**CERTIFICATE**

This is to certify that Summer Training Project Report entitled “**INDIAN KISAN**” submitted by Team members Sonal (06713502711) and ManaliVerma (06813502711) are an authentic workers carried out by them at Indira Gandhi Delhi Technical University for Women, Delhi under my guidance during STP4 in 2013. The matter embodied in this project work has not been submitted earlier for the award of any degree or diploma to the best of my knowledge and belief.

Date: Signature of the Guide

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**ABSTRACT**

Agriculture is a critical sector of the Indian economy. An average Indian still spends almost half of his/her total expenditure on food, while roughly half of India’s work force is still engaged in agriculture for its livelihood. Being a source of livelihood and food security for a vast majority of low income, poor and vulnerable sections of society, so we try to make an mobile application for the farmer. With the declining share of agriculture to GDP, the continuing high pressure of population on agriculture and the increasing fragmentation of land holdings leading to decreasing availability of cultivated land area per household, the agriculture sector alone would hardly be in a position to create additional employment opportunities to sustain the livelihood of the rural households. This deeply helps them by giving proper information of crops, agencies, organic fertilizer and weather info. This application tells how to cultivate the crops? Where to get equipment for fields? How to get kisan credit card and farm loans? Which types of fertilizer farmer have to use for good quality and not harmful for consumer? However, it also gives the details about weather to the farmer so that farmer would know the climatic conditions harvesting.

This mobile application on rural development helps the rural area for progressing in the field of agriculture more effectively. Hoping that this will help our Indian farmer who never receives appreciation and thanks inspite of such good work of years.

**CHAPTER 1**

**Introduction**

## Overview

Mobile communications technology has quickly become the world’s most common way of transmitting voice, data, and services in the developing world. Given this dramatic change mobile applications (m-apps) in general and mobile applications for agricultural and rural development (m-ARD apps) in particular hold significant potential for advancing development. They could provide the most affordable ways for millions of people to access information, markets, finance, and governance systems previously unavailable to them. M-apps are software designed to take advantage of mobile technology and can be developed for technology besides mobile phones. But mobile phones have many key advantages: affordability, wide ownership, voice communications, and instant and convenient service delivery. As a result, there has been a global explosion in the number of m-apps, facilitated by the rapid evolution of mobile networks and by the increasing functions and falling prices of mobile handsets[1].

## Project Background

**Agriculture** in [India](http://en.wikipedia.org/wiki/India) has a significant [history](http://en.wikipedia.org/wiki/History_of_agriculture). Today, India [ranks](http://en.wikipedia.org/wiki/List_of_countries_by_GDP_sector_composition) second worldwide in farm output. [Agriculture](http://en.wikipedia.org/wiki/Agriculture) and allied sectors like [forestry](http://en.wikipedia.org/wiki/Forestry_in_India) and [fisheries](http://en.wikipedia.org/wiki/Fishing_in_India) accounted for 16.6 % of the GDP in 2009, about 50 % of the total workforce. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. Therefore there is a need to develop an application for this portion of the society[1].

There has been a rapid increase in the use of the Internet in developing countries, although this expansion is still largely an urban phenomenon. Rural communities represent the "last mile of connectivity" (or the "first mile" if you look at it from a rural perspective) in both developing and developed countries with regard to access to Internet services and the telecommunication connections that help transmit those services. People in rural areas are generally unable to take advantage of the services available to their urban peers.

The Internet is a multipurpose tool, a medium of communication and perhaps the most flexible medium currently available. It has the potential to be integrated within a wide variety of efforts that have objectives such as local participation, training, education, research (especially participatory research), technical support and institutional strengthening. Thus, endeavours that might find a role for Mobile applications as it is the only electronic device being available with most of the population[2].

## Thesis Outline

This thesis report consists of seven chapters, References and Appendix. Rest of the thesis is organized as following:

**Chapter 2**- Various existing technologies used for improvement in agriculture techniques are discussed in this chapter. These technologies and various methods of implementing organic farming and organic fertilizer are compared based on their merits, demerits and deployment here. Also these are information regarding banks and proposed system.

**Chapter 3**-This chapter discusses the selection of technology, processor, software tool and other hardware components used in implementation of prototype. Different existing technologies are compared . Different processors, PIC programmers are compared and the appropriate one is selected.

**Chapter 4**- The design approach of the system is described in this chapter followed by the system Requirements, Specifications, hardware architecture, software architecture, System integration and layered structure of the system. This chapter gives the details about the hardware components used for the system along with their specifications.

**Chapter 5**-The software implementation and schematic of the system and the integration of both hardware and software is explained in this section. The working of this project is explained with the help of a sequence diagram and the flow of software code is also explained in the form of a flowchart.

**Chapter 6-** Results are given in the form of observation tables..

**Chapter 7-** Finally thesis ends with the conclusion and contributions of the system. The limitations of the system are also given in this chapter and at the end the scope for future work is given.

**CHAPTER 2**

**Literature Review**

This mobile application based on agriculture has many aspects which have been discussed in the following chapters. As per the needs and requirements of the farmers this chapter has been planned. App has four broad sections as follows.

**2.1 CROPS DESCRIPTION**

There are several existing techniques to cultivate crops that are available these days. But it’s not possible that everyone know about each and every latest technique. And also not possible that everyone knows which one is best or not. This will give short review on new techniques designed in our app .Therefore a wide description of the crops that have been incorporated in the app.

2.1.1 **Classification of Crops**

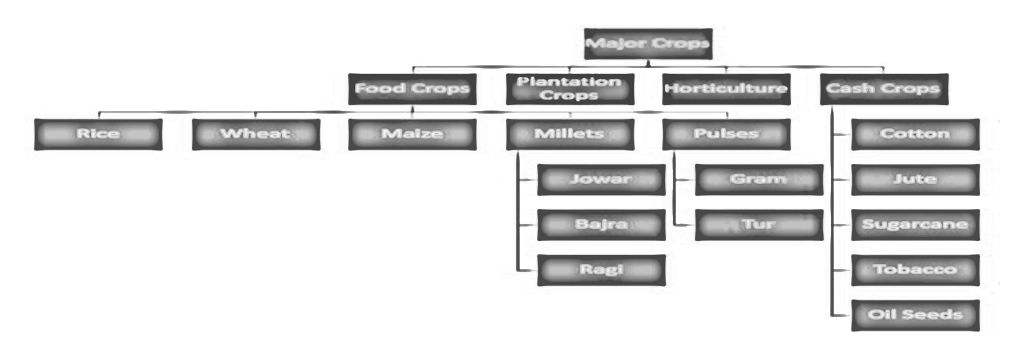


Fig 2.1 Types of Crops

2.1.1.1**FOOD CROPS**

## Rice

[](http://civilsprep.in/about-civilsprep/rice/)Fig 2.2 Rice

|  |  |
| --- | --- |
| Conditions  of growth | High Heat and High humidity 100 – 200cms of Rainfall. Grown on variety of soils – acidic / alkaline (Fields must retain water) |
| Regions | Throughout India – except higher parts of Himalayas and desert areas |
| Additional Info | In North only one crop per annum as winters are too cold there, In south and Eastern Areas two – three crops in a year. |
| Production/ Trade | India Second largest producer and consumerStates: West Bengal, Punjab, UP and AP |
|  |  |

## Table 2.1 Rice

## Wheat

[](http://civilsprep.in/about-civilsprep/wheat/)Fig 2.3 Wheat

|  |  |
| --- | --- |
| Conditions  of growth | Cool Climate with moderate rainfall Rainfall: 50 cm – 100 cm; less than 50 cms irrigation is required.Grown in variety of soils. Well drained fertile soils favourable |
| Regions | Mainly in north-western parts. Now being extended to Eastern Areas – Assam, Bengal and Orissa |
| Additional Info | Frost at flowering time, hail storm at the time of ripening causes heavy damage |
| Production/ Trade | India fourth largest producer of wheat in the world (after Russia, USA and China)UP, Punjab, Haryana, Rajasthan, MP, Bihar |

## Table 2.2 Wheat

## Maize

[](http://civilsprep.in/about-civilsprep/maize/)Fig 2.4 Maize

|  |  |
| --- | --- |
| Conditions  of growth | Varied climatic conditions. Mainly Rainfed.50cms – 100 cms (More than 100 cms/ frost – crop gone) Fertile well drained alluvial or red loams |
| Regions | Almost in all areas – Imp crop in arid lands, cultivated in J&K too. |
| Additional Info | Kharif crop except Tamil Nadu where it is a Rabi Crop |
| Production/ Trade | MP, AP, Karnataka and Rajasthan (in order) |

## Table 2.3 Maize

### Jowar

[](http://civilsprep.in/about-civilsprep/jowar/)Fig 2.5Jowar

|  |  |
| --- | --- |
| Conditions  of growth | Mostly rainfed.Rainfall: 30cms – 100 cms (Not more than that)Generally in plain areas |
| Regions | Hot and humid areas; So mainly in Southern states North Western India |
| Additional Info | Kharif and rabi crop |
| Production/ Trade | Jowar is the third most important crop after rice and wheat (in production).Maharashtra, Karnataka, MP and AP |

## Table 2.4 Rice

### Bajra

[](http://civilsprep.in/about-civilsprep/bajra/)Fig 2.6Bajra

|  |  |
| --- | --- |
| Conditions  of growth | Dry and warm climateOf course, Rain fed crop; 40cm – 50 cm rainfall (upper limit 100cm)Grown on sandy soils, black and red soils, gravely soils etc |
| Regions | Mainly in North Western Parts |
| Additional Info | Widely used as fodder |
| Production/ Trade | Maharashtra, Gujarat, UP and Rajasthan |

## Table 2.5 Bajra

### Ragi

[](http://civilsprep.in/about-civilsprep/barley/)Fig 2.7Ragi

|  |  |
| --- | --- |
| Conditions  of growth | 50cm – 100 cm Rainfall Red, light black and sandy loams |
| Regions | Drier parts of South India. |
| Additional Info | RainfedKharif crop |
| Production/ Trade | Karnataka, TN, Uttaranchal, Maharashtra |

## Table 2.6 Ragi

## Barley

|  |  |
| --- | --- |
| Conditions  of growth | Does not tolerate high heat and high humidity; Temperature: 10deg – 15 deg Rainfall: 75cms – 100cms |
| Regions | Cold drier parts – Great plains and valleys of western Himalayas |
| Additional Info | Rabi crop. Used for manufacturing beer and whisky |
| Production/ Trade | UP, Rajasthan, MP and Punjab |

## Table 2.7 Barley

### Gram

|  |  |
| --- | --- |
| Conditions  of growth | Wide range of climate. Preferably mild climate |
| Regions | Throughout India |
| Additional Info | Rabi Crop. Often grown along with wheat, Barley etc |
| Production/ Trade | Madhyapradesh, UP etc |

## Table 2.8 Gram

### Tur/ Arhar

|  |  |
| --- | --- |
| Conditions  of growth | Dry crop generally mixed with other kharif crops |
| Regions | Drier Areas |
| Additional Info | Basically a kharif Crop. But in areas of mild winters can be grown as rabi crop also |
| Production/ Trade | Maharashtra, UP, MP Gujarat, Karnataka chief producing states |

## Table 2.9 Tur

**CASH CROPS**

## Cotton

[](http://civilsprep.in/about-civilsprep/cotton/)Fig 2.8 Cotton

|  |  |
| --- | --- |
| Conditions  of growth | High Temperature. Frost hating. Prefers Clear skies50 – 100 cms; Black soils best suited, alluvial, red and laterite soils are okay. |
| Regions | Northern (Punjab, Haryana and Rajasthan), Central (Gujarat, Maharashtra, MP)Southern (AP, TN, Karnataka) |
| Additional Info | Moist weather and heavy rainfall at the time of boll opening is suicidal to crop. Kharif crop takes 6-8 months to mature |
| Production/ Trade | World’s third largest producer of Cotton after China and the USA.Maharashtra, Gujarat, AP, Punjab |

## Table 2.10 Cotton

## Jute

|  |  |
| --- | --- |
| Conditions  of growth | Hot and humid climate 120cm – 150cm rainfall is required; Light Sandy or Clayey Loams or best suited |
| Regions | Eastern parts of India. |
| Additional Info | Is in great demand for cheapness, softness, strength etc. Water intensive and labour intensive crop. |
| Production/ Trade | West Bengal, Bihar, Assam, Orissa Imported from Bangladesh |

## Table 2.11 Jute

## Sugar Cane

[](http://civilsprep.in/about-civilsprep/sugarcane/)Fig 2.9 Sugar Cane

|  |  |
| --- | --- |
| Conditions  of growth | Hot and humid climate. Too heavy rainfall or too little rainfall is harmful; Any kind of soil that can retain moisture |
| Regions | Satluj – Ganga plain, Black soil belt from Maharashtra to Tamilnadu, Coastal Andhra |
| Additional Info | Long duration crop. Frost hating. Labour Intensive |
| Production/ Trade | Second largest producer in the world after Brazil UP, Maharashtra, Karnataka, TN |

## Table 2.12 Sugar Cane

## Oil Seeds

Oil extracted form a part of our diet and is also used as raw material is many industries like paints, soaps, perfumery etc. India has largest area and production of oilseeds in the world.

