DESIGN AND DEVELOPMENT OF ANDROID APPLICATION OF GEAR DESIGN EBOOK AND CALCULATOR

MUHAMAD HAFIZUDDIN BIN ISMAIL

Report submitted in partial fulfilment of the requirements
for the award of
Diploma in Mechanical Engineering

Faculty of Mechanical Engineering
UNIVERSITI MALAYSIA PAHANG

DECEMBER 2012

ABSTRACT

Nowadays, tablet and smart phones are well-known for its brilliant operating system which is Android. Android has made its debut in 2008 to become the world most-widely used smartphone platform. Android offers its own operating system, key applications and middleware. The android applications, APK formatted file is very flexible and in variety of choices, from entertainment to education that provide full control to its users.

Geardroid is an Android based application for engineering students to study and understand the gear related topics. Its multimedia features allow the users to study and apply their understanding on gears especially on spur gears. Geardroid combines the sufficient notes, formulas, diagram and calculator to understand the gear study and reduce their burden of bringing heavy books to the class. The students can easily calculate needed items by putting the input into the calculator.

This Geardroid, developed in Google App Inventor, should be the best choice of application for engineering students to study on gear.

ABSTRAK

Masa kini, telefon pintar dan tablet sangat sinonim dengan system operasi pintar mereka, Andoid. Android mula mengambil tempat pada tahun 2008 untuk menjadi platform telefon pintar pilihan pengguna seluruh dunia. Android menawarkan sistem operasinya sendiri, applikasi telefon pintar dan middleware. Applikasi Android, dalam format APK yang fleksibel memberi kawalan penuh kepada pengguna dan datang dalam pelbagai pilihan, dari hiburan hingga pendidikan..

Geardroid adalah sebuah aplikasi berasaskan Android untuk pelajar kejuruteraan untuk mengkaji dan memahami topik berkaitan gear. Ciri-ciri multimedianya membolehkan pengguna untuk mengkaji dan mengaplikasikan pemahaman mereka terhadap gear terutamanya pada Spur gear.

Geardroid menggabungkan nota dan formula yang secukupnya, serta gambarajah dan kalkulator untuk memahami gear, dan secara tidak langsung mengurangkan beban mereka membawa buku-buku yang berat ke kelas. Pengguna boleh mengira nilai-niai yang diperlukan dengan memasukkan input secara terus ke dalam kalkulator.

Geardroid, dibangunkan menggunakan Google App Inventor, harus menjadi pilihan terbaik bagi pelajar-pelajar kejuruteraan untuk mengkaji gear.

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LIST OF SYMBOLS

m	Module	(mm)
PD	Pitch Diameter	(mm)
p	Circular Pitch	(mm)
N	Number of Teeth	
a	Addendum	(mm)
d	Dedendum	(mm)
OD	Outside Diameter	(mm)
RD	Root Diameter	(mm)
BC	Base Circle	(mm)
t	Tooth Thickness	(mm)
hw	Working Depth	(mm)
WD	Whole Depth	(mm)
C	Center Distance	(mm)
G	Gear Ratio	(mm)

LIST OF ABBREVIATIONS

UMP	University Malaysia Pahang
SDK	Software Development Kit
APK	Application Package File
C.A.M	Computer Aided Manufacturing
ITAMCO	Indiana Technology and Manufacturing Companies
MIT	Massachusetts Institute of Technology
GUI	Graphical User Interface

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter explained about the project background, problem statement, objective, and scope of this project.

1.2 BACKGROUND

The project is all about design and development of android application of gear design ebook and calculator, Geardroid in APK format application. It aims to design and create android application software that contains notes on the gear, notes on the gear formula, calculator related to the topics, and sample questions through its tutorial. This application intended to easier the engineering students to study on gears. This program will help the student to find the sufficient information in order to understand everything related to gear. It will give the application of the rules necessary to turn the gear blank to desired gear design. An Android application works on Linux-based operating system, developed by Google is program designed for touch screen mobile devices such as smart phones and tablet computers. This android application project for gear notes and gear calculator will be created using the app inventor provided by Google. The project will meet acquire skills of multimedia design and computer programming.

1.3 PROBLEM STATEMENT

Problem statement is a description on the issue appears and the way to solve the issue faced. It is the main point to be considered in generating the idea to create a project. The problem appears that drive to the creation of this application is there are no specific study material on gear that combining the book and calculator. Nowadays we have various types of reference books on gear topics that have been published in the market and variety of gear design calculator application, but most of them are just a hard copy of texts and figures or a set of calculator. This will force the student to get two items in minimum, the gear books and the gear design calculator while the can have them both at the same time. This application also will attract the interest of student to study on gears as they are always bring along their smart phones everywhere and anywhere with them. Other than that, the combination of android and smart phones is a very good medium to attract their interest as it is very synonym to them

The second problem faced is the books that they are having right now is in a quiet large in size and weight. Students should have a reference book for each of the subject taken. If they have an average 3 class of different subject per day they should bring along 3 heavy books with them every day. The average number of page of a reference book is between 350 to 450 pages and the average weight of the reference books should about 0.8 to 1.5kg. That will make the average weight of reference book to be bring along by a single student to the class is between 3kg – 4 kg every day. The creation of this application will reduce the burden of the student as this application only being install on their smart phones or tablet that just have very minimum in weight and size.

