CHAPTER - 2
LITERATURE REVIEW

2.1 INTRODUCTION

In this modern life of regional people relies on mobile technology. Users or regional people expect the all the messages given by the mobile devices or booting of particular their mobile gives the messages with regional language so he/she understanding the various messages of mobile. Literature reviews are a continuous process, which was carried out throughout this doctorate work. During our research work, the major objective of this chapter is to provide background information, which is required for understanding the Linux operating system, and particular mobile operating system, which is available with different booting process displaying in regional language in Linux operating system. Also, provide the information, which is booting sequence of Debian, Maemo as well as other Linux mobile operating systems in mobile devices with regional language. Then after background of different boot loader of different Linux operating systems of mobile devices using kernel-booting process. This chapter addresses the summary of literature reviewed at every stage of my research work.

The operating system of mobile devices is based on the standard Manufacturers who build the mobile with regional language. The performance of mobile Operating system mostly depends upon the features provided by the different boot loaders, as they are considered as the init of the operating systems. Every mobile devices boo loader has its own specifications.

During various stages of my research work, we referred various types of literature of the following manners:

- Referred Journals Research Papers
- Various Survey of Linux operating system working on mobile devices
- Various lectures delivered by of well-known companies and universities
- Video Lectures of well-known companies and universities
- Books
The systematic of literature review during all stages of my research work, getting information us to find;

- Various meaning of the concept
- Types of the concept
- Working of the concept
- Originally applied program of the concept
- Practices and stages of the algorithm of the concept
- Various Challenges of the concept
- Possible solution of the current modified challenges

Beginning this chapter of literature review during different six stages. Like in the path of introduction and information of the literature review, then discussion of the mobile operating system, Maemo Operating system, Various boot loader of the available in the mobile operating system, NOLO boo loader, and finally discussion about the language processing and applying RELAN algorithm to the particular boot loader, kernel programming and linking with the Linux Kernel.

### 2.2 Literature review on Mobile Operating System

In this phase of the literature review, referring various literatures to understand the mobile operating systems and its different uses of the global era. We getting the various operating systems are running in mobile technology with Linux Platform. Maemo [1] [9], Meego [2] [7] [8], Firefox OS [3], Tizen [2] [7] [8], Ubuntu Phone [4], Sailfish OS [5], Web OS [6].

We find the survey of how many Linux operating systems are runs in the mobile devices, we found Understanding a start-up information of first time of using mobile devices are available only in English language, so regional people may not understand how to use a mobile. Interfaces for mobile information access need to allow users flexibility in their choice of modes and interaction style in accordance with their preferences, the task, and their physical and social environment.

Mobile OS design has experienced a three-phase evolution: from the PC-based operating system to an embedded operating system to the current smartphone-oriented operating system in the past decade. Throughout the process, Mobile OS architecture has gone from
complex to simple to something in-between. The evolution process is naturally driven by the technology advancements in hardware, software, and the Internet. [10].

2.3 Literature review on Maemo Operating System

In this phase of the literature review the MAEMO Operating system are running in Nokia N900 model. Internet Tablets made by Nokia run on top of the Maemo™ platform [1]. Maemo is a mobile OS developed by Nokia, based on Debian Linux. It was originally designed for Nokia’s small mobile tablet computers like the N800 and N810, but Maemo version 5 is used in the Nokia N900 smartphone, the first Maemo device with phone functionality. The N900 was released in November 2009. The very first version of Maemo was released all the way back in November 2005 on the Nokia 770 Internet Tablet (yes, more than four years before Apple had even announced the iPad). Earlier this year, Nokia merged Maemo 6 with another platform to create MeeGo [10].

Maemo is a Debian GNU/Linux based embedded operating system designed for networked mobile devices, called Internet Tablets. Being based on Linux and Debian, which support the ideology of sharing the source code, collaboration and open development model, maemo, is open source. Maemo runs on a recent 2.6 version of Linux kernel. The user space software links with the GNU C library, glibc. [42]

Maemo aims at being as much compatible with the mainstream Linux systems as is possible, reducing the time and effort needed for porting existing applications and developing new ones to maemo platform. The package management framework comes from the Debian distribution, simplifying and automating the process of installation, upgrading, configuring and uninstallation of the software packages. The user interface architecture is based on GNOME framework, especially on GTK+ widgets. GTK+ has been further extended by Hildon to better suit the needs of an Internet Tablet. The actual user interface engine under GTK+ is X Window System (X Server) with Matchbox window manager. GUI applications are built using Hildon framework and GTK+ widgets, although using X Server directly with Xlib API is possible, but not recommended. [42]
CHAPTER: 2

Literature Review

We found there are no any regional language characters to display on booting screen in Linux based hand held devices [11]. Facing the challenge in solving the unsolved problem, the researcher focused on introducing a new proposed booting process and its component and its process (different messages) given in regional language. During this solution, many problems are there like: now a day mobile devices already have regional language application, but there is a total absence of regional language in booting process.