Groundnut

[](http://civilsprep.in/about-civilsprep/groundnut/)Fig 2.10 Oil Seeds

|  |  |
| --- | --- |
| Conditions  of growth | Tropical climate. 50 – 75 cm rainfall. Primarily rainfed. No Stagnant water. |
| Regions | Arid parts |
| Additional Info | Mostly Kharif but Rabi can also be grown. Fixes nitrogen in the soil and serves as rotation crop. |
| Production/ Trade | India largest producer of groundnut in the world. Gujarat, TN, AP.. |

## Table 2.13 Oil Seeds

### Sesamum

[](http://civilsprep.in/about-civilsprep/sesamum/)Fig 2.11Sesamum

|  |  |
| --- | --- |
| Conditions  of growth | 45-50cm. Rainfed. Well drained light loamy soils are best suited for this crop. |
| Regions | Arid parts |
| Additional Info | Kharif in North, Rabi in South |
| Production/ Trade | India largest producer of Sesamum.Gujarath, West Bengal, Maharashtra, TN |

## Table 2.14 Sesmum

### Rape Seed and Mustard

[](http://civilsprep.in/about-civilsprep/rapeseed/)Fig 2.12 Rape Seed and Mustard

|  |  |
| --- | --- |
| Conditions  of growth | Like wheat and gram, thrives only in cool climate |
| Regions | Mainly in Satluj – Ganga Plains |
| Additional Info | Rabi Crop mixed with wheat, Gram and Barley |
| Production/ Trade | India highest production of rape seed and mustard in the world. Rajasthan, UP, Haryana, WB |

## Table 2.15 Rape Seed

### Castor Seed

[](http://civilsprep.in/about-civilsprep/castor/)Fig 2.13Castor Seed

|  |  |
| --- | --- |
| Conditions  of growth | Tropical and Subtropical climate 50 – 75 cms rainfall; Clay loams, deep black soils and alluvial soils |
| Regions | North and Middle India |
| Additional Info | Kharif crop in the North and Rabi crop in the south |
| Production/ Trade | India world’s second largest producer after BrazilGujarat, AP, Rajasthan |

## Table 2.16 Castor Seed

Tea

[](http://civilsprep.in/about-civilsprep/tea/)Fig 2.14Tea

|  |  |
| --- | --- |
| Conditions  of growth | Tropical and subtropical climate (Hot and humid climate) 150cm – 300cms rainfall distributed throughout year; Well drained loams rich in humus and iron content. |
| Regions | Assam, Darjeeling hills, Nilgiri hills in South India and in Himachal Pradesh |
| Additional Info | Dried leaf of a Bush, shade loving plant. No stagnant water hence grown on slopes |
| Production/ Trade | India largest producer as well as leading exporterAssam, West Bengal, Tamil Nadu and Kerala |

## Table 2.17 Tea

## Coffee

[](http://civilsprep.in/about-civilsprep/coffee/)Fig 2.15 Coffee

|  |  |
| --- | --- |
| Conditions  of growth | Hot and humid climate Rainfall 150cm – 250cms |
| Regions | Western Ghats |
| Additional Info | It doesn’t tolerate strong sunshine. No stagnant water |
| Production/ Trade | India’s production is insignificant, but has demand due to decent quality Karnataka, Kerala, TN and AP |

## Table 2.18 Coffee

## Pepper

[](http://civilsprep.in/about-civilsprep/chillies/)Fig 2.16 Pepper

|  |  |
| --- | --- |
| Conditions  of growth | 10deg – 30 deg 200 – 300 cms rainfall; Well drained loamy soils and laterites |
| Regions | Western Ghats |
| Additional Info | Grown till altitude of 1200 m |
| Production/ Trade | Kerala, Karnataka and TN |

## Table 2.19 Pepper

**2.1.2 Fruits and Vegetables**

Apart from all these crops, additional list of some very common fruits and vegetables are also included.Fruits includes mango, banana, guava, apple etc and vegetables includes potato, onion, tomato, lady finger and peas.

**2.2 Weather**

The app has another feature in which it provides the weather updates. The weather RSS feed enables us to get up-to-date weather information for the farmer location. They can save this feed. The Weather RSS feed is a dynamically-generated feed based on WOEID. This page describes the format of the Weather request URL and the RSS response for developers. The Weather RSS feed request follows simple HTTP GET syntax. The base URL for the Weather RSS feed is <http://weather.yahooapis.com/forecastrss>[18].

For the Weather RSS feed there are two parameters:

* w for WOEID.
* u for degrees units (Fahrenheit or Celsius).

The [WOEID](http://developer.yahoo.com/geo/geoplanet/guide/concepts.html) parameter w is required. Use this parameter to indicate the location for the weather forecast as a WOEID.

<http://weather.yahooapis.com/forecastrss?w=location>

The location parameter needs to be a WOEID. To find WOEID, browse or search for your city from the [Weather](http://weather.yahoo.com/) home page. The WOEID is in the URL for the forecast page for that city.

The optional u (units) parameter indicates the degree units for the weather forecast. By default, Yahoo! Weather returns temperature information in degrees Fahrenheit. Use the u parameter to explicitly specify the degree units in Fahrenheit (f) or Celsius (c). The units parameter is case sensitive. Yahoo! Weather returns an RSS 2.0 feed in response to this request. We can subscribe to the request URL with My Yahoo! or another RSS feed aggregator, or they can incorporate the information in the RSS response into your own application.

The Weather RSS feed is an XML document that conforms to the [RSS 2.0](http://en.wikipedia.org/wiki/RSS) specification. RSS is an XML document containing a single channel element representing the feed, several elements containing metadata about the feed itself, and one or more item elements describing individual items within the feed. The Weather RSS feed also includes additional elements from the [geo](http://www.w3.org/2003/01/geo/) vocabulary as well as a custom weather vocabulary[18].

The weather forecast for a specific day. The item element contains multiple forecast elements for today and tomorrow. Attributes:

* day: day of the week to which this forecast applies. Possible values are Mon Tue Wed Thu Fri Sat Sun (string)
* date: the date to which this forecast applies. The date is in "ddMmmyyyy" format, for example "30 Nov 2005" (string)
* low: the forecasted low temperature for this day, in the units specified by the yweather:units element (integer)
* high: the forecasted high temperature for this day, in the units specified by the yweather:units element (integer)
* text: a textual description of conditions, for example, "Partly Cloudy" (string).

**2.3 Agencies**

A rise in farmer’s suicides is a result of various factors as the withdrawal of government support, insufficient or risky credit systems, the difficulty of farming semi-arid regions, poor agricultural income, absence of alternative income opportunities, a downturn in the urban economy which forced non-farmers into farming, and most importantly the absence of suitable counseling services. Special programmes were undertaken by Government but remain unnoticed by the farmers. Therefore all the essential schemes started by the govt. for the welfare of the farmers have been defined. Bank policies and schemes are also included. Inefficiency in the wholesale markets result in a long chain of intermediaries, multiple handling, loss of quality and increase in the gap between the producer and consumer prices. The purpose of regulation of agricultural markets was to protect farmers from the exploitation of intermediaries and traders and also to ensure better prices and timely payment for the produce. Therefore market links are added for this purpose.

M-apps are effective at strengthening market links[4].

Rural farmers typically lack access to financial services that could increase their ability to

upgrade or diversify their practices. This is mainly because financial institutions and insurance companies do not seek out rural customers because of the high costs of small transactions and of loan and claim management.Bank policies and schemes are also included. A very popular new 24-hr helpline number only for farmers have been introduced to provide them with each and everything[5].

**2.4 Organic Fertilizers**

Our definition of organic farming recognises the direct connection between our health and how the food we eat is produced. Artificial fertilisers are banned and farmers develop fertile soil by rotating crops and using compost, manure and clover.

Strict regulations, known as ‘standards’, define what organic farmers can and cannot do – and place a strong emphasis on the protection of wildlife and the environment.

Taking its name from the organic matter that farmers use as an alternative to synthetic fertilisers, organic farmers take a holistic, [principled](http://www.soilassociation.org/WhatisOrganic/Organicprinciples/tabid/1498/Default.aspx) approach that respects and harnesses the power of natural processes to build positive health across the ecology of the farm.

Organic farming methods offer the best, currently available, practical model for addressing climate-friendly food production. This is because it is less dependent on oil-based fertilisers and pesticides and confers resilience in the face of climatic extremes. It also stores higher levels of carbon in the soil, and as a result if organic farming was common practice in the UK, we could offset at least 23% of agriculture's current greenhouse emissions[10].

## Organic farming facts

In organic farming:

* artificial chemical fertilisers are prohibited – instead organic farmers develop a [healthy, fertile soil](http://www.soilassociation.org/WhatisOrganic/Organicfarming/Healthysoil/tabid/1466/Default.aspx) by growing and rotating a mixture of crops, adding [organic matter](http://www.soilassociation.org/WhatisOrganic/Organicfarming/Organicmatter/tabid/1467/Default.aspx) such as compost or manure and using clover to fix nitrogen from the atmosphere
* pesticides are severely restricted – instead organic farmers develop nutrient-rich soil to grow strong, healthy crops and encourage wildlife to help control pests and disease
* animal welfare is at the heart of the system and a truly free-range life for[farm animals](http://www.soilassociation.org/WhatisOrganic/Organicanimals/tabid/1469/Default.aspx) is guaranteed
* a diversity of crops and animals are raised on the farm and [rotated](http://www.soilassociation.org/whatisorganic/organicfarming/croprotations) around the farm over several seasons, including fallow periods. This mixed farming approach helps break cycles of pests and disease and builds fertility in the soil
* the routine use of drugs, antibiotics and wormers is banned – instead the farmer will use preventative methods, like moving animals to fresh pasture and keeping smaller herd and flock sizes
* genetically modified (GM) crops and ingredients are banned

**CHAPTER 3**

**Selection of Technology and Components**

There are several technologies used for building applications for mobile. Also several processors, software programmers, GSM and Bluetooth modems are available in the market. We have to select one among this wide range of components which appropriately suits the design and helps in achieving the goals and objectives set for this project. This chapters gives details about the technologies and software programmers and hardware components available in the market and explains about the selected ones.

**3.1 Mobile Operating System**

**3.1.1 Symbian**

Symbian is a [mobile operating system](http://en.wikipedia.org/wiki/Mobile_operating_system) (OS) and [computing platform](http://en.wikipedia.org/wiki/Computing_platform) designed for [smartphones](http://en.wikipedia.org/wiki/Smartphone) and currently maintained by [Accenture](http://en.wikipedia.org/wiki/Accenture).[[17]](http://en.wikipedia.org/wiki/Symbian#cite_note-mca-5) Symbian was originally developed by [Symbian Ltd.](http://en.wikipedia.org/wiki/Symbian_Ltd.),[[17]](http://en.wikipedia.org/wiki/Symbian#cite_note-6) as a descendant of [Psion](http://en.wikipedia.org/wiki/Psion)'s [EPOC](http://en.wikipedia.org/wiki/EPOC_(operating_system)) and runs exclusively on [ARM](http://en.wikipedia.org/wiki/ARM_architecture)[processors](http://en.wikipedia.org/wiki/Central_processing_unit), although an unreleased [x86](http://en.wikipedia.org/wiki/X86) port existed. The current form of Symbian is an open-source platform developed by [Symbian Foundation](http://en.wikipedia.org/wiki/Symbian_Foundation) in 2009, as the successor of the original *Symbian OS*. Symbian was used by many major mobile phone brands, like [Samsung](http://en.wikipedia.org/wiki/Samsung), [Motorola](http://en.wikipedia.org/wiki/Motorola), [Sony Ericsson](http://en.wikipedia.org/wiki/Sony_Ericsson), and above all by [Nokia](http://en.wikipedia.org/wiki/Nokia). It was the most popular smartphone OS on a worldwide average until the end of 2010, when it was overtaken by [Android](http://en.wikipedia.org/wiki/Android_OS).

Symbian rose to fame from its use with the [S60](http://en.wikipedia.org/wiki/S60_(software_platform)) platform built by Nokia, first released in 2002 and powering most Nokia smartphones. [UIQ](http://en.wikipedia.org/wiki/UIQ), another Symbian platform, ran in parallel, but these two platforms were not compatible with each other. Symbian^3, was officially released in Q4 2010 as the successor of S60 and UIQ, first used in the [Nokia N8](http://en.wikipedia.org/wiki/Nokia_N8), to use a single platform for the OS. In May 2011 an update, Symbian Anna, was officially announced, followed by Nokia Belle (previously Symbian Belle) in August 2011.[[4]](http://en.wikipedia.org/wiki/Symbian#cite_note-engadget1-7)[[5]](http://en.wikipedia.org/wiki/Symbian#cite_note-engadget2-8)

On 11 February 2011, Nokia announced that it would use [Microsoft](http://en.wikipedia.org/wiki/Microsoft)'s [Windows Phone](http://en.wikipedia.org/wiki/Windows_Phone) [OS](http://en.wikipedia.org/wiki/Mobile_operating_system) as its primary smartphone platform, and Symbian will be its franchise platform, dropping Symbian as its main smartphone OS of choice.[[9]](http://en.wikipedia.org/wiki/Symbian#cite_note-9)[[10]](http://en.wikipedia.org/wiki/Symbian#cite_note-engadget.com-10) On 22 June 2011 Nokia made an agreement with [Accenture](http://en.wikipedia.org/wiki/Accenture) for an outsourcing program. Accenture will provide Symbian-based software development and support services to Nokia through 2016; about 2,800 Nokia employees became Accenture employees as of October 2011.

