Development of Kannada Keyboard Interface and Crop Management on Nokia N900 Device

TN Nagabhushan, S.P.Shiva Prakash
Mobile Innovation Lab,
Dept. of Information Science & Engineering,
Sri Jayachamarajendra College of Engineering,
Mysore, India
{tnnagabhushan,shivasp26}@gmail.com

Suresh Chande
Nokia MeeGo device R&D
Devices
Helsinki, Finland
suresh.chande@nokia.com

Abstract

The new generation cellular phones have multi-functional capability such as imaging, video, audio recording and messaging in addition to accessing the Internet. In Karnataka there is a wide-spread movement to improve the usage of native Kannada language in every walk of life. One of the most significant techniques to improve the usage of native Kannada language is to enable the hand held devices with Kannada Language interface so that majority of the people from rural sides can benefit. There have been attempt to develop applications on free and open source software. This work unfolds the development of Kannada interface with a detailed study of Kannada literal representation in Unicode. A virtual keyboard for Kannada literals is developed and an editor for every representation of Kannada words is built on Maemo platform. Their relevant specification and implementation details are discussed. An application useful for the farming community is developed as a prototype in Kannada language. A pilot study has been conducted at a village to evaluate the usefulness of the proposed technologies and case studies are discussed.

Index Terms: Kannada, Crop, SMS, Virtual keyboard, Hand held devices.

I. INTRODUCTION

There has been exponential growth on usage of cell phones in recent tmes. Cell phones have become a necessity for everyone to manage varieties of activities. It is significant to note that in countries like India, Most cell phones are powered by ENGLISH language. It is also significant to note that India has a large rural mass who still manage their daily routines in their native languages.

In the context of agriculture, the potential of information technology (IT) can be assessed broadly under two heads: (a) as a tool for direct contribution to agricultural productivity and (b) as an indirect tool for empowering farmers to be informed and take quality decisions which will have positive impact on the way agriculture and allied activities are conducted.

Related works: There has been increased encouragemts by the govt. Of Karnataka to develop Kannada software [1]. Various institutions and univerties are actively engaged in developing fonts and unicode version of Kannada language [6]. At the same time lot of activities are going on worldwide to adopt wireless technologies to improve different aspects of agriculture [5].

In Karnataka specifically, there is a need to power the present generation cell phones with local Kannada language so as to facilitate easy exchange of relevant data or information in Kannada language. Considering the trends on using Free and Open Source Software(FOSS), there is an advantage to build Kannada language keyboard and interface[7] and develop some important application that benefits the farming community.

In order to accomplish the objectices which empower the farming community receive timely guidance on their crops for better management and get market price updates, we propose to develop

1. A Virtual Kannada Keyboard interface for n900 device
2. Develop appropriate database design with user interface to manage crops and market prices

This pilot project is tested live at a village “SUTTUR” and the case studies are discussed.

The paper is structured as follows. Section I discusses Introduction and section II discuses Design, Section III presents implementation and section IV discusses the Testing and case study. Finally section V presents conclusion.

II. Design of the Proposed System

The design includes the following phases.

Phase I: In this phase we discuss the generation of Kannada characters based on English character input

Phase II: Presents the virtual kannada keyboard design.

Phase III: Includes the design of crop management system.

Phase IV: Discusses the overall archiecture design.

Phase I: Kannada Transliteration

Fig.1 shows the process involved in converting english letters to kannada letters which involves following process.