2.4 Literature review on Kernel Boot Process

In this phase of the literature review understanding the Kernel Boot Process of the mobile operating system with Linux Operating System. The Linux boot process from the initial bootstrap to the start of the first user-space application. Along the way, you will learn about various other boot-related topics such as the boot loaders, kernel decompression, the initial RAM disk, and other elements of Linux boot. [12]

Bootloader Challenges: Image complexity like complete control over how the image is constructed and linked, other need to organize the startup code for specific processor’s boot sequence and linker for constructing a binary executable image. [13]

We found in this stage of Kernel Boot Process there are five different stages of the how the boot of the mobile devices. With the continuous of different stages like System Start-up, Boot loader (MBR), NILO Boot loader, Kernel 2.6.28, and Init stage.

2.5 Literature Review on Boot Loader

In this phase of the literature review understanding the deep knowledge of boot loader. As well as mobile operating system how loads step by steps in the mobile devices. In addition, there are many open source bootloader for Linux based mobile. Some of bootloader are specific to a particular architecture like u-boot for maemo operating system. The capability of a bootloader to support a wide variety of architectures and processors can be an important feature to larger development organizations. It is not uncommon for a single development organization to have multiple processors spanning more than one architecture. Investing in a single bootloader across multiple platforms ultimately results in lower development costs. [14] Mobile operating system could not run without support different boot loader and these all boot loader has different architecture has been used. The first steps of the boot-up process of NOLO boot loader of ARM device is varies from
Literature Review

other boot loader. When mobile device powered on, it is launched first machine code on the Master Boot Record of the memory, it is boot loader.

The boot techniques originated with a design of a bootstrap algorithm for MIMO systems. M.S. Ahmed and N. Sait in September 1989, proposed this bootstrap algorithm for the MIMO Systems. They split the nonlinear problem into 2 linear ones and the state estimation is carried out by assuming that the system parameters are known. This algorithm is used for online identification and control [15]. The literature reviews is help us to find out boot design motivated the researchers to go on developments with the boot design structure.

E.G.M. de Lacerda, A.C.P.L.F. de Carvalho, 2002, the proposed bootstraps techniques that was implemented in genetic algorithm to detect true errors using bootstraps data sets. [16] All such boot techniques followed a same procedure and concept of initiating actions in either software or hardware.

However, Ronald G. Minnich from Los Alumos National Lab in 2004 used their own bootstrap. This innovation reduces the risk of locating, verifying and loading a new OS image because here OS boots and the other OS systems work. This tricky boot is implemented by opening and validating a new image and moving it to the kernel space, now prepare for hardware reboot and load the new kernel to the existing running kernel, and entirely move to the new kernel [17]. This concept of find how to create new image and validating a new image to kernel space.

Guanfei GUO, Yaoxue ZHANG, Yuezhi ZHOU, Laurence T. YANG, Li WEI, Pengwei TIAN in 2008 designed a booting process in a transparent environment. Here the OS for the client is loaded from the server from one of the virtual disks, the client being loaded without any local memory [18]. Research focus on loader performance and booting process in transparent environment.

Junkai Gu and Weiyong Ji in 2009 proposed a secure bootstrap based on trusted computing technology. Here each time when the kernel is booted, the integrity of files and code are measured first. If this test passes, the control goes to Master Boot Record (MBR) and performs the ordinary bootstrap process. Otherwise the illegally modified all files will be recovered. For this secure bootstrap, the integrity of files that load the OS and the dynamic integrity of OS Loaders were considered. They ensured the security of system by providing a smart card to the users of system. If the card validates to be expired or wrong the system, goes to halt state [19].
Geng Qingtian, Sun Zhanchen, Zhao Hongwei and Gu Jianhao in 2011 made modifications in U-boot (Universal Boot Loader) to support for S3C2440 processor. They transferred the support files of U-boot S3C2410 so that it can support the hardware platform based on S3C2440 processor. In this U-boot, transplantation U-boot 2011.03 is used [20].

With this literature review, we focusing the NOLO bootloader, which is available for the Nokia N900, has Maemo operating system. In addition, linked with the Kernel 2.6.28 for the updating regional language in booting process for the Linux based mobile operating system.