**3.1.2 Android**

Android is a [Linux](http://en.wikipedia.org/wiki/Linux)-based [operating system](http://en.wikipedia.org/wiki/Mobile_operating_system)[[5]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-AndroidOverview-8) designed primarily for [touchscreen](http://en.wikipedia.org/wiki/Touchscreen) mobile devices such as [smartphones](http://en.wikipedia.org/wiki/Smartphone) and [tablet computers](http://en.wikipedia.org/wiki/Tablet_computer). Initially developed by Android, Inc., which [Google](http://en.wikipedia.org/wiki/Google) backed financially and later bought in 2005,[[4]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-AndroidInc-9) Android was unveiled in 2007 along with the founding of the [Open Handset Alliance](http://en.wikipedia.org/wiki/Open_Handset_Alliance): a consortium of [hardware](http://en.wikipedia.org/wiki/Computer_hardware), software, and telecommunication companies devoted to advancing [open standards](http://en.wikipedia.org/wiki/Open_standard) for mobile devices.[[10]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-AndroidAnnouncement-10) The [first Android-powered phone](http://en.wikipedia.org/wiki/HTC_Dream) was sold in October 2008.[[11]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-11)

Android is [open source](http://en.wikipedia.org/wiki/Open_source) and Google releases the code under the [Apache License](http://en.wikipedia.org/wiki/Apache_License).[[8]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-AndroidOverview-8) This open source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers. Additionally, Android has a large community of developers writing applications ("[apps](http://en.wikipedia.org/wiki/Mobile_app)") that extend the functionality of devices, written primarily in a customized version of the [Java](http://en.wikipedia.org/wiki/Java_(programming_language)) programming language.[[12]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-12) In October 2012, there were approximately 700,000 apps available for Android, and the estimated number of applications downloaded from [Google Play](http://en.wikipedia.org/wiki/Google_Play), Android's primary app store, was 25 billion.[[13]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-appstats-700000-13)[[14]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-appstats-25billion-14)

These factors have contributed towards making Android the world's most widely used smartphone platform,[[15]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-canalysQ42010-15) overtaking [Symbian](http://en.wikipedia.org/wiki/Symbian) in the fourth quarter of 2010,[[16]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-16) and the software of choice for technology companies who require a low-cost, customizable, lightweight operating system for [high tech](http://en.wikipedia.org/wiki/High_tech) devices without developing one from scratch.[[17]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-ars5th-17)As a result, despite being primarily designed for phones and tablets, it has seen additional applications on televisions, [games consoles](http://en.wikipedia.org/wiki/Games_console), [digital cameras](http://en.wikipedia.org/wiki/Digital_camera) and other electronics. Android's open nature has further encouraged a large community of developers and enthusiasts to use the open source code as a foundation for community-driven projects, which add new features for advanced users [[18]](http://en.wikipedia.org/wiki/Android_(operating_system)#cite_note-apolroms-18) or bring Android to devices which were officially released running other operating systems. In Android OS active and passive Data structure is used.

**3.1.3iOS**

iOS (previously iPhone OS) is a [mobile operating system](http://en.wikipedia.org/wiki/Mobile_operating_system) developed and distributed by [Apple Inc.](http://en.wikipedia.org/wiki/Apple_Inc.) Originally unveiled in 2007 for the [iPhone](http://en.wikipedia.org/wiki/IPhone), it has been extended to support other Apple devices such as the [iPod Touch](http://en.wikipedia.org/wiki/IPod_Touch) (September 2007), [iPad](http://en.wikipedia.org/wiki/IPad) (January 2010) and second-generation [Apple TV](http://en.wikipedia.org/wiki/Apple_TV) (September 2010). Unlike [Microsoft](http://en.wikipedia.org/wiki/Microsoft)'s [Windows Phone](http://en.wikipedia.org/wiki/Windows_Phone) and [Google](http://en.wikipedia.org/wiki/Google)'s [Android](http://en.wikipedia.org/wiki/Android_(operating_system)), Apple does not license iOS for installation on non-Apple hardware. As of June 2013, Apple's [App Store](http://en.wikipedia.org/wiki/App_Store_(iOS)) contained more than 900,000 iOS applications, 375,000 of which were optimized for iPad.[[6]](http://en.wikipedia.org/wiki/IOS#cite_note-6) These apps have collectively been downloaded more than 50 billion times.[[7]](http://en.wikipedia.org/wiki/IOS#cite_note-WWDC_2012_Keynote-7) It had a 21% share of the [smartphone](http://en.wikipedia.org/wiki/Smartphone) mobile operating system units shipped in the fourth quarter of 2012, behind only Google's Android.[[8]](http://en.wikipedia.org/wiki/IOS#cite_note-idcq412-8) In June 2012, it accounted for 65% of mobile web data consumption (including use on both the iPod Touch and the iPad).[[9]](http://en.wikipedia.org/wiki/IOS#cite_note-9) At the half of 2012, there were 410 million devices activated.[[10]](http://en.wikipedia.org/wiki/IOS#cite_note-10) According to the special media event held by Apple on September 12, 2012, 400 million devices had been sold by June 2012.[[11]](http://en.wikipedia.org/wiki/IOS#cite_note-400_Million_iOS_Devices_Sold-11)

The [user interface](http://en.wikipedia.org/wiki/User_interface) of iOS is based on the concept of [direct manipulation](http://en.wikipedia.org/wiki/Direct_manipulation), using [multi-touch gestures](http://en.wikipedia.org/wiki/Multi-touch_gestures). Interface control elements consist of sliders, switches, and buttons. Interaction with the OS includes gestures such as *swipe*, *tap*, *pinch*, and *reverse pinch*, all of which have specific definitions within the context of the iOS operating system and its multi-touch interface. Internal [accelerometers](http://en.wikipedia.org/wiki/Accelerometer) are used by some applications to respond to shaking the device (one common result is the undo command) or rotating it in [three dimensions](http://en.wikipedia.org/wiki/3D_modelling) (one common result is switching from portrait to landscape mode).

iOS is derived from [OS X](http://en.wikipedia.org/wiki/OS_X), with which it shares the [Darwin](http://en.wikipedia.org/wiki/Darwin_(operating_system)) foundation and various application frameworks. iOS is Apple's mobile version of the [OS X](http://en.wikipedia.org/wiki/OS_X) operating system used on Apple computers.

In iOS, there are four [abstraction layers](http://en.wikipedia.org/wiki/Abstraction_layer): the Core OS layer, the [Core Services](http://en.wikipedia.org/wiki/Core_Services) layer, the Media layer, and the [Cocoa Touch](http://en.wikipedia.org/wiki/Cocoa_Touch) layer. The current version of the operating system (iOS 6.1.3) dedicates 1–1.5 GB of the device's flash memory for the system partition, using roughly 800 MB of that partition (varying by model) for iOS itself.

**3.1.4 Window Phone 7**

Windows Phone 7 was the first and previous release of the [Windows Phone](http://en.wikipedia.org/wiki/Windows_Phone) mobile client operating system, released worldwide on October 21, 2010, and in the [United States](http://en.wikipedia.org/wiki/United_States) on November 8, 2010. An update to the OS codenamed *Mango* (also referred to as Windows Phone 7.5) was released in May 2011. In January 2013, Windows Phone 7.8 was released.

Microsoft officially unveiled the new operating system, **Windows Phone 7 Series**, at the[Mobile World Congress](http://en.wikipedia.org/wiki/Mobile_World_Congress) in Barcelona on February 15, 2010,[[2]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-WP7unveil-2) and revealed additional details at [MIX 2010](http://en.wikipedia.org/wiki/MIX_(Microsoft)#MIX_10.29) on March 15, 2010. The final [SDK](http://en.wikipedia.org/wiki/Software_development_kit) was made available on September 16, 2010.[[3]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-3) [HP](http://en.wikipedia.org/wiki/HP) later decided not to build devices for Windows Phone, citing that it wanted to focus on devices for its newly purchased [webOS](http://en.wikipedia.org/wiki/WebOS).[[4]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-4) As its original name was criticized for being too complex and "wordy", the name of the operating system was officially shortened to just **Windows Phone 7** on April 2, 2010.[[5]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-5)

On October 11, 2010, Microsoft's CEO [Steve Ballmer](http://en.wikipedia.org/wiki/Steve_Ballmer) announced the 10 launch devices for Windows Phone 7, made by [HTC](http://en.wikipedia.org/wiki/HTC_Corporation), [Dell](http://en.wikipedia.org/wiki/Dell), [Samsung](http://en.wikipedia.org/wiki/Samsung_Electronics), and [LG](http://en.wikipedia.org/wiki/LG_Corp.), with sales beginning on October 21, 2010 in Europe and Australia and November 8, 2010 in the United States. The devices were made available on 60 carriers in 30 countries, with additional devices to be launched in 2011.[[6]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-6) Upon the release of Windows Phone 7's "Mango" revision, additional manufacturers became partners, including [Acer](http://en.wikipedia.org/wiki/Acer_Inc.), [Fujitsu](http://en.wikipedia.org/wiki/Fujitsu), and [ZTE](http://en.wikipedia.org/wiki/ZTE).[[7]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-7)

Windows Phone initially supported twenty-five languages, with applications being available through [Windows Phone Store](http://en.wikipedia.org/wiki/Windows_Phone_Store) in 35 countries and regions. Support for additional languages and regions were subsequently brought through both the Mango and Tango updates to the OS respectively.[[8]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-8)[[9]](http://en.wikipedia.org/wiki/Windows_Phone_7#cite_note-9)

**3.2 Selection of Operating Systems**

We are selected Windows Phone 7 OS for developing our application. As it follows:

* With Windows Phone, Microsoft has created new user interface called as metro design. More over this OS can be integrated with the third party application so that user can create application whereas Android is a Linux-based operating system mostly used in smart phones that has touchscreen and also used in tablet computers[6][7].
* Lock screen of Windows can play different apps at the background, numeric password and notification of different apps whereas latest Android version has unlock by swiping to the right and also other applications can be opened by swiping left. It also has a notification of different apps when user swipes the mobile from the top[6][7]..
* As we enter the Start screen of a windows mobile, we can find set of live tiles similar to a checkerboard. Windows interface avoids list of icons and replaced with live tiles. These live tiles give live information or feeds from different applications. It is different when compared with the old trendy icons. However, the notification system in windows is not effective as Android. We will not be able to see the exact notification when the screen is locked as in Android. Another big annoyance in windows interface is multi-tasking. One needs to press the back button to view the list of recently opened items. Upon clicking any recently opened app, the user will not be taken to the point where to left previously[6][7].
* How a mobile O.S appeals to developers is also an important factor. To start developing applications for Windows Phone 8, you will need to use the Visual Studio 2012 Express for Windows Phone. Although this IDE is free, the requirement to use Visual Studio 2012 Express for Windows Phone is a little bit difficult. More still, you’d need to meet the hardware and OS requirements. This means that you will need to have Windows 8 desktop operating system, and a computer that supports hardware virtualization to develop an application for Windows Phone 8. Additionally, you need to have the special enterprise version of windows 8, not to forget that it must be the x64 version. Well, most older PCs don’t support hardware virtualization, and most of us are still comfortable with Windows phone 7[6][7].

To develop an android application, a developer just needs to download open source eclipse, and the Android SDK. Without going into more scrutiny, it is evident that Microsoft is making it a little harder for new developers to join and contribute their ingenuity to the community[6][7].

* What happens when you want to play that favorite video you have got on your desktop right from your smartphone? Well, while android offers support for multiple file formats, Windows Phone does not. So if you get that interesting .dv video file from a friend, you can just play it on your android phone, but not on your Nokia Lumia 920 or any other Windows Phone for that matter. Most file formats will work with the Windows Phone when imported from a device running the proprietary Microsoft OS. Some of us still love Linux based open-source operating systems, so this doesn’t do you any good. And without making a lot of arbitrary dots, let’s remember that while Apple was always advocating for a closed system, Microsoft has always been against such.

Android offers flash support, but Windows Phone just won’t. Why? The argument is that flash on mobile is dead. Well, you can’t just tell all those content providers out there on the World Wide Web to switch to HTML 5 so that you may access their contents on your windows Phone.

* Android has a provision to protect devices when stolen. If at all an android device is stolen, the password protection can help keep unauthorized users from accessing the phone, and more specifically personal data. Windows mobile operating system has no feature to protect stolen phones.

