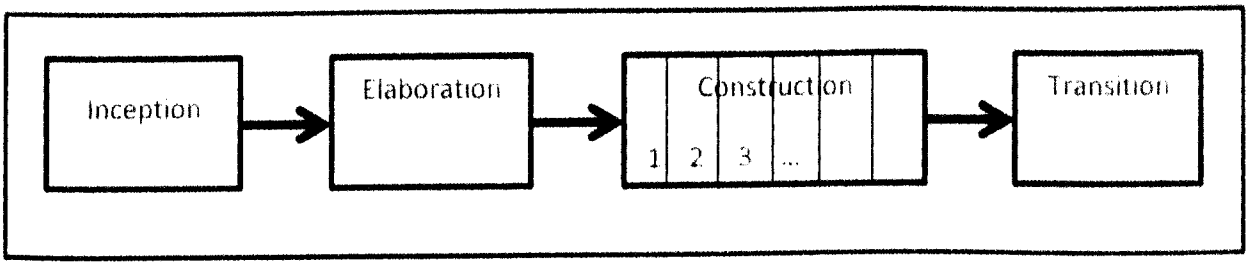

Figure 1.1: Phases in Unified Process

The Unified Process (UP) was chosen because it is an iterative methodology with well described roles and activities, using modeling techniques in object oriented analysis and design. This methodology was chosen to make the scope clear during the development of the project itself.

1.4 Scope

The scopes of this project are:

- Using programming and database to store and simulate the Tuak-making.
- Provide a prototype to differentiate the taste of Tuak according to the environment and processes.
- The simulation system will be developed by using OpenGL, operational research, Java and MySQL.
- The testing stage will be conducted at the Faculty of Computer Science and Information Technology.

1.5 Challenges

The challenges in the project are:

- There are limited numbers of people who know what Tuak is.
- Hard to find a Tuak-maker; since the consultation from an expert is Tuak-maker is needed.
- The number of respondent is limited due to lack of knowledge about Tuak.
- The information for Tuak making is limited.
- The development time takes less than a year.

1.6 Significance of project

The significances of the project are:

- To improvise the quality of Tuak-making.
- To keep track of the record involve in the Tuak-making simulation.
- To build a capital in which it will enable the export and import of Tuak throughout and outside of Malaysia.

1.7 Project Outline

This report consists of five main chapters that includes introduction, literature review, requirement analysis and design, implementation, and testing and conclusion and future works.

The first chapter for this report is the Introduction. In this chapter, the project was introduced and the whole picture of this report can be seen throughout this chapter.

The second chapter for this report is the literature review. In this chapter, four types of existing system will be compared. The attribute adaptation is then made by referring to the comparison that had been made. Here, the initial architecture of the proposed simulation system is being made.

The third chapter for this report is Requirement Analysis and Design. In this chapter the detail output such as use case and UML diagram that are based from the UP methodology are made for the simulation system. The design model such as the user interface that includes the

operation for process and operation for user interface, and access layer design will also be presented in this chapter.

The fourth chapter for this report is the Implementation. Here, the development of the system will take place and detail about the project will be specified. The test plan will also be conducted to test the simulation.

The final chapter which is the Testing and Conclusion and Future Work is to sum up the entire chapter and to discuss more on the finding.

1.8 Initial Study

For this chapter, a preliminary study had been to see the awareness of people with the existing of Tuak. The form was generated by using Google Drive Form (refer appendix). The study had been done by distributing questionnaire throughout the internet in which the link for the questionnaire had been publish in Facebook as well. The respondents for this study are 54 persons.

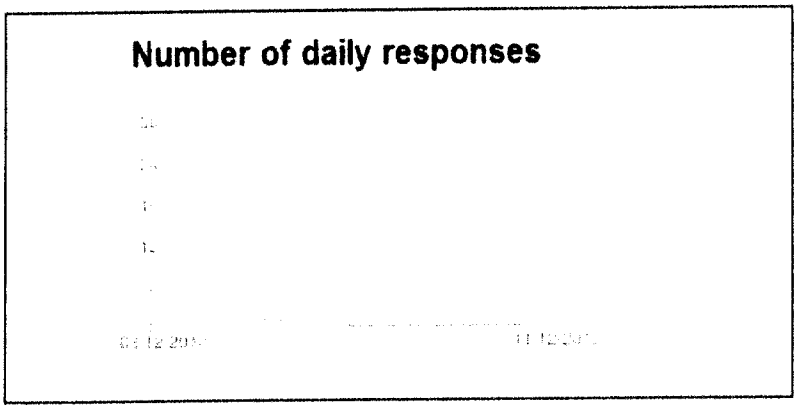

Figure 1.2: Statistic of the respondent

Shown above is the statistic of the respondent. The summary of questionnaire was attached in the appendix.

1.9 Expected outcome

This project will produce a prototype in which we can see different outcomes with different types of environment and also depending on the quantity of the ingredients.

1.9 Conclusion

Overall, this chapter is about the overview of the project and how the project will be carried throughout this period of time. This chapter discuss on the UP methodology, the methodology that is going to be implement for this project. The scope and challenges are also identified to ensure that the project is on the track.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the simulation background of the existing simulation system. Here, four existing simulation model will be discuss and will picture the simulation model that is going to be build. The review of the four systems will leads to the comparison of the system. This project will combine the features in the existing simulation model as well as the new features for the simulation of the local wine.