There are no any regional language messages of different process of booting process in Linux based mobile operating system in any Linux based mobile in world.

2.6 Literature Review on Language Processing

Language Processing is a field of Computer Science and Linguistics concerned with the interactions between computers and natural (human) languages. [11]

Natural Language Processing (NLP) is an area of research and application that explores how computers can be used to understand and manipulate natural language text or speech to do useful things. NLP researchers aim to gather knowledge on how human beings understand and use language so that appropriate tools and techniques can be developed to make computer systems understand and manipulate natural languages to perform the desired tasks. The foundations of NLP lie in a number of disciplines, viz. computer and information sciences, linguistics, mathematics, electrical and electronic engineering, artificial intelligence and robotics, psychology, etc. Applications of NLP include a number of fields of studies, such as machine translation, natural language text processing and summarization, user interfaces, multilingual and cross language information retrieval (CLIR), speech recognition, artificial intelligence and expert systems, and so on. [21]

Lexical and morphological analysis, noun phrase generation, word segmentation, etc. (Bangalore & Joshi, 1999; Barker & Cornacchia, 2000; Chen & Chang, 1998; Dogru & Slagle, 1999; Kam-Fai et al. 1998; Kazakov et al., 1999; Lovis et al., 1998; Tolle & Chen, 2000; Zweigenbaum & Grabar, 1999). [21] This Literature review; help of lexical and morphology of language processing.

Dogru & Slagle (1999) propose a model of lexicon that involves automatic acquisition of the words as well as representation of the semantic content of individual lexical entries. Kazakov et al. (1999) report research on word segmentation based on an automatically generated annotated lexicon of word-tag pairs. Kam-Fai et al. (1998) report the features of an NLP tool called Chicon used for word segmentation in Chinese text. Zweigenbaum & Grabar (1999) propose a method for acquiring morphological knowledge about words in medical literature. It takes advantage of commonly available lists of synonym terms to bootstrap the acquisition process. Although the authors experimented with the method on the SNOMED International Microglossary for pathology in its French version, they claim that since the method does not rely on a priori linguistic knowledge, it is applicable to other languages such as English. Lovis et al. (1998) propose the design of a lexicon for use in the NLP of medical texts. [21] These all literature reviews of different authors we examine automatic acquisition of the words as well as representation of the semantic content of individual lexical entries of Gujarati Unicode fonts in Linux Operating system with mobile technology.

The morphological approach is lexeme-based, and adheres to Construction Morphology, being elaborated by Booij (e.g. [23]). A compound is defined as a sequence, which cannot be generated otherwise than by morphological rules. Hence, it does not have syntactic structure [24]. This criterion is valid for French VN and Swedish NV-are compounds. Interaction between syntax and lexicon is however tolerated: the lexical rules may make use of syntactic information [25]. “Word formation patterns can be seen as abstract schemas that generalize over sets of existing complex words with a systematic correlation between form and meaning” [26]. The generalizations are expressed in the lexicon by assuming intermediate levels of abstractions between the most general schema and individual existent compounds. Hence, the lexicon is hierarchically structured. The morphology combines three aspects of complex words: phonological form, formal structure and meaning. The architecture of grammar is tripartite and parallel [27]. Abstract schemas coexist with their
individual instantiations in the lexicon. Thus, outputs of productive rules can also be listed
[23]. [22]

Manipulation of texts for knowledge extraction, for automatic indexing and abstracting, or
for producing text in a desired format, has been recognized as an important area of research
in NLP. This is broadly classified as the area of natural language text processing that allows
structuring of large bodies of textual information with a view to retrieving particular
information or to deriving knowledge structures that may be used for a specific purpose.
Automatic text processing systems generally take some form of text input and transform it
into an output of some different form. The central task for natural language text processing
systems is the translation of potentially ambiguous natural language queries and texts into
unambiguous internal representations on which matching and retrieval can take place

A natural language text processing system may begin with morphological analyses.
Stemming of terms, in both the queries and documents, is done in order to get the
morphological variants of the words involved. The lexical and syntactic processing involve
the utilization of lexicons for determining the characteristics of the words, recognition of
their parts-of-speech, determining the words and phrases, and for parsing of the sentences.
[21]

Roux and Ledoray (2000) report a project, called Aristotle that aims to build an automatic
medical data system that is capable of producing a semantic representation of the text in a
canonical form. Song and Zhao (2000) propose a method of automatic abstracting that
integrates the advantages of both linguistic and statistical analysis in a corpus. Jin and Dong-
Yan (2000) propose a methodology for generating automatic abstracts that provides an
integration of the advantages of methods based on linguistic analysis and those based on
statistics. [21] Using this literature review we focusing on which method to find out a
suffixes and stems of particular Gujarati Unicode font in Maemo operating system.