**3.3Coding Language**

**3.3.1 XAML**

Extensible Application Markup Language (XAML) is a [declarative](http://en.wikipedia.org/wiki/Declarative_programming) [XML](http://en.wikipedia.org/wiki/XML)-based language created by [Microsoft](http://en.wikipedia.org/wiki/Microsoft) that is used for initializing structured values and objects. It is available under Microsoft's [Open Specification Promise](http://en.wikipedia.org/wiki/Open_Specification_Promise).[[4]](http://en.wikipedia.org/wiki/Extensible_Application_Markup_Language#cite_note-4) The acronym originally stood for Extensible Avalon Markup Language - *Avalon* being the code-name for [Windows Presentation Foundation](http://en.wikipedia.org/wiki/Windows_Presentation_Foundation) (WPF).[[5]](http://en.wikipedia.org/wiki/Extensible_Application_Markup_Language#cite_note-5)

XAML is used extensively in [.NET Framework 3.0](http://en.wikipedia.org/wiki/.NET_Framework_3.0) & [.NET Framework 4.0](http://en.wikipedia.org/wiki/.NET_Framework_4.0) technologies, particularly [Windows Presentation Foundation (WPF)](http://en.wikipedia.org/wiki/Windows_Presentation_Foundation), [Silverlight](http://en.wikipedia.org/wiki/Silverlight), [Windows Workflow Foundation (WF)](http://en.wikipedia.org/wiki/Windows_Workflow_Foundation) and [Windows Runtime XAML Framework](http://en.wikipedia.org/wiki/Windows_Runtime_XAML_Framework). In WPF, XAML forms a [user interface markup language](http://en.wikipedia.org/wiki/User_interface_markup_language) to define UI elements, data binding, venting, and other features. In WF, [workflows](http://en.wikipedia.org/wiki/Workflow) can be defined using XAML. XAML can also be used in [Silverlight](http://en.wikipedia.org/wiki/Silverlight) applications, [Windows Phone](http://en.wikipedia.org/wiki/Windows_Phone) apps and [Windows Store apps](http://en.wikipedia.org/wiki/Windows_store_apps).

XAML elements map directly to [Common Language Runtime](http://en.wikipedia.org/wiki/Common_Language_Runtime) object instances, while XAML attributes map to Common Language Runtime properties and events on those objects. XAML files can be created and edited with visual design tools like [Microsoft Expression Blend](http://en.wikipedia.org/wiki/Microsoft_Expression_Blend), [Microsoft Visual Studio](http://en.wikipedia.org/wiki/Microsoft_Visual_Studio), and the host able Windows Workflow Foundation visual designer. They can also be created and edited with a standard [text editor](http://en.wikipedia.org/wiki/Text_editor), a code editor like [XAML Pad](http://en.wikipedia.org/wiki/XAMLPad), or a graphical editor like [Vector Architect](http://en.wikipedia.org/wiki/Vector_Architect).

Anything that is created or implemented in XAML can be expressed using a more traditional .NET language, such as [C#](http://en.wikipedia.org/wiki/C_Sharp_(programming_language)) or [Visual Basic.NET](http://en.wikipedia.org/wiki/Visual_Basic.NET). However, a key aspect of the technology is the reduced complexity needed for tools to process XAML, because it is based on XML.[[6]](http://en.wikipedia.org/wiki/Extensible_Application_Markup_Language#cite_note-6) Consequently, a variety of products are emerging, particularly in the WPF space, which create XAML-based applications. As XAML is simply based on XML, developers and designers are able to share and edit content freely amongst themselves without requiring compilation. Since it is strongly linked to the .NET Framework 3.0 technologies, the only fully compliant implementation at present is Microsoft's.[

**3.3.2 JAVA Platform**

One characteristic of Java is portability, which means that computer programs written in the Java language must run similarly on any hardware/operating-system platform. This is achieved by compiling the Java language code to an intermediate representation called [Java byte code](http://en.wikipedia.org/wiki/Java_bytecode), instead of directly to platform-specific [machine code](http://en.wikipedia.org/wiki/Machine_code). Java byte code instructions are analogous to machine code, but they are intended to be [interpreted](http://en.wikipedia.org/wiki/Interpreter_(computing)) by a [virtual machine](http://en.wikipedia.org/wiki/Virtual_machine) (VM) written specifically for the host hardware. [End-users](http://en.wikipedia.org/wiki/End-user) commonly use a [Java Runtime Environment](http://en.wikipedia.org/wiki/Java_virtual_machine) (JRE) installed on their own machine for standalone Java applications, or in a Web browser for Java [applets](http://en.wikipedia.org/wiki/Applet)[6][7].

Standardized libraries provide a generic way to access host-specific features such as graphics, [threading](http://en.wikipedia.org/wiki/Thread_(computer_science)), and [networking](http://en.wikipedia.org/wiki/Computer_network).

A major benefit of using byte code is porting. However, the overhead of interpretation means that interpreted programs almost always run more slowly than programs compiled to native executable would. Just-in-Time (JIT) compilers were introduced from an early stage that compiles byte codes to machine code during runtime.

**3.3.3 C#**

Microsoft Visual C# is [Microsoft](http://en.wikipedia.org/wiki/Microsoft)'s implementation of the [C#](http://en.wikipedia.org/wiki/C_Sharp_(programming_language)) specification, included in the [Microsoft Visual Studio](http://en.wikipedia.org/wiki/Microsoft_Visual_Studio) suite of products. It is based on the [ECMA](http://en.wikipedia.org/wiki/Ecma_International)/[ISO](http://en.wikipedia.org/wiki/International_Organization_for_Standardization) specification of the C# language, which Microsoft also created. While multiple implementations of the specification exist, Visual C# is by far the one most commonly used. In most contexts, an unqualified reference to "C#" is taken to mean "Visual C#.”

The term *Visual* denotes a brand-name relationship with other Microsoft programming languages such as [Visual Basic](http://en.wikipedia.org/wiki/Visual_Basic), [Visual FoxPro](http://en.wikipedia.org/wiki/Visual_FoxPro), [Visual J#](http://en.wikipedia.org/wiki/J_Sharp) and [Visual C++](http://en.wikipedia.org/wiki/Visual_C%2B%2B). All of these products are packaged with a graphical [IDE](http://en.wikipedia.org/wiki/Integrated_development_environment) and support [rapid application development](http://en.wikipedia.org/wiki/Rapid_application_development) of [Windows](http://en.wikipedia.org/wiki/Microsoft_Windows)-based applications.

Visual C# is currently used in development of Windows and Xbox Live games via [Microsoft XNA](http://en.wikipedia.org/wiki/Microsoft_XNA), which allows game developers to create and share their games with other gamers. Visual C# is also heavily used by ASP.NET web sites and standalone applications based on the .NET Framework[6][7].

**3.4 Selection of Coding Language**

We have selected C# and xaml codes for programming our application instead of Java Platform because of the following reasons:

The design goals for C#, as listed by the ECMA standard:

* The C# language is intended to be a simple, modern, general-purpose, object-oriented programming language.
* The language, and implementations thereof, should provide support for software engineering principles such as strong type checking, array bounds checking, detection of attempts to use uninitialized variables, and automatic garbage collection. Software robustness, durability, and programmer productivity are important.
* The language is intended for use in developing software components suitable for deployment in distributed environments.
* Source code portability is very important, as is programmer portability, especially for those programmers already familiar with C and C++.
* Support for internationalization is very important.
* C# is intended to be suitable for writing applications for both hosted and embedded systems, ranging from the very large that use sophisticated operating systems, down to the very small having dedicated functions.
* Although C# applications are intended to be economical with regard to memory and processing power requirements, the language was not intended to compete directly on performance and size with C or assembly language[22].

As it based on the C language, it is quite similar to it. It even shares some syntactic conventions with C. However, a disadvantage of C# is that, as it was developed by Microsoft for use in its .NET framework, it only works on Microsoft operating systems.

Some differences between Java and C#:

* C# provides more data types as compared to Java.
* C# contains more primitive data types than Java.
* C# supports operator overloading while Java does not.
* C# supports the strut type while Java does not.
* AII data types in C# are strut.
* C# provides better versioning than Java.
* C# allows parameters to be passed by reference by using the ref keyword, whereas Java allows parameters to be passed by value.
* C# allows variable number of parameters using the param keyword.
* C# provides static constructors for initialization.
* C# provides goto statement instead of the break statement.
* Declaration of arrays is different in C# as compared to Java.
* The convention for Java is to put one public class in each file and some compilers require this. C# allows any source file arrangement.
* Java does not support events and delegates.
* In Java, methods are virtual by default but can be made final. While, in C# they're sealed by default, but can be made virtual.
* C# doesn't have checked exceptions.
* Java doesn't allow the creation of user-defined value types.
* Java doesn't have operator and conversion overloading.
* Java doesn't have iterator blocks for simple implemetation of iterators.
* Java doesn't have anything like LINQ.
* Partly due to not having delegates, Java doesn't have anything quite like anonymous methods and lambda expressions.
* Java doesn't have expression trees.
* C# doesn't have anonymous inner classes.
* Java doesn't have any equivalent to the C# 3.0 anonymous types.
* Java doesn't have implicitly typed local variables.
* Java doesn't have extension methods.
* Java doesn't have object and collection initializer expressions.
* Java doesn't have properties as part of the language; they're a convention of get/set/is methods.
* Java doesn't have the equivalent of "unsafe" code.
* Java's enums are much more object-oriented.
* Java has no preprocessor directives (#define, #if etc in C#).
* Java has no equivalent of C#'s ref and out for passing parameters by reference.
* Java has no equivalent of partial types.
* C# interfaces cannot declare fields.
* Java has no unsigned integer types.
* Java has no language support for a decimal type.
* Java has no equivalent of null able value types.[22]

**3.5 Selection of Technology**

Communications technology, especially in telecommunications, has progressed to the point where it is inevitable to think yourself without mobiles. The communication is possible in different forms. These technologies are RF, Internet, Bluetooth, GSM and GPRS. The choice of mode of communication is dependent on setup to be established and the level of reliability needed and also on the type of application. These technologies are briefly described in next section.

**3.5.1 RF (Radio Frequency)**

RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. This wireless communication method uses wireless transmission to indirectly realize data acquisition, and it is an effective method to overcome the disadvantages produced by the wired data transmission method.

A RF module is a circuit which consists of a receiver and a transmitter. The RF transmitter collects the data from the sensors and collected data is transmitted to the monitoring station receiver. Radio frequency (RF) technology is more flexible and allows the user to link electric home appliances distributed throughout the house. RF can be categorized as a narrow band or spread spectrum. Narrow band technology requires a clear channel uninterrupted by other digital appliances. Since each transmitter/receiver appliance transmits using its own frequency, it is unlikely to interfere with other RF appliances connected to the home network.

**Features of RF Technology**

* Low Cost
* Easy Installation & maintenance

**Limitations of RF Technology**

* High bit error rate
* Low reliability
* Limited Range (few hundred meters)

**3.5.2 Internet (Web based)**

Even though the Internet is still a young technology, it's hard to imagine life without it now. Every year, engineers create more devices to integrate with the Internet. This network of networks crisscrosses the globe and even extends into space. Internet has also started to serve as a medium which allows the monitoring, control, and interaction with machine and devices. The Internet is used also in home automation which provides many features ranging from efficient use of energy to increased comfort, greater safety and security. Even from remote areas user can monitor and control the gate of his home, appliances and many other activities by using different sensors with the help of internet.

The Internet can be defined as the wired or wireless mode of communication through which one can receive, transmit information that can be used for single or multiple operations. The TCP/IP protocol makes the information transmission possible.

**Features of Internet**

* Remote Monitoring
* Real Time Monitoring
* Security

**Limitations of Internet**

* Additional cost of PC
* Internet access is mandatory

**3.5.3 Bluetooth**

Bluetooth is a highly versatile and attractive technology among other short range wireless technologies. It operates over an unlicensed frequency band of 2.4 GHz and links digital devices within a range of 10 meters to 100 meters at a speed of up to 3 Mbps depending upon the Bluetooth device class. Bluetooth technology was designed primarily to support simple wireless networking of personal consumer devices and peripherals, including cell phones, PDAs, and wireless headsets but now it is also used in automation that is if a user has to control or monitor devices within a limited range, Bluetooth is a cost effective solution.

Bluetooth networks have topology called a piconet. Piconets contain a minimum of two and a maximum of eight Bluetooth peer devices out of which one is master and others are slave. Slaves can only listen to master node whereas master is the only one which transmits. Devices communicate using protocols that are part of the Bluetooth Specification.

**Features of Bluetooth**

* Low operating cost
* Low power requirements
* Small size and fast response

**Limitations of Bluetooth**

* Limited range (up to few meters)
* No real time monitoring
* Access delay and Interference

**3.5.4 GSM (Global System for Mobile)**

GSM is a [digital](http://searchcio-midmarket.techtarget.com/definition/digital) mobile telephony system that is widely used throughout the world. It is a second generation cellular standard developed to cater voice services and data delivery using digital modulation. It operates at either the 900 [MHz](http://searchnetworking.techtarget.com/definition/MHz) or 1800 MHz frequency band. Since almost all GSM network operators have roaming agreements with foreign operators, users can often continue to use their mobile phones when they travel to other countries and also number of its users is not limited. The coverage of GSM network is vast so it provides a strong platform for the user to monitor and control devices from any part of the world via SMS (Short Message Service).