2.2 Brewery Fermentation Model

The brewery fermentation model is used to observe the typical responses under varying fermentation condition. Matlab and SIMULINK had been used to model the simulation of this system. Three main characteristic are going to be tested in order to check for the rate of fermentation. This include the yeast growth; which works as a function of the initial dissolved oxygen concentration and sterol content, the effect of yeast vitality and dissolved oxygen on overall fermentation rate and the inclusion of ester formation. The key fermentation variables that had been concerned in this model are the wort composition, specific gravity, wort temperature, yeast growth, pH, dissolved oxygen level, VDK and Ester.

2.2.1 Yeast growth

The equation that had been formulated in differential equation form for implementation in the SIMULINK is as below:

$$\frac{dX_T}{dt} = \mu_S \frac{d\Delta X}{dt}$$

Where

XT = total biomass

μS = stoichimetrical yield of biomass (function of cell sterol)

To demonstrate the effectiveness of the model, fermentation runs were simulated at four different initial dissolved oxygen levels (10, 15, 20 and 23ppm respectively) when operating at the same

isothermal wort temperature (Tw), yeast vitality (α) and pitching rate (PR).The operating conditions are defined as Tw = 15 °C, α = 1.0 and PR = 1.5/l (dry weight).

2.1.2 Overall fermentation rate

The equation that had been formulated in for overall fermentation rate are shown as below:

$$S_{DO} = 0 \qquad if \ \frac{dDO}{dt} > 0$$

$$S_{DO} = 1\left(1 - e^{-\left(1/t_{DO}\right)^{t}}\right) if \ \frac{dDO}{dt} = 0$$

Where

SD*O* = Initial cell sterol (units)

To demonstrate the response of the model, fermentation runs were simulated at four different initial dissolved oxygen levels (10, 15, 20 and 25 ppm respectively) with yeast vitality α = 0.7 (figure 1) and the same test were repeated with α = 1.3 (figure 2). The operating conditions are defined as Tw = 15 °C, α = 1.0 and PR = 1.5/l (dry weight).

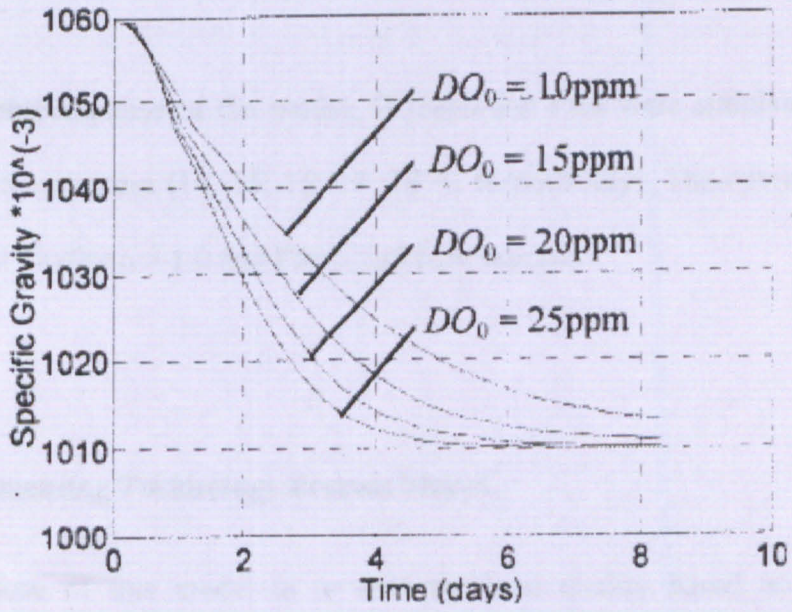

Figure 1: Specific gravity profiles for varying initial dissolved oxygen levels for $\alpha = 0.7$.

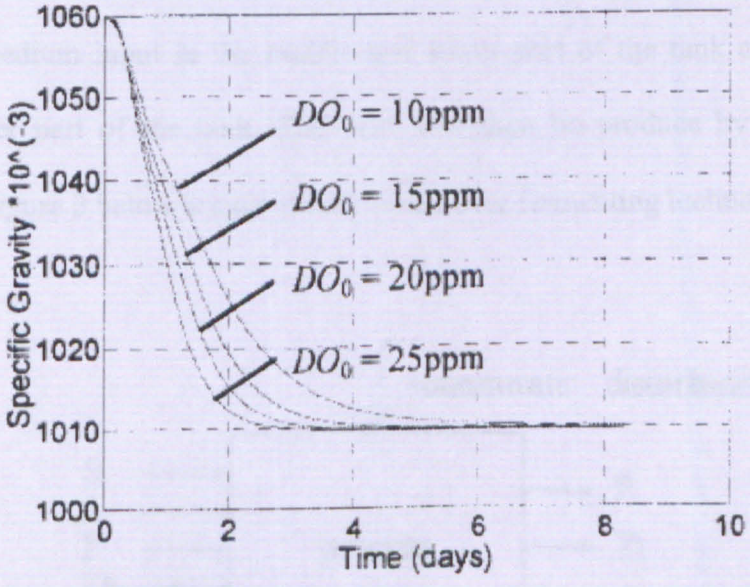

Figure 2: Specific gravity profiles for varying initial dissolved oxygen levels for $\alpha = 1.3$.