1.4 OBJECTIVE

Objective is the main target that should be accomplished to ensure the successful of a project. The objective of this project is to design and develop android application software that works as an educational ebooks and calculator related to the gear topics. The android application is to build using the App Inventor used to be provided by Google and now has been developed by Massachutes Institute of Technology. The free web-based program will be the platform to fully design and develop the whole application.

1.5 SCOPE

The content in the notes in this application is targeted to the engineering students especially the students of diploma. The application will cover some notes to the gears including the introduction to gears, purpose of gears, advantages and disadvantages of gears, classifications of gears, and types of gears. The application will explain in details all the notes and formulas necessary to design a blank gear to desired spur gear design.

The formula provided for designing spur gear is

i. Module (m)
ii. Pitch Diameter (PD)
iii. Pitch Circle (P)
iv. Number of Teeth (n)
v. Addendum (a)
vi. Dedendum (d)
vii. Outside Diameter (OD)
viii. Center Distance (C)
ix. Tooth Thickness (t)
x. Working Depth (hw)
xi. Whole Depth (WD)
xii. Root Diameter (RD)
xiii. Base Circle (BC)
xiv. Gear Ratio (GR)

This application provides diagrams, videos, calculator, and some tutorial toward fundamental lesson of the gears. This will help the understanding of the students and giving a new way of study for the user.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Literature review is one of the common ways used to generate the ideal design in making any product. In order to produce the ideal design, the review should be made to determine the suitable characteristic and the requirement of the product to be produce. In this section, review based on android and the existing android application will be made. Additional literature has been studied on history of android and app inventor for android.

2.2 OVERVIEW ON MOBILE PLATFORM

2.2.1 Android

Android is a Linux-based operating system created for mobile phones such as Smartphone and Tablet computer that developed by Google in conjunction of Open Handset Alliance. Android is very popular among the touch screen tablets and smartphones as it is an open source operating system. It offers over millions of applications and most of them are free of charge and can be easily installed into the phone by visiting the Google Play Store. Android released in upgraded version by times which are 2.0, 3.0 and the latest android version 4.2 is called 'jelly bean'. Figure 2.1 shows an example of smartphone using android operating system.

Figure 2.1: Samsung Galaxy SIII using Android operating system

Source: Samsung (2012)

2.3 OVERVIEW ON EXISTING APPLICATION

Google Play store is the main site to download and publish created android applications. Most of the applications are from other android developer beside the official android team, which are by personal or company. Here is some review on existing android application in the Google Play.

2.3.1 Gear C.A.M (www.gearcam.com)

This android version of Gear C.A.M application provided by www.gearcam.co.uk is created to calculate and design the Involutes Gear. It will help the user to design most of the types of gear. The interface used by this application is by typing the values into the textboxes and calculate the result by clicking on the buttons. The usage of this application is to visualising existing designs, adding a mating gear to a current gear set, changing ratios using existing centres, working out Span or Size over pin dimensions, checking backlashes and interferences for most of

the gear types and sizes. There are some advantages of this application such as designs can be seen visually in diagram form, inputs can be Imperial or Metric or any combination, and all output can be printed. The disadvantages of this program there are no formula shown for every calculation, no notes given to briefly explain about the gear itself or the parts of the gear so this application is not suitable the beginners.