**Features of GSM**

* Wide range
* Mobility
* Low maintenance cost

**Limitations**

* No real time monitoring

**3.5.5 GPRS (General Packet Radio Service)**

General Packet Radio Service is a packet-switching technology that enables data transfers through cellular networks. It is used for mobile internet, MMS and other data communications. In theory the speed limit of GPRS is 115 kbps, but in most networks it is around 35 kbps. Informally, GPRS is also called 2.5G.It is an enhancement to the existing GSM networks that introduce packet data transmission. This service allows the user to use internet services via mobile phone all the time anywhere in the world. The data speed of GPRS is more than four times than that of conventional GSM system.

**Features of GPRS**

* High data rate
* Real time monitoring
* Accuracy

**Limitations of GPRS**

* Usage cost is high

From the above discussion it is concluded that designing a remote monitoring and control system using any one of these technologies, that satisfies all the parameters simultaneously is a complicated task. Each proposed technology has its own merits and demerits. However, there is still a possibility of designing a cost effective system which has an improved performance in most of the respects that will work optimally in many different applications. We have chosen both Bluetooth and GSM communication technologies for the implementation. Bluetooth will reduce the network usage cost when operating from a limited range and GSM will add the element of mobility when controlling the devices remotely from anywhere. GSM modem used in this project is SIM300 by SIMCOM and Bluetooth modem is AUBTM-20 by AUSTAR.

**3.6Selection of Processor**

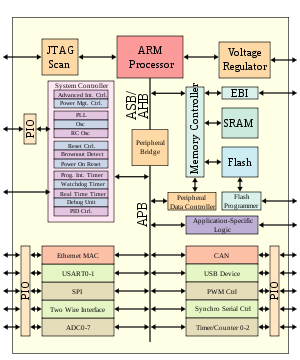
**3.6.1ARM Processor**

The **ARM** architecture describes a family of [RISC](https://en.wikipedia.org/wiki/Reduced_instruction_set_computing)-based [computer processors](https://en.wikipedia.org/wiki/Central_processing_unit) designed and licensed by British company [ARM Holdings](https://en.wikipedia.org/wiki/ARM_Holdings). It was first developed in the 1980s[[2]](https://en.wikipedia.org/wiki/ARM_architecture#cite_note-ARM1-2) by [Acorn Computers Ltd](https://en.wikipedia.org/wiki/Acorn_Computers_Ltd) to power their desktop machines and subsequently spun off as a separate company, now ARM Holdings. Globally as of 2013 it is the most widely used [32-bit](https://en.wikipedia.org/wiki/32-bit) [instruction set architecture](https://en.wikipedia.org/wiki/Instruction_set_architecture) in terms of quantity produced.[[3]](https://en.wikipedia.org/wiki/ARM_architecture#cite_note-3)[[4]](https://en.wikipedia.org/wiki/ARM_architecture#cite_note-4) According to ARM Holdings, in 2010 alone, producers of chips based on ARM architectures reported shipments of 6.1 billion [ARM-based processors](https://en.wikipedia.org/wiki/List_of_applications_of_ARM_cores), representing 95% of [smartphones](https://en.wikipedia.org/wiki/Smartphone), 35% of [digital televisions](https://en.wikipedia.org/wiki/Integrated_digital_television) and [set-top boxes](https://en.wikipedia.org/wiki/Set-top_boxes) and 10% of [mobile computers](https://en.wikipedia.org/wiki/Mobile_computer).

As an [IP core](https://en.wikipedia.org/wiki/Semiconductor_intellectual_property_core) business, ARM Holdings itself does not manufacture its own electronic chips, but licenses its designs to other [semiconductor](https://en.wikipedia.org/wiki/Semiconductor) manufacturers. ARM-based processorsand [systemchip](https://en.wikipedia.org/wiki/System_on_a_chip) include the [Qualcomm](https://en.wikipedia.org/wiki/Qualcomm) [Snapdragon](https://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)), [Vidia](https://en.wikipedia.org/wiki/NVidia) [Tegra](https://en.wikipedia.org/wiki/Tegra),Marvell [Xscale](https://en.wikipedia.org/wiki/Xscale) and [Texas Instruments](https://en.wikipedia.org/wiki/Texas_Instruments) [OMAP](https://en.wikipedia.org/wiki/OMAP), as well as ARM's Cortex series and [Apple System on Chips](https://en.wikipedia.org/wiki/Apple_System_on_Chips) (used in its [iPhones](https://en.wikipedia.org/wiki/IPhone)). The name was originally an [acronym](https://en.wikipedia.org/wiki/Acronym) for [*Acorn*](https://en.wikipedia.org/wiki/Acorn_Computers)*RISC Machine*  and subsequently, after the name Acorn was dropped, *Advanced RISC Machine*.

Using a [RISC](https://en.wikipedia.org/wiki/Reduced_instruction_set_computing) based approach to computer design, ARM processors require significantly fewer transistors than processors that would typically be found in a traditional computer. The benefits of this approach are reduced costs, heat and power usage compared to more complex chip designs, traits which are desirable for light, portable, battery-powered devices such as smart phones and tablet computers.[[7]](https://en.wikipedia.org/wiki/ARM_architecture#cite_note-7) The reduced complexity and simpler design allows companies to build a low-energy [system on a chip](https://en.wikipedia.org/wiki/System_on_a_chip) for an [embedded system](https://en.wikipedia.org/wiki/Embedded_system) incorporating memory, interfaces, radios, etc. The earliest example was the [Apple Newton](https://en.wikipedia.org/wiki/Apple_Newton) tablet but this same approach is still used in the [Apple A4](https://en.wikipedia.org/wiki/Apple_A4) and [A5](https://en.wikipedia.org/wiki/Apple_A5) chips in the [iPad](https://en.wikipedia.org/wiki/IPad). Alternatively the use of a simpler design allows more efficient multi-core CPUs and higher core counts at lower cost, allowing higher levels of processing power and improved energy efficiency for [servers](https://en.wikipedia.org/wiki/Server_(computing)) and [laptops](https://en.wikipedia.org/wiki/Laptop) and notepad computers.

ARM periodically releases updates to its core—currently the widely used ARMv7 and the upcoming (as of 2012/13) 32/64 bit ARMv8—which chip manufacturers can then license and use for their own devices. Variants are available for each of these to include or exclude optional capabilities. Current versions use 32-bit instructions with 32-bit address space, but accommodates 16-bit instructions for economy and can also handle [Java bytecodes](https://en.wikipedia.org/wiki/Java_bytecode) which use 32-bit addresses. In 2012, [AMD](https://en.wikipedia.org/wiki/AMD) announced that it will produce systems on a chip based on the 64-bit ARM core for servers by 2014[6].

Fig 3.1 ARM Processor

**3.6.2 Qualcomm Quad-core processor**.

The Qualcomm Snapdragon™ 400 processors featured a quad-core CPUs with integrated multimode 3G/4G LTE.

In addition to multimode 3G/4G LTE, the processor integrates key modem features including TD-SCDMA, HSPA+ (up to 42Mbps), and multi-SIM capabilities.

The Snapdragon 400 processor will also support multi-SIM

Fig 3.2 Qualcomm Quad-core Processor

capabilities of Dual SIM, Dual Standby and Dual SIM, Dual Active and is optimized to deliver a smooth, graphics-rich gaming experience and provides Miracast™ support for wireless streaming of multimedia content.

The platform also supports a rich set of wireless connectivity functionality including integrated Qualcomm VIVE™ 802.11ac Wi-Fi, Bluetooth, FM and NFC. In addition, it includes the QuickCharge 1.0 feature charges devices up to 40 percent faster than conventional charging methods.

"By offering a multimode 3G/4G LTE variant to Qualcomm Snapdragon 400 tier of processors with quad-core CPUs, we are ensuring that emerging regions are equipped and prepared for the imminent transition to multimode 3G/4G LTE, in addition to being equipped for every major 2G and 3G technology," said Cristiano Amon, executive vice president and co-president of mobile and computing products, Qualcomm Technologies. "Snapdragon 400 processors provide customers with a wide range of innovative smartphones for both the high-volume and mid-tier segments."The new Snapdragon 400 processor (8926) will be available in late 2013[19].

3.2.3 Snapdragon Processor

Snapdragon is a family of mobile [systems on a chip](http://en.wikipedia.org/wiki/System_on_chip) (SoC) by [Qualcomm](http://en.wikipedia.org/wiki/Qualcomm). Qualcomm considers Snapdragon a "platform" for use in [smart phones](http://en.wikipedia.org/wiki/Smartphone), tablets, and [smart book](http://en.wikipedia.org/wiki/Smartbook)s devices.

The original Snapdragon CPU, dubbed [Scorpion](http://en.wikipedia.org/wiki/Scorpion_(CPU)), is Qualcomm's own design. It has many features similar to those of the [ARM](http://en.wikipedia.org/wiki/ARM_architecture) [Cortex-A8](http://en.wikipedia.org/wiki/ARM_Cortex-A8) core and it is based on the [ARM](http://en.wikipedia.org/wiki/ARM_architecture) v7 instruction set, but theoretically has much higher performance for multimedia-related SIMD operations. The successor to Scorpion, found in S4 Snapdragon SoCs is named [Krait](http://en.wikipedia.org/wiki/Krait_(CPU)) and has many similarities with the ARM [Cortex-A15](http://en.wikipedia.org/wiki/Cortex-A15) CPU and is also based on the [ARMv7](http://en.wikipedia.org/wiki/ARMv7) instruction set.

All Snapdragon processors contain the circuitry to decode [high-definition video](http://en.wikipedia.org/wiki/High-definition_video) (HD) resolution at [720p](http://en.wikipedia.org/wiki/720p) or [1080p](http://en.wikipedia.org/wiki/1080p) depending on the Snapdragon chipset. [Adreno](http://en.wikipedia.org/wiki/Adreno), the company's proprietary GPU technology, integrated into Snapdragon chipsets (and certain other Qualcomm chipsets) is Qualcomm's own design, using assets the company acquired from [AMD](http://en.wikipedia.org/wiki/AMD). The Adreno 225 GPU in Snapdragon S4 SoCs adds support for [DirectX](http://en.wikipedia.org/wiki/DirectX) 9/Shader Model 3.0 which makes it compatible with [Microsoft](http://en.wikipedia.org/wiki/Microsoft)'s [Windows 8](http://en.wikipedia.org/wiki/Windows_8).

Compared to System on chips from many competitors, Snapdragon SoCs have been unique in that they have had the antenna for cellular communication on-die. That is, they do not require a separate external antenna on the [PCB](http://en.wikipedia.org/wiki/Printed_circuit_board). Since Snapdragon S4, the majority of S4 SoCs also features on-die [Wi-Fi](http://en.wikipedia.org/wiki/Wi-Fi), [GPS](http://en.wikipedia.org/wiki/GPS)/[GLONASS](http://en.wikipedia.org/wiki/GLONASS) and [Bluetooth](http://en.wikipedia.org/wiki/Bluetooth) basebands. This integration reduces the complexity and cost of the final design for the [OEM](http://en.wikipedia.org/wiki/OEM). It also has the advantage of benefiting from advances in the manufacturing process, for example [28 nm](http://en.wikipedia.org/w/index.php?title=28_nm&action=edit&redlink=1) in most S4 SoCs, thus providing antennas and other dedicated circuitry with lower power characteristics than external chips manufactured with older processes.

SNAPDRAGON S200

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model Number** | [**Semiconductor technology**](http://en.wikipedia.org/wiki/Semiconductor_device_fabrication) | **CPU Instruction Set** | **CPU** | **CPU Cache** | **GPU** | **Wireless Radio Technologies** | | **Sampling Availability** | | **Utilizing Devices** | |
| APQ8055 | 45 nm | ARMv7 | Up To 1.4 GHz[Scorpion](http://en.wikipedia.org/wiki/Scorpion_(CPU)) | L2: 256 kB | [Adreno](http://en.wikipedia.org/wiki/Adreno)205 | Dual-channel 333 MHz LPDDR2[[15]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-15) | Lacks cellular antenna | Q2 2010 | [Nokia Lumia 900](http://en.wikipedia.org/wiki/Nokia_Lumia_900), [Bambook Sunflower](http://en.wikipedia.org/w/index.php?title=Bambook_Sunflower&action=edit&redlink=1)[[16]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-16) | |

Table 3.1 Snapdragon S200

SNAPDRAGON S400

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model Tier** | **Model Number** | [**Semiconductor technology**](http://en.wikipedia.org/wiki/Semiconductor_device_fabrication) | **CPU Instruction Set** | **CPU** | **CPU Cache** | **GPU** | **Memory Technology** | **Wireless Radio Technologies** | **Utilizing Devices** | |
| Plus  Pro | MSM8227[[32]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-qualcomm.com-32) | 28 nm LP | ARMv7 | Up To 1 GHz Dual-core[Krait](http://en.wikipedia.org/wiki/Krait_(CPU))[[13]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-ReferenceA-13) | L0: 4kB+4kB, L1: 16kB+16kB, L2: 1MB | [Adreno](http://en.wikipedia.org/wiki/Adreno) 305 (FWVGA/720p) |  | Bluetooth 4.0, 802.11n (2.4/5 GHz), UMTS (DC-HSPA+, TD-SCDMA) | [Nokia Lumia 520](http://en.wikipedia.org/wiki/Nokia_Lumia_520),[[37]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-X-bit_labs_Lumia_520.2F720-37) [Nokia Lumia 620](http://en.wikipedia.org/wiki/Nokia_Lumia_620),[[37]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-X-bit_labs_Lumia_520.2F720-37) [Nokia Lumia 720](http://en.wikipedia.org/wiki/Nokia_Lumia_720),[[37]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-X-bit_labs_Lumia_520.2F720-37) Sony Xperia M,[[38]](http://en.wikipedia.org/wiki/Snapdragon_(system_on_chip)#cite_note-38) Sony Xperia M dual | |
|  |  |  |  |  |  |  |  |  |  |
| MSM8960T | 28 nm LP | ARMv7 | Up To 1.7 GHz Dual-core[Krait](http://en.wikipedia.org/wiki/Krait_(CPU)) | L0: 4kB+4kB, L1: 16kB+16kB, L2: 1 MB | [Adreno](http://en.wikipedia.org/wiki/Adreno) 320 (WUXGA/1080p) at 400 MHz | Dual-channel 500 MHz LPDDR2 | Bluetooth 4.0, 802.11n (2.4/5 GHz), World Mode (LTE FDD/TDD CAT3, SVLTE-DB, TD-SCDMA, Rel9 DC-HSPA+, GSM/GPRS/EDGE, | [Nokia Lumia 920](http://en.wikipedia.org/wiki/Nokia_Lumia_920)T,[Sony XperiaSP](http://en.wikipedia.org/wiki/Sony_Xperia_SP),Xiaomi Mi-2A | |

Table 3.1 Snapdragon S400

**3.7 Selection of Software Development Tool**

Software development tool is a software package which is used to develop the software part of the system i.e. the software code. It consists of lots of supporting tools such as editor, compiler, project manager, simulator and debugger. Here for this project we need a tool which is used for building application,The programming language used for programming is C Sharp language. User writes his code in C language on the editor and then compiles the code with a C Sharp compiler. This code is then simulated by a simulator and then it is debugged for the errors .Few of the available tools are Visual Studio 2010, Expression Blend. These tools are explained in the following section.