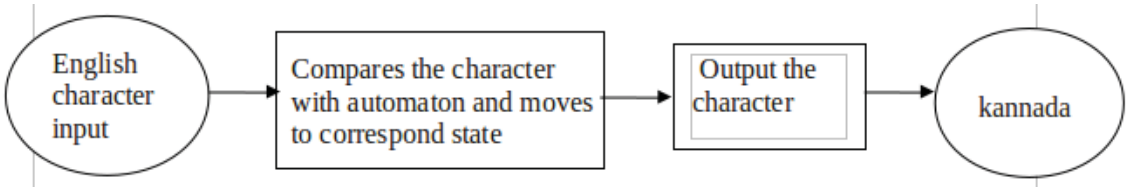
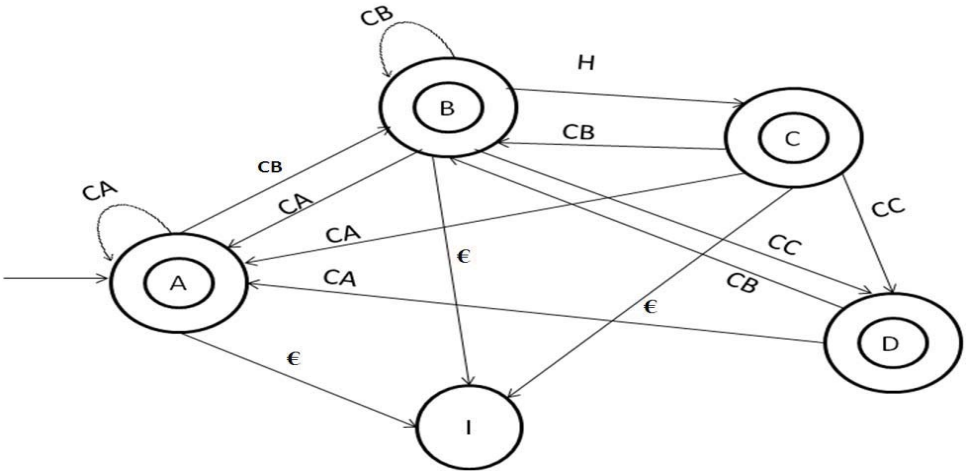


Fig.1. English to Kannada convertion process

Whenever a english character is input to the translator, the character is given as input to the automata and corresponding output from the automata is placed in the editor, for every character given as input to the automata, corresponding state change is made in the automata. The state changes and the transitions are showed in Fig.2.



CA- Character set involve all characters. Level 0

CB- Character set involve all remaining characters. Level 1

CC- Character set involve all kagunithas Level-1

CD- Character set reaching one of the state

Fig.2. Automaton for English to Kannada letter mapping

The above automaton shows the states and transitions made for converting the english charachter to kannada character which mainly involes five states, state A, state B, state C, state D and state I.

State A: This state invoves all the independent vowel character set. Whenever an english character corresponding to independent vowel character set is given as input to the automaton, the automaton stays in this state. whenever english character corresponding to the other character set is given as input then state transition takes place from state A to state B. If the automaton is unable to transit to any state then it moves to invalid state I.

State B: This state involves all consonants in kannada. Whenever an english character corresponding to consonant character set is given as input, state transition remains in the state B, if the character H is given as input the state trasition takes place from state B to state C, when english characters corresponding to dependent vowel sign character set is given as input, state transition takes place from state B to state D, if the automaton is unable to transit to any state then it moves to invalid state I.

Whenever an english character corresponding to independent vowel character set is given as input and when the automaton is in any of the state, it moves to state A.

Phase II:Virtual Kannada Editor

Fig.3 shows the process involved in outputting kannada text to the text widget using the kannada virtual keyboard, which involves the following processes. Whenever a key is pressed in the kannada virtual keyboard, a button press event occurs. Then a check is made whether the button pressed is a functional key or a text key. If the key pressed is the functional key, then the corresponding operation is performed else the pressed key id is matched against the button to character map table, and the corresponding character is sent to the text widget. While sending the character check is made whether the shift key

is ON or OFF, if the shift key is on then the upper character in the key is sent else the lower key in the button is sent.