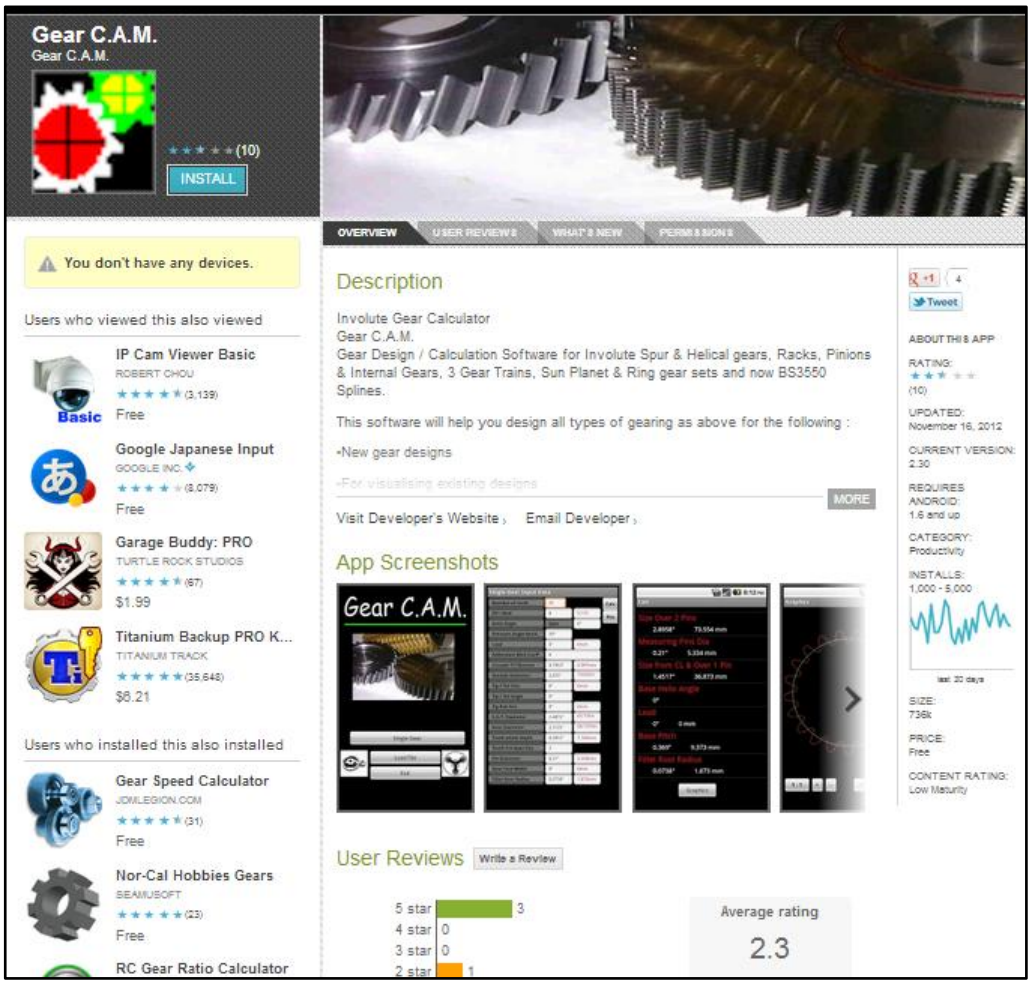

Figure 2.2: Gear C.A.M in Google Play Store site

Source: Google Play Store (2012)

Figure 2.3: Screenshot of Gear C.A.M main menu

Source: Google Play store (2012)

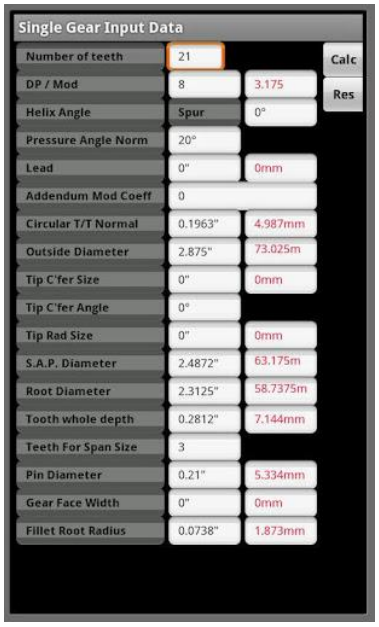

Figure 2.4: Screenshot of Single Gear Input Data in Gear C.A.M

Source: Google Play Store (2012)

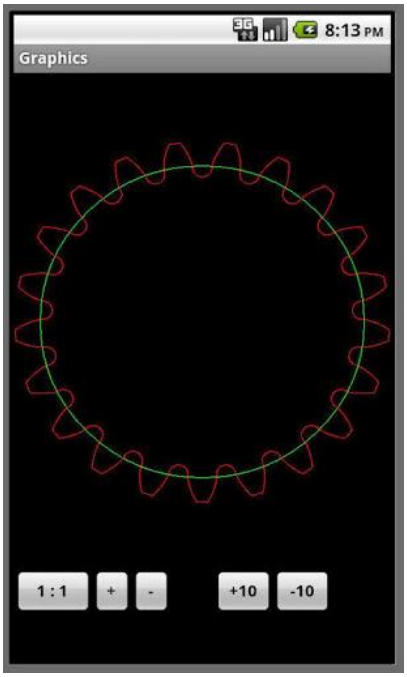

Figure 2.5: Screenshot of the graphics of Gear in Gear C.A.M

Source: Google Play (2012)

2.3.2 RC Gear Ratio Calculator (Chanyou Hwang at Google Play Store)

RC Gear Ratio Calculator, the idea from Chanyou Hwang is a program designed especially to determine and calculate any gear ratio. This application will help the android user to calculate the gear ratio by selecting the suitable gear type. This application used the common interface by typing the values into the textboxes and calculates the result by clicking on the buttons. The benefit of this application is the user can easily calculate the preferred design gear design ratio by filling the values needed. The disadvantages of this application is it can only be use to determine the ratio of gear while there are no calculation needed to calculate and design a whole new gear. This application also did not provide any information on gear design or the ratio itself.