**3.7.1 Visual Studio Expression 2010**

**Microsoft Visual Studio** is an [integrated development environment](https://en.wikipedia.org/wiki/Integrated_development_environment) (IDE) from [Microsoft](https://en.wikipedia.org/wiki/Microsoft). It is used to develop [console](https://en.wikipedia.org/wiki/Console_application) and [graphical user interface](https://en.wikipedia.org/wiki/Graphical_user_interface) [applications](https://en.wikipedia.org/wiki/Application_software) along with [Windows Forms](https://en.wikipedia.org/wiki/Windows_Forms) or [WPF](https://en.wikipedia.org/wiki/Windows_Presentation_Foundation) applications, [web sites](https://en.wikipedia.org/wiki/Web_site), [web applications](https://en.wikipedia.org/wiki/Web_application), and [web services](https://en.wikipedia.org/wiki/Web_service) in both [native code](https://en.wikipedia.org/wiki/Native_code) together with [managed code](https://en.wikipedia.org/wiki/Managed_code) for all platforms supported by [Microsoft Windows](https://en.wikipedia.org/wiki/Microsoft_Windows), [Windows Mobile](https://en.wikipedia.org/wiki/Windows_Mobile), [Windows CE](https://en.wikipedia.org/wiki/Windows_CE), [.NET Framework](https://en.wikipedia.org/wiki/.NET_Framework), [.NET Compact Framework](https://en.wikipedia.org/wiki/.NET_Compact_Framework) and [Microsoft Silverlight](https://en.wikipedia.org/wiki/Microsoft_Silverlight).

Visual Studio includes a [code editor](https://en.wikipedia.org/wiki/Code_editor) supporting [IntelliSense](https://en.wikipedia.org/wiki/IntelliSense) as well as [code refactoring](https://en.wikipedia.org/wiki/Code_refactoring). The integrated [debugger](https://en.wikipedia.org/wiki/Microsoft_Visual_Studio_Debugger) works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building [GUI](https://en.wikipedia.org/wiki/GUI) applications, [web designer](https://en.wikipedia.org/wiki/Web_designer), [class](https://en.wikipedia.org/wiki/Class_(computing)) designer, and [database schema](https://en.wikipedia.org/wiki/Database_schema) designer. It accepts plug-ins that enhance the functionality at almost every level—including adding support for [source-control](https://en.wikipedia.org/wiki/Source_control) systems (like [Subversion](https://en.wikipedia.org/wiki/Subversion_(software)) and [Visual SourceSafe](https://en.wikipedia.org/wiki/Visual_SourceSafe)) and adding new toolsets like editors and visual designers for [domain-specific languages](https://en.wikipedia.org/wiki/Domain-specific_language) or toolsets for other aspects of the [software development lifecycle](https://en.wikipedia.org/wiki/Software_development_lifecycle) (like the [Team Foundation Server](https://en.wikipedia.org/wiki/Team_Foundation_Server) client: Team Explorer).

Visual Studio supports different [programming languages](https://en.wikipedia.org/wiki/Programming_language) by means of language services, which allow the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. Built-in languages include [C](https://en.wikipedia.org/wiki/C_(programming_language))/[C++](https://en.wikipedia.org/wiki/C%2B%2B) (via [Visual C++](https://en.wikipedia.org/wiki/Visual_C%2B%2B)), [VB.NET](https://en.wikipedia.org/wiki/VB.NET) (via [Visual Basic .NET](https://en.wikipedia.org/wiki/Visual_Basic_.NET)), [C#](https://en.wikipedia.org/wiki/C_Sharp_(programming_language)) (via [Visual C#](https://en.wikipedia.org/wiki/Visual_C_Sharp)), and [F#](https://en.wikipedia.org/wiki/F_Sharp_(programming_language)) (as of Visual Studio 2010). Support for other languages such as [M](https://en.wikipedia.org/wiki/M_(programming_language)), [Python](https://en.wikipedia.org/wiki/IronPython), and [Ruby](https://en.wikipedia.org/wiki/IronRuby) among others is available via language services installed separately. It also supports [XML](https://en.wikipedia.org/wiki/XML)/[XSLT](https://en.wikipedia.org/wiki/XSLT), [HTML](https://en.wikipedia.org/wiki/HTML)/[XHTML](https://en.wikipedia.org/wiki/XHTML), [JavaScript](https://en.wikipedia.org/wiki/JavaScript) and [CSS](https://en.wikipedia.org/wiki/Cascading_Style_Sheets). Individual language-specific versions of Visual Studio also exist which provide more limited language services to the user: Microsoft Visual Basic, Visual J#, Visual C#, and Visual C++.

Microsoft provides "Express" editions of its Visual Studio 2010 components Visual Basic, Visual C#, Visual C++, and Visual Web Developer at no cost. Visual Studio 2012, 2010, 2008 and 2005 Professional Editions, along with language-specific versions (Visual Basic, C++, C#, J#) of Visual Studio Express 2010 are available for free to students as downloads via Microsoft's [Dream Spark](https://en.wikipedia.org/wiki/DreamSpark) program.

Once requirements have been gathered and at least some design has been done, it’s time to start writing code. Visual Studio was originally created more than a decade ago to support this part of the development process, and it’s still a critical aspect of what the tool family provides[14][18].

Like every IDE, Visual Studio 2010 provides a graphical interface for developers. Figure 8 shows a simple example.

Figure 3.3: The Visual Studio 2010 IDE lets developers write, compile, execute, and test code.



As the figure suggests, the tool provides what a modern developer expects from an IDE, including a straightforward mechanism for managing code and configuration files, along with the ability to show different parts of the code in different colors. The Visual Studio 2010 IDE also supports using multiple monitors, with different parts of the interface shown on different screens.

This same user interface can be used to write code in any of the languages provided with Visual Studio 2010, including:

C# and Visual Basic, languages with different syntaxes but very similar functionality. Both produce managed code, i.e., code based on the .NET Framework’s Common Language Runtime (CLR).

F#, a Microsoft-created language supporting functional and object-oriented programming. It also produces managed code.

C++, which can produce both managed and unmanaged (i.e., native) code. Many projects in many organizations use C++, and Visual Studio 2010 contains various enhancements aimed expressly at C++ developers.

JScript.NET, Microsoft’s extended version of ECMA-262 (commonly known as JavaScript). This language produces managed code, but Visual Studio 2010 also supports creating standard JavaScript that runs in any Web browser.

Developers can also add other languages to the Visual Studio IDE. Microsoft provides IronPython and IronRuby, for example, CLR-based versions of Python and Ruby. Other vendors offer languages as well, such as COBOL from Micro Focus.

Whatever language a developer chooses, he creates a *project* to contain his work. Visual Studio 2010 provides a range of built-in project types, including projects for creating a WPF application, a Windows Service, a Class Library, various kinds of ASP.NET applications, test projects, modelling projects, and many more. One or more projects of different types can be combined to create a *solution*. For example, a solution might contain a project for an ASP.NET application containing code, a modelling project with UML diagrams describing that application, and a test project with tests for that application.

### 3.7.2 Visual Studio LightSwitch 2011

The first version of Visual Studio LightSwitch, released July 26, 2011,[[20]](https://en.wikipedia.org/wiki/Microsoft_Visual_Studio#cite_note-61) had many differences from the current release of LightSwitch. Notably the tool was purchased and installed as a stand-alone product. If Visual Studio 2010 Professional or higher was already installed on the machine, LightSwitch would integrate into that.[[21]](https://en.wikipedia.org/wiki/Microsoft_Visual_Studio#cite_note-62)

The second major difference was the middle tier was built and exposed using WCF RIA Services.

**Visual Studio Professional**

Visual Studio Professional Edition provides an IDE for all supported development languages. As of Visual Studio 2010, the Standard edition was dropped.[[63]](https://en.wikipedia.org/wiki/Microsoft_Visual_Studio#cite_note-VS_2010_Licensing_Changes-63) MSDN support is available as MSDN Essentials or the full MSDN library depending on licensing. It supports [XML](https://en.wikipedia.org/wiki/XML) and [XSLT](https://en.wikipedia.org/wiki/XSLT) editing, and can create deployment packages that only use [ClickOnce](https://en.wikipedia.org/wiki/ClickOnce) and [MSI](https://en.wikipedia.org/wiki/Windows_Installer). It includes tools like Server Explorer and integration with [Microsoft SQL Server](https://en.wikipedia.org/wiki/Microsoft_SQL_Server) also. Windows Mobile development support was included in Visual Studio 2005 Standard, however, with Visual Studio 2008, it is only available in Professional and higher editions. Windows Phone 7 development support was added to all editions in Visual Studio 2010. Development for [Windows Mobile](https://en.wikipedia.org/wiki/Windows_Mobile) is no longer supported in Visual Studio 2010; it is superseded by [Windows Phone 7](https://en.wikipedia.org/wiki/Windows_Phone_7)[7][8].

**Visual Studio Premium**

Visual Studio Premium Edition includes all of the tools in Visual Studio Professional and adds additional functionality such as [code metrics](https://en.wikipedia.org/wiki/Code_Metrics), [profiling](https://en.wikipedia.org/wiki/Profiling_(computer_programming)), [static code analysis](https://en.wikipedia.org/wiki/Static_code_analysis), and database unit testing.

**Visual Studio Ultimate**

Visual Studio Ultimate provides a set of software and database development, collaboration, metrics, architecture, testing and reporting tools in addition to the features provided by Visual Studio Premium. As of Visual Studio 2010, the Team Suite edition was renamed to the Ultimate edition.[[63]](https://en.wikipedia.org/wiki/Microsoft_Visual_Studio#cite_note-VS_2010_Licensing_Changes-63) Visual Studio Ultimate offers a superset of toolsets based on the [Application Lifecycle Management](https://en.wikipedia.org/wiki/Application_Lifecycle_Management) (ALM) role it is being used for[8][9].

## 3.8 Selection of Programmer/ Debugger

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Product** | **Projects Templates** | **MSDN Integration** | **Debugging** |  |  | **IntelliTrace** | **Unit Test** | **Code Coverage** | **Coded UI Test** | **Test Impact Analysis** | **Load Testing** |  | **Architecture and Modelling** | **Mobile Development** |
| **Express** | Limited | Essential | Yes |  |  | No | No | No | No | No | No |  | No | Windows Phone 7 and Windows Phone 8 only |
| **Professional** | Yes | Essentials or Full | Yes |  |  | No | Yes | No | No | No | No |  | No | Windows Phone 7 and Windows Phone 8 only |
| **Premium** | Yes | **Full** | Yes |  |  | No | Yes | Yes | Yes | Yes | No |  | Read-only | Windows Phone 7 and Windows Phone 8 only |
| **Ultimate** | Yes | **Full** | Yes |  |  | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes | Windows Phone 7 and Windows Phone 8 only |

Table 3.3 Selection of Programmer

Visual Studio 2010 [IDE](https://en.wikipedia.org/wiki/Integrated_development_environment) has been redesigned which, according to [Microsoft](https://en.wikipedia.org/wiki/Microsoft), clears the UI organization and "reduces clutter and complexity." The new IDE better supports multiple document windows and floating tool windows, while offering better multi-monitor support. The IDE shell has been rewritten using the [Windows Presentation Foundation](https://en.wikipedia.org/wiki/Windows_Presentation_Foundation) (WPF), whereas the internals have been redesigned using [Managed Extensibility Framework](https://en.wikipedia.org/wiki/Managed_Extensibility_Framework) (MEF) that offers more extensibility points than previous versions of the IDE that enabled add-ins to modify the behavior of the IDE[15].