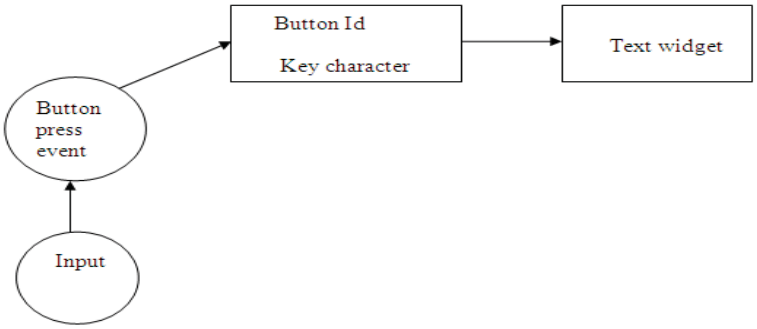


Fig.3. Process of Kannedi

Phase III: Crop management system

The crop management system comprises of two divisions namely, Farmers data Registration and SMS communication. The module requires a registration details such as Name of the farmer, village, taluk, district, soil type, crop type, crop variety, phone number and date of sowing. Upon entering these details, the server update the database. An internal timer keep track of specific peroids on which the farmer must be alerted about the market pricing or control measures such as providing manures, spraying pesticides etc.. These information are made available to the hand phone of registered farmers. The sequence diagram for registration and message generation is shown in Fig. 4 and 5 respectively.

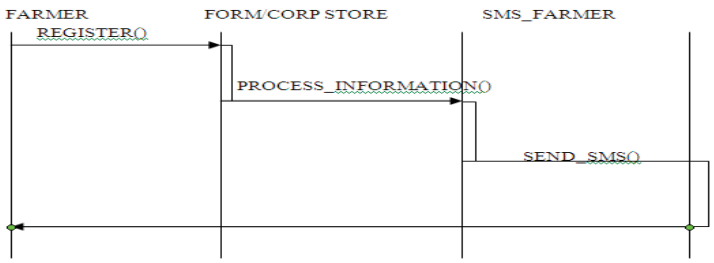


Fig.4. Sequence diagram for Farmer Registration

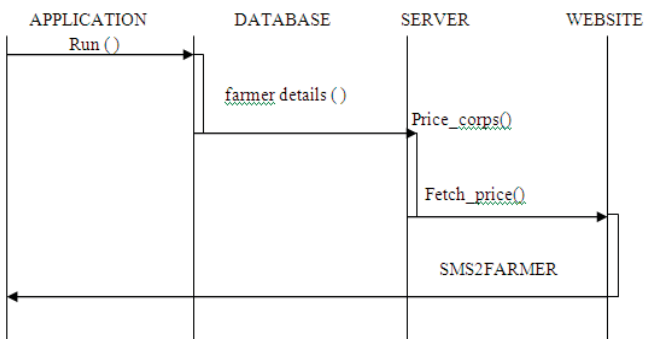


Fig.5. Sequence diagram for SMS Farmer

Phase IV: Overall Architecture

The overall architecture of the proposed system is depicted in Figure-6. Interface when accessed should ask for authenticated user to login and work on it. After authentication, the forms are accessible to the user to enter the data in respective fields. The data collected is stored in a database. Finally an SMS to the farmers about prices, fertilizers and pesticides related to the crop is sent.

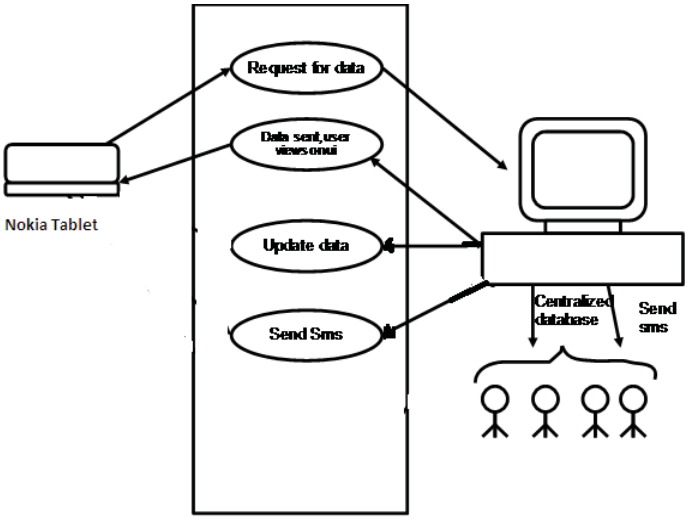


Fig.6. Architecture of the proposed system

III. IMPLEMENTATION

The design of the proposed system is implemented using Qt for front end and MySQL on database. The software development on Kannada character generation, development of Virtual Kannada Keyboard and the necessary Tables for handling crops, user interface and SMS module is presented in details in the following section.