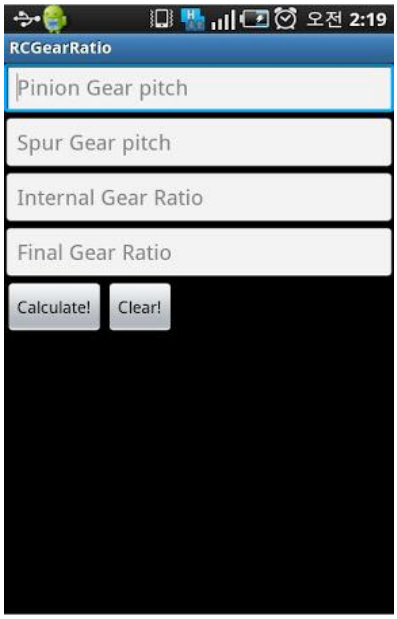

Figure 2.6: Screenshot of the RC GEAR Ratio for android

Source: Google Play store (2012)

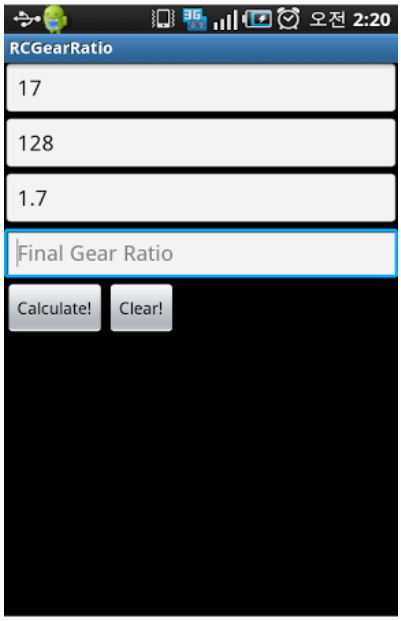

Figure 2.7: Screenshots of the RC Gear Ratio for android

Source: Google Play (2012)

2.3.3 GearWear by (ITAMCO)

This simple application is used to convert different gear pitch sizes. It uses basic formulas to convert diametral, circular, and module pitches. It is intended for approximate calculations and should be used for reference only. The features of this application os to convert between different gear pitch sizes such as Diametral, Circular, and Module pitches. As explained, this application only can calculate the pitch size of different gears. Figure 2.8 and figure 2.9 show the application screenshots

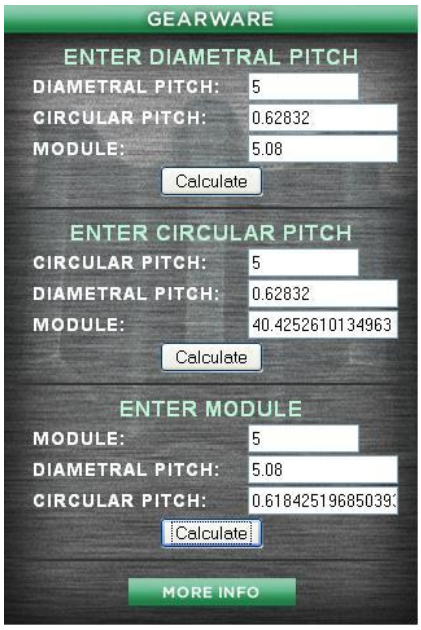

Figure 2.8: GearWear by ITAMCO

Source: Google Play (2012)

Figure 2.9: GearWear by ITAMCO

Source: Google Play (2012)

2.4 SUMMARY

From the reviews, conclusion that can be made is the development of android on gear is already started. Each product has own advantages and disadvantages. This will be the guideline in making the ideal design of the product to be developed.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter will explain the details of the production of this application. It will provide information of the android language, android application developer software, and the process of developing this application in detail. Skill of multimedia design and programming will be needed in developing this application.

3.2 ANDROID DEVELOPER SOFTWARE

SDK android, Google App Inventor, and Java Eclipse is the example of android application developer software. Applications are usually developed in Java Programming language with their own way of usage, interface and method. This is some review on SDK android and Google App Inventor.

3.2.1 SDK Android

Software Development Kit (SDK) is one the common used android developer software. It provides the tool package to develop the android application using the C programming language. Users have to download the package data of platforms in a quite big size to their personal computer to be installed. It is using the full programming language of C, the user must master the language first. So, this software is not recommended for the beginners in programming. There is no limit on