**CHAPTER 4**

**Design of the Application**

This chapter describes the design approach and conceptual design of an application regarding agriculture. The approach related with the concepts of crops and field related work for farmer. The conceptual design of slow agricultural growth is a concern for policymakers as some two-thirds of India’s people depend on rural employment for a living. It comprises system design and methodology related with the application requirement. It is software requirement specification and its requirement elication, design, analysis and verification. Now let’s discus these SRS briefly.

**4.1 Introduction to System Design**

Requirements are the backbone of a software development project. They drive the design and development, they determine what tests are done, and they’re fundamental to deciding when the software is ready to ship. Given this central role, managing requirements effectively is important.

In Visual Studio 2010, requirements are stored as work items in TFS. The product doesn’t specify how requirements should be gathered, however. One common solution is to record requirements using Microsoft Word or another tool. Third party products, such as Team Spec from Team Solutions, provide add-ins that allows requirements gathered in Word to be automatically synchronized with requirement work items in TFS. Another option is to use Sketch Flow, a tool included with Microsoft’s Expression Blend, to create quick sketches of user interfaces. Because these interface prototypes let people see what an application will look like, they can help in understanding a project’s requirements.

However they’re gathered, requirements stored in TFS can be used in several different ways. A primary goal of Visual Studio 2010 is to provide requirements traceability, connecting requirements with other aspects of development throughout a project’s life. As mentioned earlier, requirements can be connected with other work items such as tasks and test cases to make this possible. These connections let team members do things like determine which requirements don’t yet have test cases, figure out who’s responsible for the tasks necessary to meet a given requirement, or decide what tests to work on today.

System provides support for several of the activities in the requirements life cycle, as well as a rich ecosystem for partners to plug in and provide additional activities that can be well integrated. The goal is for these activities to be integrated and enacted on the as your process and your process template dictate. System began by addressing issues in the implementation phase. Visual Studio continues to be an established productivity too and Team System integrates with Visual Studio to enact the process by which developers and testers complete their work.

**4.2 Design Methodology**

**Requirements Elicitation and Refinement**

*Requirements elicitation and refinement* is the act of collecting requirements from the end user. The elicitations involve collections of data related with these following categories:

* Crops
* Agencies
* Organic fertilizer
* Weather

Crops includes Major Crops i.e. food crops, cash crops, plantation crops etc. Agencies include Banks and manufacture companies details. Organic fertilizers are fertilizers derived from animal or vegetable matter. It includes types of fertilizer that farmer can use in the fields for great improvement in growth of crops[22].

**Requirements Analysis and Breakdown**

Requirements breakdown is the act of translating the farmer problems and needs into solutions and work. It includes Kisan Credit Card and Farm Loan Application files which can help financially. Other banks are also included for them for their easy retrieval and get contact with them directly by using this app. It contains information regarding manufacture companies, organic fertilizer companies and farm equipment companies.[16]

**Requirements Specification**

The process of describing the solution is mainly system of how a farmer can easily get a loan.For this purpose NABARD introduce “Kisan credit card”. It is essentially a type of revolving cash credit facility with withdrawals and repayments to meet the production credit needs, cultivation expenses and the contingency expenses of the farmers. Recently, banks have also extended credit towards working capital requirements for other activities such as cattle breeding and poultry farming through this scheme. Each farmer is given a passbook and is sanctioned a credit limit, which can be modified depending on his performance and repayment record, thereby maintaining a working relationship between him and the bank. While the limit of credit is decided on the basis of operational landholding, cropping pattern and scale of operations, the full year's credit requirement of the borrower is taken care of and each card is valid upto five years. With minimum paper work and simplification of documentation for withdrawal of funds from the bank, not only has availability of credit been made easier but the system has also been made straightforward to operate and farmers have been given sufficient freedom to decide how to use their credit. The card also carries some insurance cover at a nominal premium. Requirements specification emphasizes the reaching of an agreement or baseline solution from which to move forward.[14]

**System Analysis and Design**

Several tools and diagramming surfaces aid in this process to refine requirements into a cohesive architecture and to a code skeleton for implementation. The references, contacts, direct link with banks, companies and non- government organizations will deeply influence the farmer. Their guidance helps them to cultivate the crops within the time interval and with best quality assurance.[17]

**Requirements Refinement**

Visual Studio Team System 2010 will intend to address the requirements refinement process. It will be easy to create hierarchies of agriculture items and indicate interdependencies easily. The process template will define the types of relationship links that we would like to have available for our methodology (for example predecessor/successor, dependency) and specify rules, such as required links or fields that roll-up across work items. These links are helps them to know what types of schemes and proposals will introduce for their benefits.

**Requirements Implementation**

Visual Studio 2010 will provide customizable link types that will make it much easier to create meaningful link relationships between the farmer and other workers. We expect to provide reports and views that illustrate how work is related to each other, to help people better understand the context of their work and the effect of a change. We expect also to provide rules and schemes around links, to enable work rollup or dependency acceptance. These rules and schemes will make sure that the right link relationships are set up and keep the maintenance of the links to a minimum. The rules should be customizable and extensible, so that processes can be enacted in the tools more easily.

As a result, Visual Studio 2010 should make it easy for the methodology to follow the process and maintain work relationships easily throughout the application life cycle. Both business analysts and end users will be more connected to the work of the development team with reports that are up to date and reflect the work of the team accurately.

**Requirements Validation**

Visual Studio 2010 will make it easy to track and execute manual tests, and to link these tests to requirements. The business companies analyst now will contact with the farmer and give them full information regarding their equipment and deliver them at their door.

**4.3 Design Model**

We have selected **Spiral Model** for our application because of the following reasons:

The spiral model combines the idea of [iterative development](http://en.wikipedia.org/wiki/Iterative_development) (prototyping) with the systematic, controlled aspects of the [waterfall model](http://en.wikipedia.org/wiki/Waterfall_model). It allows for incremental releases of the product, or incremental refinement through each time around the spiral. The spiral model also explicitly includes [risk management](http://en.wikipedia.org/wiki/Risk_management) within [software development](http://en.wikipedia.org/wiki/Software_development). Identifying major risks, both technical and managerial, and determining how to lessen the risk helps keep the [software development process](http://en.wikipedia.org/wiki/Software_development_process) under control.[22]

The spiral model is based on continuous refinement of key products for requirements definition and [analysis](http://en.wikipedia.org/wiki/Systems_analysis), [system](http://en.wikipedia.org/wiki/Systems_design) and [software design](http://en.wikipedia.org/wiki/Software_design), and [implementation](http://en.wikipedia.org/wiki/Computer_programming) (the code). At each iteration around the cycle, the products are extensions of an earlier product. This model uses many of the same phases as the waterfall model, in essentially the same order, separated by planning, risk assessment, and the building of prototypes and simulations.[[3]](http://en.wikipedia.org/wiki/Spiral_model#cite_note-Nasa04-3)

Documents are produced when they are required, and the content reflects the information necessary at that point in the process. All documents will not be created at the beginning of the process, nor all at the end (hopefully). Like the product they define, the documents are works in progress. The idea is to have a continuous stream of products produced and available for user review.[22]

The spiral lifecycle model allows for elements of the product to be added in when they become available or known. This assures that there is no conflict with previous requirements and design. This method is consistent with approaches that have multiple software builds and releases and allows for making an orderly transition to a maintenance activity. Another positive aspect is that the spiral model forces early user involvement in the system development effort. For projects with heavy user interfacing, such as user application programs or instrument interface applications, such involvement is helpful.[[3]](http://en.wikipedia.org/wiki/Spiral_model#cite_note-Nasa04-3)

Starting at the center, each turn around the spiral goes through several task regions [[3]](http://en.wikipedia.org/wiki/Spiral_model#cite_note-Nasa04-3):

* Determine the objectives, alternatives, and constraints on the new iteration.
* Evaluate alternatives and identify and resolve risk issues.
* Develop and verify the product for this iteration.
* Plan the next iteration.

**CHAPTER 5**

**Implementation**

The people responsible for building a new application usually start by thinking about its structure. This describes the implementation of the application. What parts should the application have? What should each one do? And how should those parts fit together? Once code actually exists, they ask more questions. What does this class look like? What other classes is it related to? What’s the sequence of calls from this method?

All of these questions lend themselves to visual answers. In every case, creating diagrams that show what’s going on can be the clearest path to understanding. Accordingly, Visual Studio 2010 contains tools for creating and working with diagrams that address all of these questions. These tools and the questions they address are sometimes lumped under the heading of “architecture”.

**5.1 Layer Diagram**

Grouping related responsibilities into clearly defined parts of the code makes sense. One obvious example of this is the division between user interface, business logic, and data in a multi-tier application. But these sharply defined boundaries aren’t useful solely for design; enforcing them also makes code more maintainable. Knowing that a change in, say, the user interface tier won’t affect the data tier eliminates one more risk in making that change.

To help define and enforce these boundaries, Visual Studio 2010 provides *layer diagrams*. An architect or developer can create a layer diagram, then associate different parts of the application with each layer by dragging and dropping a project or class file into it.



Figure 5.1: A layer diagram allows grouping code into layers, then enforcing rules about how the code in those layers interacts.

This diagram defines three layers: Presentation, Business, and Data. Each layer contains specific chunks of code, such as namespaces, classes, and methods. Dependencies across layer boundaries are constrained, as the figure suggests. And just to be clear: The Presentation/Business/Data split shown here is a good example, but the creator of a layer diagram is free to define any layering structure he likes.

A layer diagram can be used to validate the rules it contains, making sure that code conforms to the diagram’s constraints. It’s even possible to make this validation automatic, such as by using gated check-in to prevent checking in code that violates the layer constraints.

**5.2 Software**

Visual Studio 2010 allows developers to create applications for various versions of the .NET Framework, an ability that Microsoft calls *multi-targeting*. It also provides toolkits (with their own project types and more) for building software on various Windows-based platforms. They include the following:

Microsoft Visual Studio 2010 SharePoint Developer Tools for customizing SharePoint sites or creating wholly new applications built on SharePoint.

Office Developer Tools for creating applications that use or extend Excel, Word, PowerPoint, InfoPath, Outlook, Project, or Visio.

Windows Azure Tools for Visual Studio, helping developers create cloud-based applications for the Windows Azure platform.

Developers can also download other software that runs inside the Visual Studio 2010 IDE, such as development tools for Windows Phone 7. Along with these toolkits, Visual Studio 2010 includes a number of specialized designers for working with various technologies, regardless of the application type that’s being created. Here are a few examples:

The WPF and Silverlight Designer, a graphical tool for creating and working with XAML user interfaces.

The Workflow Designer for creating applications that use Windows Workflow Foundation.

The XML Schema Designer, a graphical tool for working with XML schemas defined in XSD.

The Object Relational (O/R) Designer, a graphical tool for creating a LINQ to SQL object model mapping for SQL Server data.

The HTML Designer, a graphical tool for creating and working with HTML documents.

Visual Studio 2010 supports other aspects of modern software development as well. For example, as multi-core machines become ubiquitous, writing code that exploits this processing power becomes essential. To help developers do this, the Visual Studio 2010 IDE provides parallel computing libraries and debugging options for creating parallel applications.

**5.3 System Integration and Testing**

Along with writing code, every developer does testing and debugging. It’s common today, for example, for a developer to create *unit tests* for the code she writes. Each unit test runs against a specific component, such as a method, verifying one or more assumptions about the behavior of that component. Unit tests are commonly automated, which lets a group of unit tests be run easily whenever changes are made. To support this, Visual Studio 2010 provides a unit testing framework. It’s also possible to use other unit testing frameworks with Visual Studio 2010, such as N Unit, although much of the integration with the rest of this product family is lost.

As just described, many applications also rely on logic embedded in a database, such as triggers and stored procedures. Like code running outside the database, this logic can benefit from unit tests. To help do this, Visual Studio 2010 provides support for creating *database unit tests*. The product also includes data generators to help create realistic test data for a database or to sanitize existing data by removing sensitive or private information.

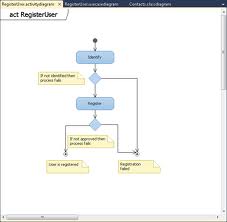
Visual Studio 2010 provides other support for testing by developers as well. For example, it’s increasingly common to write tests before all the code those tests will exercise has been written. Doing this typically requires generating stubs, something that Visual Studio 2010 can do automatically with an option called *Generate from Usage*. A developer can ask the tool to generate a stub for a class, method, field, or other identifier, making it easier to use a test-first development style.

An essential part of creating good code is having effective tools for debugging. The Visual Studio 2010 IDE includes a debugger, of course, but the product also provides a technology called *Intelli Trace*. Using this option, it’s possible to create a trace of an application either during testing (as described later) or by running the application directly from the Visual Studio IDE. This trace provides a series of very detailed snapshots of the running application that the developer can load into the debugger, then use to replay its execution. It’s even possible to move back and forth in the running application, getting a detailed look at exactly what’s happening throughout. The goal is to provide a clear view into the code as it runs, making it easier to identify what’s wrong.