A. Kannada Transliteration

The screen shot of the language translation from english to kannada is as shown in the Fig.7. The Unicode Standard (Version 3) encodes Kannada characters in the same relative positions as those coded in the ISCII-1988 standard [1],

Fig.7. Snapshot of Kannada language

B. Kannad keyboard (Kannedi)

Kannedi is a word processing application for creating documents in Kannada language. Kannedi is developed with an intention to support Kannada language on the N900 series devices. Kannedi works on Maemo operating system. It supports saving the documents in Unicode format which means one can transfer documents to other operating systems that support Unicode. Kannedi uses the standards proposed by the Karnataka Government for the ANSI Kannada fonts and the keyboard. Kannedi is a special local language software package developed exclusively for Nokia devices running on maemo platform. It is a transliteration software which converts 'Kannada text written in English' to its respective scripts. With this basic functionality, it helps in creation of Kannada documents.

The usage of English language & English keyboard in tablet pc is inevitable. It is difficult for a common user to use separate keyboard logic for typing English & Kannada language at the same time. On that account, Kannada language can be effortlessly written in English itself. At present there are several software available for Desktop Publishing in Kannada language. However, most of them have their own specific keyboard design. Though such a design is easy to follow for those who are proficient in that language, it is not a easy job for people who use the English keyboard in their everyday life.

The Kannedi software comes handy under these circumstances. By providing what is known as "Transliteration Scheme" where Kannada language can be written first in English script and then be converted into its Kannada language. One of the main objective of Kannedi is the "portability of data". With Kannedi, one can transfer the data between Kannedi and other applications in Unicode format, in either direction. The transliteration scheme of Kannedi uses anuswara and visarga. We provide local language support for the Nokia tablet, which is used as a communicating device between the farmer and the centralized database. Figure-8 shows Virtiual Kannada keyboard.

Fig.8. Virtual Kannada Keyboard

C. Crop management System

The Crop management application has a rich user interface developed using Qt[2]. Every time the application is run, it asks for a user name and password, thus ensuring secure access to the database. The application is designed in such a way that the user

feels that the data resides on the tablet itself. We do this using the centralized database and Wi-Fi connection. The user can retrieve and view information stored in the centralized database from the tablet anywhere as long as the tablet is in a Wi-Fi environment. The tablet-operator is given the facility to view the details of the farmer. The tablet-operator can also update the corresponding data [3].

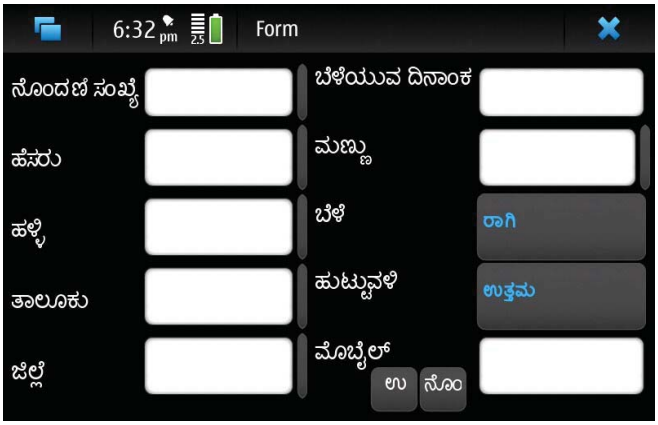


Fig.9. Snapshot of the application UI

Fig. 9 shows the snapshot of the application user interface which contains farmers mobile number, farmers_name,village, taluk, district, date_sowing_seed, type of soil in which seeds are sown, type of crop, crop grade and an option to submit the details entered to the server.