Information extraction (IE) is a subset of knowledge discovery and data mining research that
aims to extract useful bits of textual information from natural language texts (Gaizauskas &
Wilks, 1998). [21] A variety of information extraction (IE) techniques are used and the
extracted information can be used for a number of purposes, for example to prepare a
summary of texts, to populate databases, fill-in slots in frames, identify keywords and phrase for information retrieval, and so on. IE techniques are also used for classifying text items according to some pre-defined categories. An earlier example of text categorization system is CONSTRUE, developed for Reuters, that classifies news stories (Hayes, 1992). The CONSTRUE software was subsequently generalized into a commercial product called TCS (Text Categorization Shell). An evaluation of five text categorization systems has been reported by Yang and Liu (1999).

Stemming was actually introduced by Lovins [28] who in 1968 proposed the use of it in Natural Language Processing applications. Two more stemming algorithms were proposed by Hafer and Weiss [29] and Paice [30]. Martin Porter [31] in 1980 suggested a suffix-stripping algorithm, which is still considered a standard stemming algorithm. Another approach to stemming was proposed by Frakes and Baeza-Yates [32] who proposed the use of term indexes and its root word in a table lookup. With the improvement in processing capabilities, there was a paradigm shift from purely rule-based techniques to statistical/machine learning approaches. Goldsmith [33] [34] proposed an unsupervised approach to model morphological variants of European languages. Snover and Brent [35] proposed a Bayesian model for stemming of English and French languages. Freitag [36] proposed an algorithm for clustering of words using co-occurrence information. For Indian languages, Larkey et al. [37] used 56 rules to implement a stemmer for Gujarati. Ramanathan and Rao [38] used the same approach, but used some more rules for stemming. Dasgupta and Ng [39] proposed an unsupervised morphological stemmer for Bengali. Majumder et al. [40] proposed a cluster based approach based on string distance measures, which required no linguistic knowledge. Pandey and Siddiqui [41] proposed an unsupervised approach to stemming for Gujarati.

2.7 Literature Review on Kernel Programming

Modules are pieces of code that can be loaded and unloaded into the kernel upon demand. They extend the functionality of the kernel without the need to reboot the system. For example, one type of module is the device driver, which allows the kernel to access hardware connected to the system. Without modules, we would have to build monolithic kernels and add new functionality directly into the kernel image. Besides having larger kernels, this has the disadvantage of requiring us to rebuild and reboot the kernel every time we want new
functionality. [44] Using this literature review we understand the how to make module of the particular algorithm as well as defining kernel to access hardware connected to the system.

The init_module() either registers a handler for something with the kernel, or it replaces one of the kernel functions with its own code (usually code to do something and then call the original function). The cleanup_module() function is supposed to undo whatever init_module() did, so the module can be unloaded safely. [44] Using this function we can understand the handlers of the module and how to safely unload the module of the programming.

The printk() was not meant to communicate information to the user but happens to be a logging mechanism for the kernel, and is used to log information or give warnings. Therefore, each printk() statement comes with a priority. [44] This approaches help to defining the messages in the user define module and displaying the different warning to the kernel of operating system.

Understanding the defining the class and call of the class of kernel programming as well as various system calls how to linking with the header and source files of the kernel. In a deep approaches to how linking of user define file with various source and header file of kernel of Maemo Operating system.

### 2.8 Conclusion

During this chapter literature review on different point of view of operating system, Maemo Operating system, NOLO bootloader, as well as different process of Kernel and its system call and specific for Language processing in for particular Nokia N900 with Maemo operating system.

This research work is benefiting to the specific domain people like village people who do not understand English language. The introduction of the outcome of this research will definitely help them understand the instruction of booting process of the mobile devices as it will be in Gujarati language, which they understand.

The limitation of this research is that since it is pedagogical and carried out with the limited resources and funds, it has been limited only to the introduction of two character and two
suffixes. The researcher is confident enough to work upon fully developed RELAN algorithm, which might lead to the introduction of whole setup of Gujarati language in booting process.

In addition, not last but least we finding the literature review on how to developing a module or source file of the kernel 2.6.28 with the Kernel programming.
2.9 References

CHAPTER: 2

Literature Review


[21] Chowdhury G. Gobinda, Dept. of Computer and Information Science, University of Strathclyde, Glasgow G1 1XH, UK, “Natural Language Processing”.

[22] Book, Gelbukh Alexander, “Special Issue: Natural Language Processing and its Applications”, 2010