Figure 5.2: When running a test from the Visual Studio IDE or Microsoft Test Manager, a tester can rely on one or more diagnostic data adapters to collect data about that test.

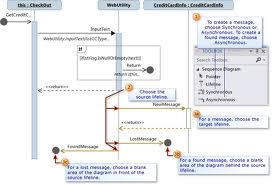
**5.4 Activity Diagram**

****Fig 5.3 Activity Diagram

An activity represents an operation on some class in the system that results in a change in the state of the system.

**5.5 Interaction Diagram**

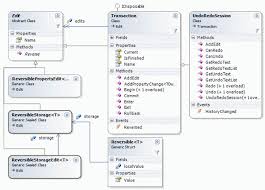
An interaction diagram shows an interaction, consisting of a set of objects and their relationship, including the messages that may be dispatched among them. Interaction diagrams address the dynamic view of a system.

Fig 5.4 Interaction Diagram

**5.6 Class Diagram**

The class diagram shows the relationship amongst classes. There are four types of relationships in class diagrams.

1. **Association** are semantic connection between classes. When an association connects two classes, each class can send messages to the other in a sequence or a collaboration diagram. Associations can be bi-directional or unidirectional.
2. **Dependencies** connect two classes. Dependencies are always unidirectional and show that one class, depends on the definitions in another class.
3. **Aggregations** are stronger form of association. Anaggregation is a relationship between a whole and its parts.
4. **Generalizations** are used to show an inheritance relationshipbetween two classes.

Fig 5.5 Class Diagram

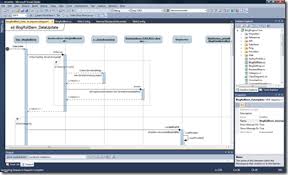
**5.7 Sequence Diagram**

In Visual Studio 2010, a *sequence diagram* shows an interaction, which represents the sequence of messages between instances of classes, components, subsystems, or actors. Time flows down the diagram, and it shows the flow of control from one participant to another.

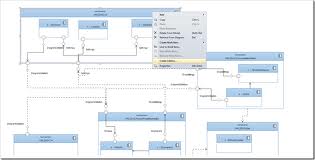
The diagram shows example instances and events, instead of classes and methods; more than one instance of the same type can appear in the diagram, and more than one occurrence of the same message can appear also.

There are two kinds of sequence diagram:.

**UML Sequence Diagrams** form part of a UML model, and exist only within UML modeling projects.

Fig 5.6 UML Sequence Diagram

**Code-based Sequence Diagrams** can be generated from .NET program code, and can be placed within any project

Fig 5.7 Code-based Sequence Diagram

**CHAPTER 6**

**TESTING**

**6.1 What Is Testing?**

“Testing is the process of executing a program with the intent of finding errors.”

Many people understand many definitions of testing

1. Testing is the process of demonstrating that errors are not present.

2. The purpose of testing is to show that a program performs its intended functions correctly.

3. Testing is the process of establishing confidence that a program does what it is supposed to do.

**6.2 Why Should We Testing?**

Although software testing is itself an expensive activity, yet launching ofsoftware without testing may lead to cost potentially much higher than that of testing, specially in systems where human safety is involved.

In the software life cycle the earlier the errors are discovered and removed, the lower is the cost of their removal.

**6.3 What Should We Testing?**

We should test the program’s responses to every possible input. It means,we should test for all valid and invalid inputs. Suppose a program requires two 8 bit integers as inputs. Total possible combinations are 28x28. If only one second it required to execute one set of inputs, it may take 18 hours to test all combinations. Practically, inputs are more than two and size is also more than 8 bits. We have also not considered invalid inputs where so many combinations are possible. Hence, complete testing is just not possible, although, we may wish to do so.

**Test, Test Case and Test Suite**

Test and Test case terms are used interchangeably. In practice, both are same and are treated as synonyms. Test case describes an input description and an expected output description.

The set of test cases is called a test suite. Hence any combination of test cases may generate a test suite.

**Verification and Validation**

Verification is the process of evaluating a system or component todetermine whether the products of a given development phase satisfy the conditions imposed at the start of that phase.

Validation is the process of evaluating a system or component during or at the end of development process to determine whether it satisfies the specified requirements .

Testing= Verification+Validation

**6.4Testing**

**Alpha, Beta and Acceptance Testing**

The term Acceptance Testing is used when the software is developed for a specific customer. A series of tests are conducted to enable the customer to validate all requirements. These tests are conducted by the end user /customer and may range from adhoc tests to well planned systematic series of tests.

The terms alpha and beta testing are used when the software is developed as a product for anonymous customers.

Alpha Tests are conducted at the developer’s site by some potential customers. These tests are conducted in a controlled environment. Alpha testing may be started when formal testing process is near completion.

Beta Tests are conducted by the customers / end users at their sites.

Unlike alpha testing, developer is not present here. Beta testing is conducted in a real environment that cannot be controlled by the developer.

**Functional Testing**

Input domain Output Domain

OUTPUT DATA TEST

INPUT DATA

TEST

**Boundary Value Analysis**

Consider a program with two input variables x and y. These input variables have specified boundaries as:

a <=x <= b

c <= y <= d

c

y

d

a b

x

**Worst-case testing**

If we reject “single fault” assumption theory of reliability and may like to seewhat happens when more than one variable has an extreme value. In electronic circuits’ analysis, this is called “worst case analysis”. It is more thorough in the sense that boundary value test cases are a proper subset of worst case test cases. It requires more effort. Worst case testing for a function of *n* variables generates 5*n* test cases as opposed to 4*n*+1 test case for boundary value analysis.

**Equivalence testing**

In this method, input domain of a program is partitioned into a finite number ofequivalence classes such that one can reasonably assume, but not be absolutely sure, that the test of a representative value of each class is equivalent to a test of any other value.

**Two steps are required to implementing this method:**

1. The equivalence classes are identified by taking each input condition and partitioning it into valid and invalid classes. For example, if an input condition specifies a range of values from 1 to 999, we identify one valid equivalence class [1<item<999]; and two invalid equivalence classes

[item<1] and [item>999].

2. Generate the test cases using the equivalence classes identified in the previous step. This is performed by writing test cases covering all the valid equivalence classes. Then a test case is written for each invalid equivalence class so that no test contains more than one invalid class. This is to ensure that no two invalid classes mask each other.

**Cause Effect Graphing Technique**

Consider single input conditions

Do not explore combinations of input circumstances

**Steps**

1. Causes & effects in the specifications are identified. A cause is a distinct input condition or an equivalence class of input conditions. An effect is an output condition or a system transformation.

2. The semantic content of the specification is analyzed and transformed into a Boolean graph linking the causes & effects.

3. Constraints are imposed

4. Graph – limited entry decision table. Each column in the table represent a test case.

5. The columns in the decision table are converted into test cases.

**Structural Testing**

A complementary approach to functional testing is called structural / white box testing. It permits us to examine the internal structure of the program.

**Path Testing**

Path testing is the name given to a group of test techniques based on judiciously selecting a set of test paths through the program. If the set of paths is properly chosen, then it means that we have achieved some measure of test thoroughness.

This type of testing involves:

1. Generating a set of paths that will cover every branch in the program.

2. Finding a set of test cases that will execute every path in the set of program paths.

**Flow Graph**

The control flow of a program can be analyzed using a graphical representation known as flow graph. The flow graph is a directed graph in which nodes are either entire statements or fragments of a statement, and edges represent flow of control.

**Cyclomatic Complexity**

McCabe’s cyclomatic metric V(G) = *e* – *n* + 2P.

**Several properties of cyclomatic complexity are stated below:**

1. V(G) \_1

2. V (G) is the maximum number of independent paths in graph G.

3. Inserting & deleting functional statements to G does not affect V(G).

4. G has only one path if and only if V(G)=1.

5. Inserting a new row in G increases V(G) by unity.

6. V(G) depends only on the decision structure of G.

**Two alternate methods are available for the complexity calculations:**

1. Cyclomatic complexity V(G) of a flow graph G is equal to the number of predicate (decision) nodes plus one.

V(G)= +1

Where is the number of predicate nodes contained in the flow graphG.

2. Cyclomatic complexity is equal to the number of regions of the flow graph.

**Graph Matrices**

A graph matrix is a square matrix with one row and one column for every node in the graph. The size of the matrix (i.e., the number of rows and columns) is equal to the number of nodes in the flow graph.

**Data Flow Testing**

Data flow testing is another from of structural testing. It has nothing to do with data flow diagrams.

i. Statements where variables receive values.

ii. Statements where these values are used or referenced.

As we know, variables are defined and referenced throughout the program. Wemay have few define/ reference anomalies:

i.A variable is defined but not used/ referenced.

ii.A variable is used but never defined.

iii. A variable is defined twice before it is used.

**Mutation Testing**

Mutation testing is a fault based technique that is similar to fault seeding, except that mutations to program statements are made in order to determine properties about test cases. It is basically a fault simulation technique.

Multiple copies of a program are made, and each copy is altered; this altered copy is called a mutant. Mutants are executed with test data to determine whether the test data are capable of detecting the change between the original program and the mutated program.

A mutant that is detected by a test case is termed “killed” and the goal of mutation procedure is to find a set of test cases that are able to kill groups of mutant programs.

When we mutate code there needs to be a way of measuring the degree to which thecode has been modified. For example, if the original expression is x+1 and the mutant for that expression is x+2, that is a lesser change to the original code than a mutant such as (c\*22), where both the operand and the operator are changed. We may have a ranking scheme, where a first order mutant is a single change to an expression, a second order mutant is a mutation to a first order mutant, and so on. High order mutants becomes intractable and thus in practice only low order mutants are used.

One difficulty associated with whether mutants will be killed is the problem of reaching the location; if a mutant is not executed, it cannot be killed. Special test cases are to be designed to reach a mutant. For example, suppose, we have the code.

Read (a,b,c);

If(a>b) and (b=c) then

x:=a\*b\*c; (make mutants; m1, m2, m3 …….)

To execute this, input domain must contain a value such that a is greater than b andb equals c. If input domain does not contain such a value, then all mutants made at this location should be considered equivalent to the original program, because the statement x:=a\*b\*c is dead code (code that cannot be reached during execution). If we make the mutant x+y for x+1, then we should take care about the value of y which should not be equal to 1 for designing a test case.

**Levels of Testing**

There are 3 levels of testing:

i. Unit Testing

ii. Integration Testing

iii. System Testing

**Unit Testing**

1. The size of a single module is small enough that we can locate an error fairly easily.

2. The module is small enough that we can attempt to test it in some demonstrably exhaustive fashion.

3. Confusing interactions of multiple errors in widely different parts of the software are eliminated.

**Integration Testing**

The purpose of unit testing is to determine that each independent module iscorrectly implemented. This gives little chance to determine that the interface between modules is also correct, and for this reason integration testing must be performed. One specific target of integration testing is the interface: whether parameters match on both sides as to type, permissible ranges, meaning and utilization.

**System Testing**

Of the three levels of testing, the system level is closet to everyday experiences.

We test many things; a used car before we buy it, an on-line cable network service before we subscribe, and so on. A common pattern in these familiar forms is that we evaluate a product in terms of our expectations; not with respect to a specification or a standard. Consequently, goal is not to find faults, but to demonstrate performance. Because of this we tend to approach system testing from a functional standpoint rather than from a structural one. Since it is so intuitively familiar, system testing in practice tends to be less formal than it might be, and is compounded by the reduced testing interval that usually remains before a delivery deadline.

**Validation Testing**

It refers to test the software as a complete product.

o This should be done after unit & integration testing.

o Alpha, beta & acceptance testing are nothing but the various ways of involving customer during testing.

o Validation testing improves the quality of software product in terms of functionalcapabilities and quality attributes.

**CHAPTER 7**

**Conclusion and Future Work**

This work was taken up with an objective to use appropriate technology for communication between devices and user which will eliminate the usage cost. In this respect it was essential to first study the different technologies used till now for agriculture technology which will monitor the procedures for growing crops.

**7.1 Conclusion**

This application for Windows Phone will serve almost all the issues faced by an Indian Farmer while cultivating his field. This app provides the best ways for growing a crop with its preliminary requirements, ways to go for Organic Farming which is now the need of the hour as well as use of good agricultural practices that makes use of less resources and more efficiently. This app also provides a free service for Weather Forecasting so that the farmer knows about the occurrence of a rainfall. Giving him a service that will tell him the markets for its food crops around it and market prices so that no one will be able to cheat him. Prices of the agriculture equipments can also be seen. Various Government Programmesschemes for the farmers which goes unseen by them are listed as well as the application forms for that also there.Hoping that this app will serve the purpose of farmers with utmost efficiency.

**7.2 Limitations**

* Limited information of crops.
* Limited number of agencies and banks information
* Language Dependent i.e English
* Use of Internet in every case.

**7.3 Future Work**

This includes

* State wise division of crops as there are some specific crops grown in a particular state.
* Incorporation of the text in various languages.
* Description of more crops to be included.
* Availability of this app easily on a mobile that is affordable by a farmer.
* Weather Forecasting to be more efficient
* Usage of app with less use of internet.

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