The Crop management System is designed to notify the farmers about their latest prices, fertilizers and pesticides with the help of SMS automatically [5]. The latest prices (both minimum and maximum) related to their areas are sent based on the date of harvesting (counted from the date of sowing) automatically. The farmer get registered by entering the details like, crop he is growing, soil type and furnishing his field information in the interface provided on Nokia N900 tablet. The data will be sent to centralized database via Wi-Fi connectivity and get stored in the database. The daemon process which is running in the central server, will update the database. Parallely the daemon process logins to www.krishimaratavahini.kar.nic.in web-site and fetches the latest prices of the crops and store/updates the database. Later based on the type of crop the farmer is growing, its price will be sent to the respective farmer using the sms service provider.

Also periodically based on the current status of the crop like by calculating the number of days after sowing, the type of fertilizer and pesticides that need to be applied to the crop will be fetched from the database and it will be sent as sms to the farmer. Here we have used www.160by2.com as the service provider which gives authority to send free messages to n number of users. The crop and farmer table updation and sms module application consists of two daemon processes. To update the price of the crop table, we need to find matching of farmer and his related crop, to send status of his crop The daemon process will login to the www.krishim aratavahini.kar.nic.in website and extracts the minimum and maximum price of the crop with respect to its variety and stores into the database. Every day it gets updated. The min and max price will be sent as sms to farmers based on the crop they have grown in their field.

The other daemon process, matches the farmer details like his id with the crop and the sms will be sent periodically to the farmers based on the status of the crop. The php program will store the data extracted from the tablet to centralized database. For Centralized database we use MySQL to store the data. PHP is used to access the database and manipulate the data. PHP connects to the database using a database handler. The connection is established using mysql_connect function which takes the database name, user name and password as parameters. Once the connection is established, we construct a SQL query and execute it using mysql_exec function. Table 1 shows the structure of the farmer and crop table along with few tuples inserted in it.

TABLE I
FARMER AND CROP TABLES
CROP TABLE STRUCTURE

f_id	f_name	f_village	f_taluk	f_district	f_soil	c_id	f_mobile	f_dos
101	prakash	suttur	Nanjund	Mysore	Black	111	9900254112	01/01/11

FARMER TABLE STRUCTURE

f_id	c_id	c_name	c_varietyid	c_varname	c_soil	c_days	c_stage	c_fert
101	111	ragi	11	uttama	Black	36	2	Gobar

c_pest	c_water	c_minprice	c_maxprice	c_doh
HNO	10	800	1200	07/02/11

D. SMS

We are making use of www.160by2.com SMS gateway which provides free SMS service. Sending of SMS is fully automated with the help of PHP-cURL .

To render an SMS, Create a cookie file that will store the session. We set the user name and password of one of the known accounts. We use an add on called Tamper data in Mozilla Firefox which shows us what parameters are being posted. We use these parameters and Urlencode it and then send it as post parameters to the required URL. Basically URL is doing the work of the browser. SMS is sent by retrieving data and phone number from the database and sent in individually. The following snapshots shows the messages sent to the different farmers based on the status of the crop.

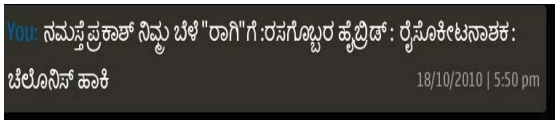


Fig.10. 'SMS' text

The SMS to the farmer will be sent in local language as shown in Figure-10. Once the farmer gets registered for instance if we take it as Ragi crop after few days as specified, an SMS goes to farmer in kannada language stating that “Hello prakash ur crop Ragi is to

be sprayed with pesticides". Similarly few days later automatically another message is sent to the farmer regarding the manure he has to put to his crop as shown in Figure10.

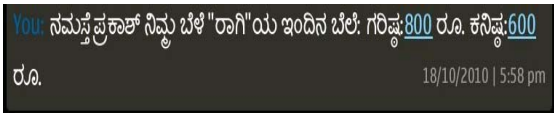


Fig.11. 'SMS' text

Finally at the time of harvesting of the crop the server will send a message to the farmer the status of the crop price in the current market. The server will fetch the price of the crop from www.krishimaratavahini.kar.nic.in website maintained by government of Karnataka as shown in Fig.11.

IV. TESTING

The software module comprising of Virtual Kannada Keyboard and the front end on crop management us ported onto N900 device. Initially we selected four farmers from the village and registered their relevant data from the device. The data automatically uploaded into the server. The specific data relevant to each crop is sent by the server as SMS texts to the farmers cell phones at specific time periods. Table IIa indicate the registration details of four selected farmers. Table IIb indicate the advice sent by the system on selection of relevant manure by way of SMS and the current market price for their crop at the time of harvest. It can be seen from the Tables that the advices sent out onto the farmers cell phones periodically help them immensely to manage their crops better. Also the farmers can maximize price for their crops based on price alerts.

TABLE IIa

f_id	f_name	f_village	f_taluk	f_district	f_soil	c_id	f_mobile	f_dos
101	prakash	suttur	Nanjund	Mysore	Black	111	9900254112	01/01/11
102	siddaraju	suttur	Nanjund	Mysore	Red	221	9886361341	01/01/11
103	mahesha	suttur	Nanjund	Mysore	Black	331	9586342107	02/01/11
104	sharana	suttur	Nanjund	Mysore	Red	441	9444356682	02/01/11

V. CONCLUSION

This project is mainly addressed a local language interface onto N900 device and successfully shown an important application on crop management. The pilot project has yielded significant success. More farmer data with more crops are in the process of integration for large testing.

ACKNOWLEDGMENT

The authors would like to thank Nokia University relations for providing research grant under No.VTU/ELC/2008-09/336 Dated. 02-03-2009.

TABLE IIb

f_id	c_id	c_name	c_varietyid	c_varname	c_soil	c_days	c_stage	c_fert
101	111	ragi	11	uttama	Black	36	2	Gobar
102	221	wheat	21	bansi	Red	45	3	mangala
103	331	paddy	31	IR20	Black	45	3	hybrid
104	441	jowar	41	hibrid	Red	48	4	mangala

c_pest	c_water	c_minprice	c_maxprice	c_doh
chelosis	10	800	1200	07/02/11
HNO	20	1200	1800	16/02/11
rybosis	20	700	1500	17/02/11
syenium	10	850	2700	20/02/11

REFERENCES

[1] Kannada General Information and Description, Directorate of Information Technology, Government of Karnataka, Bangalore, October 2002.
[2] Qt Mobility 1.2: QSystemNetworkInfo Class Reference. - http://doc.qt.nokia.com/qtmobility-1.2/qsystemnetworkinfo.html.
[3] An SMS Based Rural Application for Agricultural Consultancy and Commodity Booking Service, Pramita Mitra, Amitabha Samajpati, Tanmoy Sarkar, Pradip K. das, Emerging Applications of Information Technology-2006
[4] S Sivakumar, “ITC eChoupal Experience Sharing”, http://www.iimahd.ernet.in/ egov/ifip/april2004/eChoupal.pdf
[5] The use of wireless technology in tropical agriculture research field work, Carlos B. MENESES, Rolf GRAU, Jacobo GARCES Information Services Unit, International Center for Tropical Agriculture (CIAT) Cali, Colombia
[6] kuvempu kannada tantramsha, http://www.kannadauniversity.org/kuvempueng.html
[7] Lee Y. E., Benbasat I. Interface Design for Mobile Commerce. Communications of the ACM. Vol. 46. No. 12. 2003. pp. 49 – 52.